**Ministry of Power, Energy and Mineral Resources**
**The People's Republic of Bangladesh**

# Data Collection Survey
# on
# Bangladesh Natural Gas Sector

# FINAL REPORT

**January 2012**


**JAPAN INTERNATIONAL COOPERATION AGENCY**

**ORIENTAL CONSULTANTS CO., LTD.**


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Source: Petrobangla Annual Report 2010

# Abbreviations

| | |
|---|---|
| ADB | Asian Development Bank |
| BAPEX | Bangladesh Petroleum Exploration & Production Company Limited |
| BCF | Billion Cubic Feet |
| BCMCL | Barapukuria Coal Mine Company Limited |
| BEPZA | Bangladesh Export Processing Zones Authority |
| BERC | Bangladesh Energy Regulatory Commission |
| BEZA | Bangladesh Economic Zone Authority |
| BGFCL | Bangladesh Gas Fields Company Limited |
| BGSL | Bakhrabad Gas Systems Limited |
| BOI | Board of Investment |
| BPC | Bangladesh Petroleum Corporation |
| BPDB | Bangladesh Power Development Board |
| CNG | Compressed Natural Gas |
| DWMB | Deficit Wellhead Margin for BAPEX |
| ELBL | Eastern Lubricants Blenders Limited |
| EMRD | Energy and Mineral Resources Division |
| ERD | Economic Related Division |
| ERL | Eastern Refinery Limited |
| GDP | Gross Domestic Product |
| GEDBPC | General Economic Division, Bangladesh Planning Commission |
| GIZ | Gesellschaft für Internationale Zusammenarbeit |
| GOB | Government of Bangladesh |
| GTCL | Gas Transmission Company Limited |
| GTZ | Deutsche Gesellschaft fur Technische Zusammenarbeit |
| GSMP | Gas Sector Master Plan |
| GSRR | Gas Sector Reform Roadmap |
| HCU | Hydrocarbon Unit |
| IDB | Islamic Development Bank |
| IFC | International Finance Corporation |
| IOC | International Oil Company |
| JDCF | Japan Debt Cancellation Fund |
| JICA | Japan International Cooperation Agency |
| JGTDSL | Jalalabad Gas Transmission and Distribution System Limited |
| JOCL | Jamuna Oil Company Limited |

| | |
|---|---|
| KAFCO | Karnaphuli Fertilizer Company Limited |
| KfW | Kreditanstalt für Wiederaufbau |
| KGDCL | Karnaphuli Gas Distribution Company Limited |
| LNG | Liquefied Natural Gas |
| LPGL | LP Gas Limited |
| MGMCL | Maddhapara Granite Mining Company Limited |
| MMCFD | Million Cubic Feet per Day |
| MOF | Ministry of Finance |
| MoPEMR | Ministry of Power, Energy and Mineral Resources |
| MPL | Meghna Petroleum Limited |
| NEP | National Energy Policy |
| NSAPR II | National Strategy for Accelerated Poverty Reduction II (Revised) FY2009-11 |
| NWPGCL | North-West Power Generation Company Limited |
| PD | Power Division |
| PDF | Price Deficit Fund |
| PGCL | Pashchimanchal Gas Company Limited |
| POCL | Padma Oil Company Limited |
| PRSP | Poverty Reduction Strategy Paper |
| PSC | Production Sharing Contract |
| PSMP | Power Sector Master Plan |
| RPGCL | Rupantarita Prakritik Gas Company Limited |
| SAOCL | Standard Asiatic Oil Company Limited |
| SGCL | Sundarban Gas Company Limited |
| SGFL | Sylhet Gas Fields Limited |
| SOGC | State-Owned Gas Company |
| TGTDCL | Titas Gas Transmission and Distribution Company Limited |
| TFC | Total Final Consumption of energy |
| TPES | Total Primary Energy Supply |
| USAID | United States Agency for International Development |
| USGS | United States Geological Survey |
| WB | World Bank |

# Contents

# Appendices

# Chapter 1 Outline of the Survey

## 1.1 Background of the Survey

In Bangladesh, the demand for natural gas has increased rapidly along with the recent economic development. As a result, constraints on gas supply have become obvious due to the delay in new gas field development and the bottlenecks such as lack of gas transmission infrastructure, and therefore, the country is chronically facing gas shortages.

To cope with this situation, the Bangladesh government has envisioned the following objectives in the National Energy Policy, with the recognition that the natural gas sector plays critical roles in the socio-economic development.

- Expanding the exploration and development of gas reserves through the cooperation of the public and private sectors
- Privatizing the gas retail section
- Rationalizing gas prices and linking them to the international prices
- Promoting environmental social considerations from the stage of gas reserves appraisal and development

Also, the infrastructure development has been listed in the strategic block II of “Critical Sectors for Pro-poor Economic Growth”, which is one of four strategic blocks in the Poverty Reduction Strategy Papers (PRSPs), and the power and energy sector has been designated as the most critical challenge among them.

In consideration of the important roles which the power and energy sector plays in socio-economic activities in Bangladesh, JICA has provided various supports focusing predominantly on the power sector.

However, the support for the natural gas sector is becoming increasingly important because of the following reasons:

- Constraints on gas supply have recently become obvious.
- It is anticipated that natural gas will continue to be a leading energy source during the process to achieve energy source diversification in the middle and long term.

## 1.2 Objective and Contents of the Survey

The objective of this Survey is to collect and analyze the information which is required;

- To clarify the bottlenecks in the natural gas sector in Bangladesh, the differences in availability from region to region, measures taken by related agencies and issues to be addressed from now on.
- To examine the direction, strategy and approaches of the future Japanese cooperation.

Contents of this Survey are outlined as below:

- Collect and systematically summarize the information required to examine the possibility of the assistance by JICA by reviewing the existing related documents which are available from related entities as well as the interviews with related entities
- Based on the information collected and summarized, propose the fields in the natural gas sector to be assisted by Japanese ODA loans and Technical Assistance Projects.
- Based on the previous achievements of the development in the natural gas sector, propose the potential projects and confirm their feasibility with Bangladesh side.

## 1.3 Survey Team

The Survey team is composed of six experts, one in each field as below.

**Table 1.3.1**

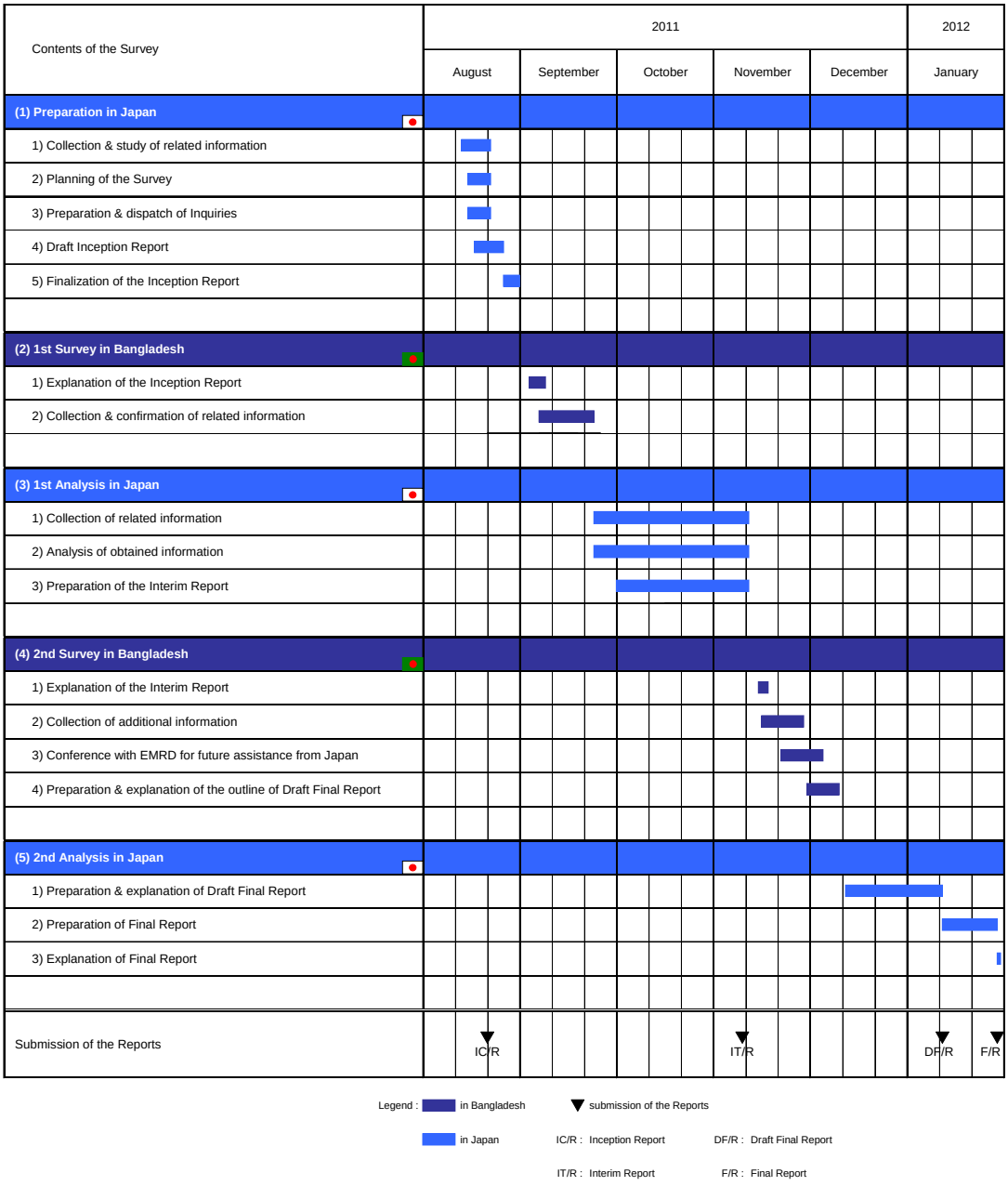
| Name | | Field |
|---|---|---|
| 1. | Shinichi IWAMOTO | Team Leader/Natural gas sector |
| 2. | Kazutora KONO | Sub Leader/Organizational & institutional analysis |
| 3. | Akiyoshi SASANO | Gas exploration & production |
| 4. | Kunihiro KATO | Gas reserve analysis |
| 5. | Shoetsu MIZUSHIMA | Gas transmission and distribution |
| 6. | Hisashi MATSUDA | Economic & financial analysis |

## 1.4 Survey Schedule

### 1.4.1 Entire Schedule

The survey was conducted according to the entire schedule as shown in the Table 1.4.1.

**Table 1.4.1 Entire survey schedule**




## 1.4.2 1st & 2nd Surveys in Bangladesh

The Survey team had meetings with related entities as shown in Table 1.4.2 & Table 1.4.3 during the 1st & 2nd surveys in Bangladesh.

## Table 1.4.2 Interviews carried out during 1st survey in Bangladesh

| Date | | Meeting commenced at | Meeting with | Contents of the meeting | Attendance | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | Team leader/Natural gas sector | Sub leader/Organizational & institutional analysis | Gas exploration & production | Gas transmission & distribution | Economical & financial analysis |
| | | | | | Iwamoto | Kono | Sasano | Mizushima | Matsuda |
| 3-Sep | Sat | Narita --> Singapore --> Dhaka | | | | | | | |
| 4-Sep | Sun | 11:40 | EMRD | Survey outline/Cooperation to survey team | ○ | ○ | ○ | ○ | ○ |
| | | 14:45 | HCU | Survey outline/Questionnaire | ○ | ○ | ○ | ○ | ○ |
| | | 16:00 | GTCL | Survey outline/Questionnaire | ○ | ○ | ○ | ○ | ○ |
| 5-Sep | Mon | 15:30 | ADB | Survey outline/Questionnaire | ○ | ○ | - | - | ○ |
| 6-Sep | Tue | 9:00 | BAPEX | Survey outline/Questionnaire | ○ | ○ | ○ | ○ | ○ |
| | | 14:00 | WB | Survey outline/Present activities & future plan | ○ | ○ | - | - | - |
| | | 15:30 | BERC | Survey outline/Questionnaire | ○ | ○ | - | - | ○ |
| 7-Sep | Wed | 12:20 | BPDB | Survey outline/Questionnaire | ○ | ○ | - | - | - |
| | | 13:10 | NWPGCL | Survey outline/Questionnaire | ○ | ○ | - | - | - |
| | | 16:10 | JICA | Progress of survey/Support to survey team | ○ | ○ | ○ | ○ | ○ |
| 8-Sep | Thu | 11:00 | Petrobangla | Survey outline/Questionnaire | ○ | ○ | ○ | ○ | ○ |
| | | 15:00 | JGTDSL | Survey outline/Questionnaire | ○ | ○ | - | ○ | ○ |
| 9-Sep | Fri | Summarize Survey Results | | | | | | | |
| 10-Sep | Sat | 〃 | | | | | | | |
| 11-Sep | Sun | 10:00 | Tullow | Survey outline/Questionnaire/Recent activities | - | - | ○ | - | ○ |
| | | 12:20 | RPGCL | Survey outline/Questionnaire | - | - | ○ | - | ○ |
| | | 15:00 | Santos | Survey outline/Questionnaire/Recent activities | - | - | ○ | - | ○ |
| 12-Sep | Mon | 10:00 | Petrobangla | Questionnaire | ○ | ○ | ○ | ○ | ○ |
| | | 11:10 | BGFCL | Survey outline/Questionnaire | ○ | ○ | ○ | ○ | ○ |
| | | 11:50 | SGDCL | Survey outline/Questionnaire | ○ | ○ | ○ | ○ | ○ |
| | | 14:30 | GTCL | Questionnaire/Reference Doc. | ○ | ○ | - | ○ | - |
| 13-Sep | Tue | 11:00 | ERD of MOF | Survey outline | - | - | ○ | - | ○ |
| | | 11:25 | GEDBPC | Questionnaire/Reference Doc. | - | - | ○ | - | ○ |
| | | 12:45 | SGFL | Survey outline/Questionnaire | - | - | ○ | - | ○ |
| 14-Sep | Wed | 12:00 | BAPEX | Questionnaire/Gas fields status | ○ | - | ○ | - | ○ |
| | | 13:30 | TGTDCL | (No interview due to absence of responsible staff) | - | - | ○ | - | ○ |
| | | 14:30 | GTCL | Questionnaire | - | ○ | - | ○ | - |
| 15-Sep | Thu | 10:00 | KAFCO | Questionnaire/Reference Doc. | ○ | ○ | - | - | - |
| | | 10:15 | PGCL | Questionnaire/Reference Doc. | - | - | ○ | - | ○ |
| | | 15:00 | BPC | Questionnaire/Reference Doc. | ○ | ○ | - | - | - |
| | | 15:00 | HCU | Questionnaire | - | - | ○ | - | ○ |
| 16-Sep | Fri | Summarize Survey Results | | | | | | | |
| 17-Sep | Sat | 〃 | | | | | | | |
| 18-Sep | Sun | 10:10 | IDB | Survey outline/Present activities & future plan | ○ | - | - | - | - |
| | | 11:25 | GEDBPC | GDP growth | - | - | - | - | ○ |
| | | 14:00 | GIZ | Survey outline/Present activities & future plan | - | - | - | - | ○ |
| 19-Sep | Mon | 10:30 | EMRD | Progress of survey/Reference Doc. | ○ | ○ | - | - | - |
| | | 14:00 | USAID | Survey outline/Present activities & future plan | ○ | ○ | - | - | - |
| 20-Sep | Tue | 10:20 | BPDB | Power plants' operation up to 2018 | - | ○ | - | - | - |
| 21-Sep | Wed | 10:30 | JICA | Progress of survey | ○ | ○ | - | - | - |
| 22-Sep | Thu | Summarize survey results at hotel due to Hartar / Dhaka --> | | | | | | | |
| 23-Sep | Fri | --> Singapore --> Narita | | | | | | | |

## Table 1.4.3 Interviews carried out during 2nd survey in Bangladesh

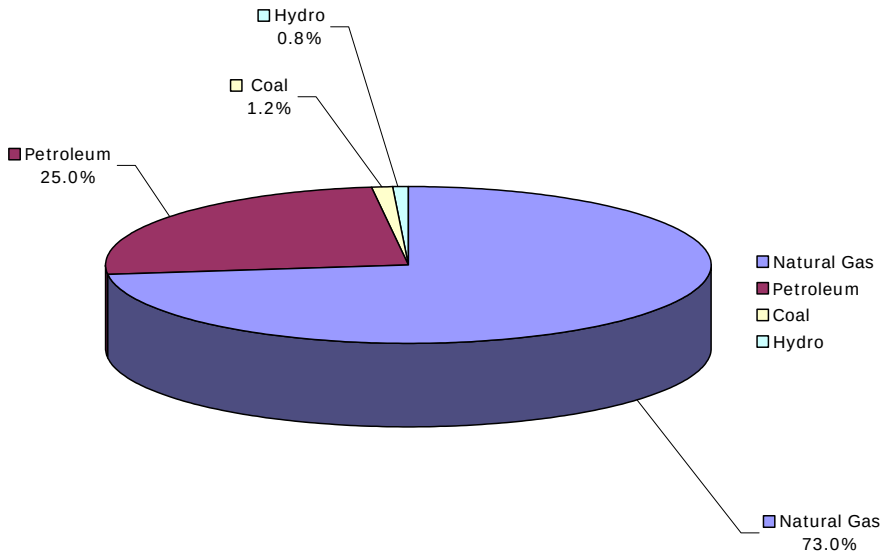
| Date | | Meeting commenced at | Meeting with | Contents of the meeting | Attendance | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | Team leader/Natural gas sector | Sub leader/Organizational & institutional analysis | Gas exploration & production | Gas transmission & distribution | Economical & financial analysis |
| | | | | | Iwamoto | Kono | Sasano | Mizushima | Matsuda |
| 14-Nov | Mon | Haneda --> HongKong --> Dhaka | | | | | | | |
| 15-Nov | Tue | 9:00 | JICA | Survey outline/Support to survey team | ○ | ○ | ○ | ○ | ○ |
| | | 14:10 | EMRD | Survey outline/Support to survey team/Questionnaire | ○ | ○ | ○ | ○ | ○ |
| | | 16:00 | HCU | Survey outline/Questionnaire | ○ | ○ | ○ | ○ | ○ |
| 16-Nov | Wed | 11:30 | EMRD | Support to survey team/Questionnaire | ○ | ○ | - | - | - |
| | | 12:30 | BPDB | Questionnaire | ○ | ○ | - | - | - |
| | | 15:00 | Petrobangla | Support to survey team/Questionnaire | ○ | - | ○ | ○ | - |
| | | 15:30 | BPC | Questionnaire | - | ○ | - | - | ○ |
| 17-Nov | Thu | 9:30 | Planning Com. | Questionnaire | - | ○ | - | - | ○ |
| | | 11:30 | Petrobangla | Questionnaire | ○ | - | ○ | ○ | - |
| | | 13:30 | Chevron | Questionnaire/Present activities | ○ | ○ | ○ | ○ | ○ |
| | | 16:00 | GTCL | Pipeline network analysis/Projects' status | ○ | ○ | - | ○ | - |
| 18-Nov | Fri | Summarize Survey Results | | | | | | | |
| 19-Nov | Sat | 〃 | | | | | | | |
| 20-Nov | Sun | 9:20 | BOI | Economy & Investment status | ○ | ○ | - | - | ○ |
| | | 11:30 | World Bank | Present activities & future plan | ○ | ○ | - | - | ○ |
| | | 15:00 | JICA | Progress of survey | ○ | ○ | - | - | - |
| | | 16:35 | Marubeni | Natural gas supply status | ○ | ○ | - | - | ○ |
| 21-Nov | Mon | 11:00 | Tullow | Present activities | - | - | ○ | - | ○ |
| | | 13:45 | JETRO | Energy consumption & investment status | - | - | - | - | ○ |
| | | 16:30 | Petrobangla | Future assistance from JICA | ○ | ○ | - | - | - |
| 22-Nov | Tue | 11:00 | ADB | Questionnaire/Present activities | ○ | - | - | - | - |
| | | 11:20 | Power Div. | Renewable energy/Energy saving | - | ○ | - | - | - |
| | | 11:30 | BEPZA | EPZ's present status | - | - | - | - | ○ |
| 23-Nov | Wed | 10:45 | Petrobangla | Subsidies | ○ | ○ | - | - | ○ |
| | | 11:30 | BAPEX | Questionnaire/Future assistance from JICA | - | - | ○ | ○ | - |
| | | 16:00 | BERC | Questionnaire/Future assistance from JICA | ○ | ○ | - | - | ○ |
| 24-Nov | Thu | Summarize Survey Results | | | | | | | |
| 25-Nov | Fri | 〃 | | | | | | | |
| 26-Nov | Sat | 〃 | | | | | | | |
| 27-Nov | Sun | 〃 | | | | | | | |
| 28-Nov | Mon | 10:30 | BGFCL | Inspection of gas leaking site | ○ | ○ | ○ | ○ | - |
| 29-Nov | Tue | 10:00 | GTCL | Upcoming Projects' status/Future assistance from JICA | ○ | ○ | - | ○ | - |
| 30-Nov | Wed | 14:00 | HCU | Energy balance sheet | ○ | ○ | ○ | - | ○ |
| | | 16:00 | BAPEX | Future assistance from JICA | ○ | - | ○ | - | - |
| 1-Dec | Thu | 9:30 | Petrobangla | IOC/PSC | ○ | ○ | ○ | - | - |
| | | 10:50 | KGDCL | Future assistance from JICA | ○ | ○ | ○ | - | - |
| | | 14:40 | Petrobangla | Request for the meeting with TGTDCL | ○ | ○ | - | - | - |
| | | 15:25 | TGTDCL | Survey outline/Questionnaire | ○ | ○ | - | - | - |
| | | 16:00 | GTCL | Future assistance from JICA | ○ | ○ | - | - | - |
| 2-Dec | Fri | Summarize Survey Results | | | | | | | |
| 3-Dec | Sat | 〃 | | | | | | | |
| 4-Dec | Sun | Summarize Survey Results (Hartar) | | | | | | | |
| 5-Dec | Mon | 16:00 | EMRD | Main points of DF/R | ○ | ○ | - | - | - |
| 6-Dec | Tue | Summarize Survey Results (National Holiday) | | | | | | | |
| 7-Dec | Wed | 10:30 | Petrobangla | Main points of DF/R | ○ | ○ | - | - | - |
| | | 11:30 | TGTDCL | Questionnaire/Main points of DF/R | ○ | ○ | - | - | - |
| | | 15:30 | JICA | Main points of DF/R / Future assistance from JICA | ○ | ○ | - | - | - |
| 8-Dec | Thu | Summarize Survey Results / Dhaka --> | | | | | | | |
| 9-Dec | Fri | --> HongKong --> Haneda | | | | | | | |

# Chapter 2 Summary

## 2.1 Present State and Challenges of Natural Gas Sector

### 2.1.1 Energy Consumption in Bangladesh

Figure 2.1.1 shows the share of energy used for commercial purposes in the fiscal year 2008/09.




Source: Energy and Mineral Resources Division

**Figure 2.1.1 Share of Commercial Energy in FY 2008/09**

The share of natural gas accounts for 73% of the total energy used for commercial purposes. It is obvious that the dependence on low-priced indigenous natural gas is very high, and the realization of energy best mix, providing protection against the expected natural gas depletion, is one of the major challenges in Bangladesh.

The increase of energy supply for sustainable economic growth and the clearance of regional gap in the energy supply for the poverty reduction are major challenges for the energy sector in Bangladesh. However, the depletion of natural gas is expected in near future while the dependence on natural gas in the energy supply is still very high.

In order to meet these challenges, the natural gas sector is expected to:

- Increase the natural gas supply to contribute to solving the energy crisis
- Eliminate the regional gas supply gap to contribute to the poverty reduction
- Encourage the introduction of alternative energy by gas price reform

### 2.1.2 Policies

(1) National Development Plans

The "National Strategy for Accelerated Poverty Reduction II" (NSAPR II) was published by the Planning Commission of GOB in December 2009 for the reduction of poverty and the development of Bangladesh. Subsequently the following mid and long term development plans were published in the light of NSAPR II.

- Sixth Five Year Plan FY2010-2015
- Outline Perspective Plan of Bangladesh 2010-2021

These plans set the following goals for natural gas sector:

- Increase of gas production
- Reinforcement and expansion of the gas pipeline network
- Elimination of the supply-demand gap as well as the regional supply gap
- Reduction of system losses

(2) National Energy Policy

This is the latest national energy policy approved in 1995, which is outdated and does not reflect the present energy crisis in Bangladesh. Therefore the renewal of this policy is urgently required.

(3) Policies for Natural Gas Sector

The "Gas Sector Master Plan & Strategy" was published in 2006 with the assistance of WB. However, there are some parts to be reviewed due to the recent changes in supply-demand scenario as well as the recent increase of international energy price.

Also the "Gas Sector Reform Road map" was formulated in 2005 with the assistance of ADB that guides the implementation of the policies required for the reform of the gas sector, and it was reviewed in 2008 by EMRD. However, most policies are yet to be implemented.

As mentioned above, there are specific goals set in the national development plans and there are sectorial plans set with the assistance of development partners. However, the

review and renewal activities for these plans to reflect the rapid changes of domestic and international situation are insufficient.

### 2.1.3 Organization

The energy sector of Bangladesh is under the control of the Ministry of Power, Energy and Mineral Resources (MoPEMR), and this ministry is divided into the Power Division (PD) and Energy and Mineral Resources Division (EMRD). The natural gas sector is under the control of EMRD, and managed by Petrobangla with its affiliated companies composed of three exploration and production companies, one transmission company, six distribution companies and one company for CNG promotion. Further Petrobangla supervises IOCs' activities under PSC. Figure 2.1.2 shows the organizational structure of the sector mentioned above.

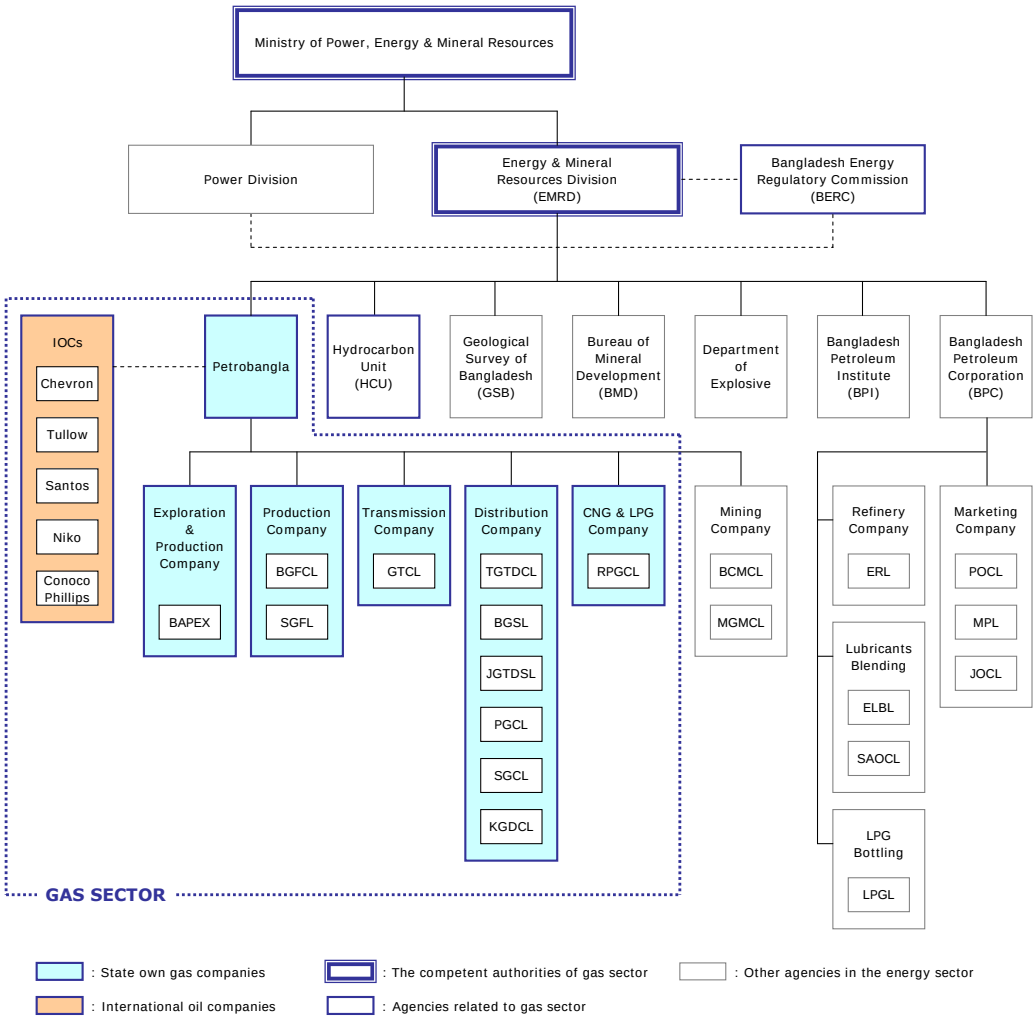



**Figure 2.1.2 Organizational Structure of Energy Sector**

Petrobangla's affiliated companies receive the revenue from gas sales according to a fixed ratio, and do not have sufficient autonomy or financial independence. The revenue based on fixed ratio is not sufficient for subsidiaries to invest for future development or to carry out proper operation and maintenance.

In order to resolve these situations, gas price should be equalized to the level of the replacement fuel so that State-Own Gas Companies (SOGCs) can improve their financial status to obtain greater autonomy and financial independence.

### 2.1.4 Natural Gas Demand

(1) History of Natural Gas Demand

Figure 2.1.3 shows the sectorial annual gas sales from 1980 to 2010. Gas sales are not exactly equal to the gas demand in recent years because of the recent scarce gas supply, however, the sectorial share of natural gas and its historical changes can be read as follows:

- Share of power sector as well as industry has been increasing along with the development of the Bangladesh economy.
- Recent scarce gas supply has been affecting the gas supply to fertilizer factories.
- Share of CNG became significant in recent years due to the rapid spread of CNG in the transport sector.

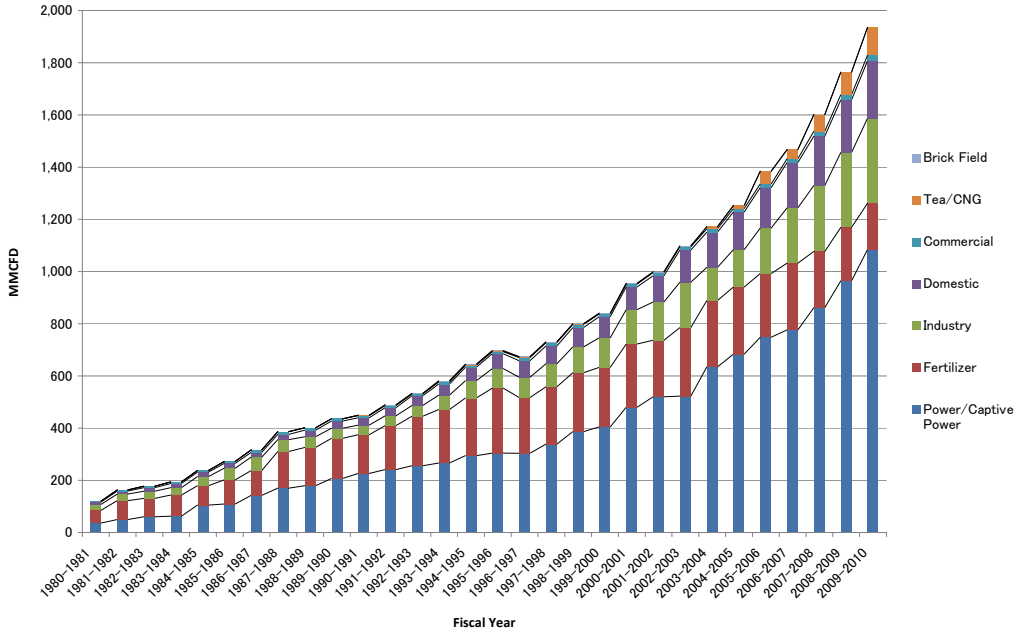



**Figure 2.1.3 Sectorial Annual Gas Sales: 1980-2010**

(2) The Projections for Natural Gas Demand

In this report, the Survey team projected the sectorial gas demand up to 2030 according to the latest information collected during the 1st and 2nd surveys in Bangladesh as summarized in Table 2.1.1 below.

**Table 2.1.1 Sectorial Gas Demand Projection**

(MMCFD)

| Year | Power | Captive P | Fertilizer | Industrial | Comm. | Domestic | CNG,Tea | Total |
|---|---|---|---|---|---|---|---|---|
| 2010 – 2011 | 932 | 330 | 281 | 351 | 23 | 259 | 112 | 2,289 |
| 2011 – 2012 | 1,080 | 363 | 281 | 387 | 25 | 287 | 121 | 2,544 |
| 2012 – 2013 | 1,335 | 399 | 281 | 418 | 27 | 312 | 131 | 2,903 |
| 2013 – 2014 | 1,435 | 438 | 281 | 451 | 29 | 339 | 142 | 3,115 |
| 2014 – 2015 | 1,590 | 481 | 281 | 488 | 31 | 369 | 153 | 3,393 |
| 2015 – 2016 | 1,570 | 531 | 303 | 539 | 34 | 410 | 166 | 3,554 |
| 2016 – 2017 | 1,570 | 587 | 303 | 595 | 38 | 456 | 180 | 3,729 |
| 2017 – 2018 | 1,532 | 649 | 329 | 658 | 41 | 506 | 195 | 3,910 |
| 2018 – 2019 | 1,532 | 717 | 329 | 727 | 45 | 563 | 211 | 4,125 |
| 2019 – 2020 | 1,532 | 792 | 329 | 803 | 50 | 625 | 229 | 4,360 |
| 2020 – 2021 | 1,522 | 879 | 322 | 891 | 55 | 697 | 249 | 4,615 |
| 2021 – 2022 | 1,522 | 781 | 322 | 971 | 59 | 764 | 271 | 4,690 |
| 2022 – 2023 | 1,497 | 684 | 322 | 1,058 | 64 | 839 | 295 | 4,757 |
| 2023 – 2024 | 1,397 | 586 | 322 | 1,153 | 69 | 919 | 321 | 4,766 |
| 2024 – 2025 | 1,425 | 488 | 322 | 1,256 | 74 | 1,007 | 349 | 4,921 |
| 2025 – 2026 | 1,384 | 391 | 322 | 1,372 | 81 | 1,107 | 380 | 5,036 |
| 2026 – 2027 | 1,376 | 293 | 322 | 1,499 | 87 | 1,218 | 414 | 5,209 |
| 2027 – 2028 | 1,371 | 195 | 322 | 1,637 | 95 | 1,339 | 451 | 5,411 |
| 2028 – 2029 | 1,334 | 98 | 322 | 1,789 | 103 | 1,473 | 492 | 5,610 |
| 2029 – 2030 | 1,268 | 0 | 322 | 1,954 | 111 | 1,619 | 536 | 5,811 |

## 2.1.5 Natural Gas Reserves, Exploration and Production

(1) Natural Gas Reserves

The latest gas reserve estimation report in Bangladesh is Gas Reserve Estimation 2010 conducted by Gustavson Associates that HCU (Hydrocarbon Unit of Energy and Mineral Resources Division) commissioned. The survey team received some summary table of the reserves, however could not receive a copy of the whole report because the government approval was not yet obtained. Therefore, by comparing some reserve data of the 2010 report with the joint assessment report of gas reserve conducted by Norwegian Petroleum Directorate (NPD) and HCU in 2003, the cause of significant increase or decrease in reserves of each field were discussed.

In the year 2010, there were 23 natural gas fields discovered in Bangladesh, among these 16 fields are producing, 4 fields have production suspended and 3 fields are undeveloped. Gas initially in place (proved + probable) in 2010 was 35.5 TCF (Trillion Cubic Feet), and recoverable reserve (proved + probable) was 28.2 TCF. By December 2010, after producing 9.6 TCF of gas, the remaining reserve was 18.6 TCF.

In the 2010 estimation, the recoverable reserve in Titas, Bibiyana, Rashidpur and Kailash Tila fields increased more than 1 TCF, but in Habiganj decreased more than 1 TCF. The reasons for increases or decrease in reserve are probably due to improvement in the delineation of the structure by the acquisition of new seismic and well data, the advances in seismic data processing and interpretation techniques, increasing the accuracy of decline curve methods or material balance estimate, and the use of the proper recovery factor by increasing pressure & production data.

(2) Natural Gas Exploration and Production

The gas production of domestic gas fields in the fiscal year 2009/10 is 1,926mmcfd by three national production companies (BGFCL/SGFL/BAPEX) and four International Oil Companies (Chevron/Tullow/ Santos/Niko).

Table 2.1.2 shows production data of each gas field in the fiscal year 2009/10.

**Table 2.1.2 Production Data (FY 2009-2010)**

| Company | Name of Gas Fields | Total Wells | Flowing Wells (no) | Production (Ave, Daily MMCFD) | Production (Yearly BCF) |
|---|---|---|---|---|---|
| **Petrobangla Fields:** | | | | | |
| **BGFCL** | Titas | 16 | 14 | 404.3 | 147.6 |
| | Habiganj | 11 | 9 | 235.0 | 85.8 |
| | Bakhrabad | 8 | 4 | 35.2 | 12.9 |
| | Narshingdi | 2 | 2 | 33.0 | 12.1 |
| | Meghna | 1 | 1 | 0.0 | 0.0 |
| | **Sub-Total** | **38** | **30** | **707.6** | **258.3** |
| **SGFL** | Sylhet | 3 | 1 | 3.1 | 1.1 |
| | Kailashtila | 6 | 6 | 90.5 | 33.0 |
| | Rashidpur | 7 | 5 | 48.6 | 17.7 |
| | Beanibazar | 2 | 2 | 14.8 | 5.4 |
| | **Sub-Total** | **18** | **14** | **156.9** | **57.3** |
| **BAPEX** | Saldanadi | 2 | 2 | 8.4 | 3.1 |
| | Fenchuganj | 2 | 2 | 24.7 | 9.0 |
| | Shahbazpur | 2 | 1 | 5.6 | 2.1 |
| | **Sub-Total** | **6** | **5** | **38.7** | **14.1** |
| **Petrobangla Total Production** | | **62** | **49** | **903.2** | **329.7** |
| **IOC Fields :** | | | | | |
| **Santos** | Sangu (Existing) | 7 | 6 | 36.7 | 13.4 |
| **Chevron** | Jalalabad | 4 | 4 | 162.9 | 59.5 |
| | Moulavibazar | 5 | 4 | 58.4 | 21.3 |
| | Bibiyana | 12 | 12 | 658.0 | 240.4 |
| | **Sub-Total** | **21** | **20** | **879.3** | **320.9** |
| **Niko** | Feni | 5 | 1 | 1.7 | 0.6 |
| **Tullow** | Bangura | 6 | 4 | 105.1 | 38.4 |
| **IOC Total Productionj** | | **39** | **31** | **1,022.8** | **373.3** |
| **Total (Petrobangla + IOC)** | | **101** | **79** | **1,926.0** | **703.0** |

Source : Petrobangla Annual Report 2010

Further to the above, the latest total production at the beginning of December 2010 increased up to 2,050 mmcfd including the production increase from Chevron's gas fields, the commencement of gas production from the new gas field of BAPEX and ceased production of Niko's gas field.

Long term gas production up to 2030 including the import of LNG was projected based on the Gas Evacuation Plan 2010-2015 and IOC's production forecast.

The result of the projection is shown in Table 2.1.3.

**Table 2.1.3 Long Term Production Forecast**

(MMCFD)

| Year | Expected Gas Demand | Prospect by Study Team | | | |
|---|---|---|---|---|---|
| | | Petrobangla | | IOC | Total |
| 2011 | 2,289 | 1,140 | | 1,128 | 2,268 |
| 2012 | 2,544 | 1,390 | | 1,498 | 2,888 |
| 2013 | 2,910 | 1,520 | (LNG Import) | 1,798 | 3,318 |
| 2014 | 3,123 | 1,565 | 500 | 2,051 | 4,116 |
| 2015 | 3,389 | 1,615 | 500 | 2,248 | 4,363 |
| 2016 | 3,551 | 1,880 | 500 | 2,538 | 4,918 |
| 2017 | 3,726 | 1,922 | 500 | 2,362 | 4,784 |
| 2018 | 3,928 | 1,939 | 500 | 2,004 | 4,443 |
| 2019 | 4,142 | 1,884 | 500 | 1,688 | 4,072 |
| 2020 | 4,378 | 1,841 | 500 | 1,446 | 3,787 |
| 2021 | 4,632 | 1,768 | 500 | 1,177 | 3,445 |
| 2022 | 4,708 | 1,632 | 500 | 986 | 3,118 |
| 2023 | 4,775 | 1,514 | 500 | 833 | 2,847 |
| 2024 | 4,783 | 1,408 | 500 | 653 | 2,561 |
| 2025 | 4,939 | 1,227 | 500 | 557 | 2,284 |
| 2026 | 5,054 | 1,074 | 500 | 437 | 2,011 |
| 2027 | 5,227 | 957 | 500 | 281 | 1,738 |
| 2028 | 5,429 | 678 | 500 | 258 | 1,436 |
| 2029 | 5,628 | 609 | 500 | 254 | 1,363 |
| 2030 | 5,829 | 561 | 500 | 251 | 1,312 |

The production of natural gas will increase till 2016 (peaking at 4,918 mmcfd) by the gas production augmentation plan with LNG import, and fulfill the gas demand up to 2018. However, the production of gas will gradually decrease against the increase of gas demand, and the supply/demand gap will become even bigger year by year. Bangladesh will face a serious gas shortage after the year 2020 if no alternative was to be found.

### 2.1.6 Natural Gas Transmission

There are many gas fields around the north-east part of Bangladesh, but the gas transmission system around the west and south-west part is inadequate to supply natural gas.

Also the present system does not have enough redundancy and there are no compressors to permit operation at peak load capacity.

The “Gas Sector Master Plan 2006” and the “Gas Evacuation Plan 2010-15” were issued to solve these problems. In these plans, gas transmission pipeline system improvements and subsequent expansions are being planned and under execution.

The Survey team conducted a pipeline network analysis based on the gas supply and demand projections, and the pipeline system improvement plan to evaluate the pipeline network transmission capacity in the future, for 2015, 2020, 2025 and 2030.

Forecast of natural gas supply to planned Bheramara power plant, planned Haripur power plant and KAFCO fertilizer factory is described as follows.

(1) Bheramara new power plant

The analysis result for Node 77 on the pipeline analysis model, in which the Bheramara new power plant is contained, is as follows;

In 2015, under the assumption that the supply would meet the demand and a compressor station (discharge pressure of 1000 psig) would be installed at Elenga (Node 60) together with other infrastructure as planned, it was confirmed that the 68mmcfd demand for gas would be transferred to Node 77 at a minimum pressure of more than 791psi.

In 2020, 2025 and 2030, it was assumed that the production capacity would decrease and the supply would not meet the demand in the gas grid. An analysis was conducted to determine whether the pipeline network would have sufficient capacity to transfer the gas to meet the demand under the condition that the gas would inflow endlessly from almost all of the gas fields to keep the supply pressure designated (without relationship to the actual demand/supply balance). Consequently, it was confirmed that the pipeline network to the new Bheramara power plant would have the capacity to transfer the gas demanded at sufficient pressure.

(2) Haripur new power plant

In 2015, it was confirmed that the 60mmcfd demand for gas would be supplied to Node 72, in which the Haripur new power plant is contained, at the sufficient pressure of 967psi.

In 2020, 2025 and 2030, as mentioned in (1) above, with the condition that the gas would inflow endlessly from almost all of the gas fields to keep the supply pressure designated without relationship to the actual demand/supply balance, it was confirmed that the pipeline network to the Haripur new power plant would have the capacity to transfer the gas to meet the demand at sufficient pressure.

(3) KAFCO fertilizer factory

In 2015, it was confirmed that the 60mmcfd demand for gas would be supplied to Node 41, in which the KAFCO fertilizer factory is contained, at the sufficient pressure of 1351psi.

In 2020, 2025 and 2030, with the same condition in the above (1) and (2), it was confirmed that the pipeline network to the KAFCO fertilizer factory would have the capacity to transfer the gas at sufficient pressure.

### 2.1.7 Natural Gas Sales

Sectorial gas sales are shown in Figure 2.1.3 of section 2.1.4.

Gas demand of the power and captive power sector has increased on an ongoing basis from 480mmcfd to 1,084 mmcfd in the last decade.
On the other hand, gas demand of the fertilizer factory has remained at the same level since 1990. But the ratio of fertilizer demand to all sectors decreases due to the growth of power and non-bulk demand.

Industry and Domestic gas demands are increasing and were 325 mmcfd and 220 mmcfd in FY 2009 respectively.
CNG and Tea Estates gas demands are very low. But CNG demand in 2004 has been increasing rapidly in recent years.

System loss reduction and system efficiency improvement are the major issues in the gas distribution market in Bangladesh. Thus system loss reduction plan and system efficiency improvement project are being implemented at the Titas Gas Transmission and Distribution Company Limited, one of the gas distribution companies.

### 2.1.8 Natural Gas Tariffs and Governmental Subsidies

(1) Natural Gas Tariff

The Bangladesh Energy Regulatory Commission (BERC) was established under the BERC Act in 2003 in order to establish a transparent system in setting energy prices.

End user gas prices are set and approved by BERC. Metered rates are used for industrial and commercial sectors while fixed rates as per appliance are used for domestic households.

Generally gas prices for the power sector and fertilizer factories that are strongly related to the people's livelihood are set lower while gas prices for industry and the commercial sector are set relatively higher.

For the fair collection of gas fees the fixed rates currently adopted for domestic households should be changed to metered rates by the installation of meters as early as possible.

(2) Gas Tariff Distribution

The revenue from the gas produced by state-owned gas production companies is distributed to the GOB (55%) and Petrobangla group companies (45%).

The allocation to the GOB (55%) is composed of the following duty and tax;

- Supplementary Duty (SD)
- Value Added Tax (VAT)

and the allocation to Petrobangla group companies is composed of the following seven margins:

- Price Deficit Fund (PDF) Margin
- BAPEX Margin
- Deficit Wellhead Margin for BAPEX (DWMB)
- Wellhead Margin
- Transportation Margin
- Distribution Margin
- Gas Development Fund (GDF)

(3) Governmental Subsidies

The financial condition of GOB has been tightening in recent years. The planned revenue is 72% of the planned expenditure in the fiscal year 2011-2012, and the

remaining 25% and 3% are managed by domestic/foreign loans and foreign grants respectively.

The usage of subsidies in various fields as of November 2011 already exceeded the allocation of the state budget in the fiscal year 2011-2012. Subsidies are mainly used for energy sector (BPC: Bangladesh Petroleum Corporation and PDB: Power Development Board) and agriculture. The sum of probable usage of subsidies to BPC and PDB accounts for approximately 2.2% of the expected GDP of the fiscal year 2011-2012.

On the other hand the natural gas sector does not use any governmental subsidies. Petrobangla group is still profitable and contribute to the state revenue, in spite of the natural gas price which is set lower than its opportunity cost.
However, the natural gas sector will also be subsidized in near future unless gas price is properly reformed, because the decrease of share of natural gas in primary energy supply and import of LNG are expected.
Therefore the natural gas transaction in economic price without subsidy and the application of the Public Private Partner Ship (PPP) scheme projects are required for the sustainable development of the sector.

### 2.1.9 Financial Condition of Natural Gas Sector Enterprises

Petrobangla and Petrobangla's affiliated companies apply a consolidated accounting system, and Petrobangla manages and controls activities of its affiliated companies.
According to the consolidated balance sheet and income statement as well as the interview with the financial division of Petrobangla, total gas sales is Taka 88,306 million and 52% (Taka 45,919 million) is Petrobangla group's earning and 48% is for IOCs. Then 55% of Petrobangla group's earning (Taka 21,540 million) is paid to the GOB as SD & VAT, and also IOCs pays VAT and corporation tax to the GOB.
Petrobangla group generates before tax profit and pay income tax at Taka 7,473 million which is an average income tax rate of about 24%. Moreover, Petrobangla group pays dividend at Taka 4,768 million from after tax net profit.
Accordingly, the contribution to the national exchequer by the natural gas sector is calculated at Taka 40,138 million including disbursement to the GOB, VAT of IOCs, income tax by Petrobangla group and dividends to the national exchequer. This accounts for 0.6% of GDP and supports the national exchequer greatly.

### 2.1.10 Participation of Private Sector in Natural Gas Sector

The private investment climate in Bangladesh is ranked at 122nd out of 183 countries in "Doing Business" by the World Bank (WB) and International Finance Corporation (IFC). The private investment in Bangladesh is coordinated by the Board of Investment (BOI).

Currently Petrobangla is the promotion agency for the investment in the natural gas sector. Generally speaking, area wide development and huge scale of development should be taken care by BOI which is connected to the prime ministers office directly. In Bangladesh, the GOB/BOI is recommended to deal directly with the investment in the natural gas sector rather than entrusting to Petrobangla.

## 2.2 Assistance by Other Development Partners in Natural Gas Sector

Table 2.2.1, which is based on the information in the Annual Report 2009/10 for Petrobangla, shows the ongoing projects, which consisted of 12 projects financed by ADB and another 2 projects financed by WB and JDCF. ADB has no specific future project right now after completion of the two loan projects under implementation. Though WB intends to assist the power sector from now on, it has no specific future loan project in the gas sector now. IDB is now assisting the power sector, LPG terminal, renewable energy, etc. GIZ conducts grass roots cooperation projects such as electrification in rural regions, improvement of cooking fuel for household, etc.

**Table 2.2.1 Gas Sector Ongoing Project Financed by ODA Agencies**

[Million Taka]

| No. | Name of Project | Project Period | Executing Agency | Development Partners | Estimated Cost (Project Aid) |
|---|---|---|---|---|---|
| 1 | Muchai-Ashuganj Compressor Station Installation Project | Jan'06-Dec'11 | GTCL | PSC | 3,041 (2,093) |
| 2 | Construction of Monohordi-Dhanua, Elenga-East Bank of Jamuna Bridge 30" diax120km Gas Transmission Pipeline and Installation of Compressor Stations at Ashuganj and Elenga | Jan'06-Jun'11 | GTCL | ADB | 8,346 (5,183) |
| 3 | Appraisal of Gas Field (3D Seismic) (Titas, Bakhrabad, Sylhet, Kailashtila and Rashidpur) Project (Revised) | Jan'06-Dec'12 | BGFCL | ADB | 785 (420) |
| | | | SGFL | | 860 (390) |
| 4 | Construction of West Bank of Jamuna Bridge-Nalka, Hatikumrul-Iswardi-Bheramata 30"diaX98.10km Gas Transmission Pipeline | Jul'06-Jun'11 | GTCL | ADB | 6,287 (3,422) |
| 5 | Construction of Bonpara-Rajshahi Gas Transmission Pipeline | Jul'06-Jun'11 | GTCL | ADB | 1,615 (763) |
| 6 | Gas Distribution Network in Rajshahi City and Adjoing Area | Jul'06-Jun'11 | PGCL | ADB | 1,056 (463) |
| 7 | System Loss Reduction of Titus Gas Transmission and Distribution Company Ltd. | Jul'06-Jun'11 | TGTDCL | ADB | 226 (140) |
| 8 | Upgradation of Data Center of BAPEX | Jul'06-Jun'11 | BAPEX | ADB | 189 (153) |
| 9 | Construction of Bheramara-Khulna 20"diax162.50km Gas Transmission Pipeline | Jul'07-Jun'12 | GTCL | ADB | 6,853 (3,259) |
| 10 | Gas Seepage Control and Appraisal & Development of Titus Gas Field | Jan'10-Jun'14 | BGFCL | ADB | 10,000 (8,100) |
| 11 | Supply Efficiency Improvement of Titus Gas Transmission and Distribution Company Ltd. | Jan'10-Oct'12 | TGTDCL | ADB | 555 (347) |
| 12 | Gas Distribution Network in South-West Zone | Jan'10-Dec'12 | SGCL | ADB | 5,305 (2,800) |
| 13 | Construction of Bakhrabad-Siddhirganj Gas Transmission Pipeline | Jul'07-Dec'12 | GTCL | WB | 6,855 (4,293) |
| 14 | Exploration and Production Company Building of BAPEX | Jul'08-Jun'11 | BAPEX | JDCF | 2,000 (0) |
| | | | BGSL | | 1,400 (0) |
| Total | | | | | 55,372 (31,826) |

**Source: Petrobangla Annual Report 2010**

## 2.3 Proposal for the Assistance to Natural Gas Sector by Japanese ODA

### 2.3.1 Challenges of Natural Gas Sector Identified

As a result of data collection and analysis, bottlenecks for the development of the natural gas sector are extracted as follows:

(1) Deficient gas supply from state-owned production companies due to the delay of new gas field development as well as delay of the production increase from existing gas fields
(2) Delay of the commencement of gas exploration and production by IOCs due to the prolonged conclusion of PSC
(3) Regional gas supply gap due to the delay of the expansion of gas pipelines in the north-west and south-west of the country
(4) Delayed gas price reform which will affect the national finance in the future
(5) Inefficient use of natural gas
(6) Low effectiveness of development plans assisted by financing agencies

### 2.3.2 Measures to Overcome the Challenges of Natural Gas Sector

Bangladesh government needs to overcome these challenges of natural gas sector to escape from the recent energy crisis and to realize sustainable energy supply. Table 2.3.1 shows the measures to overcome the challenges with their priority order, effectiveness and expected schedule.

## Table 2.3.1 Measures to Overcome the challenges that should be addressed by the Government of Bangladesh

| Measures to Overcome the Challenges | Priority | Effect | 2012 | | | | 2013 | | | | 2014 | | | | 2015 | | | | 2016 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | q1 | q2 | q3 | q4 | q1 | q2 | q3 | q4 | q1 | q2 | q3 | q4 | q1 | q2 | q3 | q4 | q1 | q2 | q3 | q4 |
| **A. Exploration and Production** | | | | | | | | | | | | | | | | | | | | | | |
| 1) Increase of gas reserve by exploration and drilling | 1 | Sup. increse | | | | | | | | | | | | | | | | | | | | |
| 2) Increase of gas supply from existing gas fields | 1 | Sup. increse | | | | | | | | | | | | | | | | | | | | |
| 3) New gas field development of SOGs | 1 | Sup. increse | | | | | | | | | | | | | | | | | | | | |
| 4) New gas field development of IOCs | 1 | Sup. increse | | | | | | | | | | | | | | | | | | | | |
| (aritime dispute settlement, Review of PSC conditions) | | | | | | | | | | | | | | | | | | | | | | |
| 5) Import of LNG | 1 | Sup. increse | | | | | | | | | | | | | | | | | | | | |
| 6) Import of natural gas from neighboring countries | 2 | Sup. increse | | | | | | | | | | | | | | | | | | | | |
| **B. Transmission** | | | | | | | | | | | | | | | | | | | | | | |
| 1) Reinforcement of pipeline network | 1 | Sup. increase | | | | | | | | | | | | | | | | | | | | |
| (Bypass Lines/Compressor stations/Pigging/etc.) | | | | | | | | | | | | | | | | | | | | | | |
| 2) Effective gas supply by SCADA system | 1 | Sup. control | | | | | | | | | | | | | | | | | | | | |
| (time or volume/region) | | | | | | | | | | | | | | | | | | | | | | |
| **C. Distribution** | | | | | | | | | | | | | | | | | | | | | | |
| 1) Introduction of metering system | 1 | Dem. control | | | | | | | | | | | | | | | | | | | | |
| (domestic consumers and industries) | | | | | | | | | | | | | | | | | | | | | | |
| 2) Introduction of high efficiency plants and appliances | 1 | Dem. control | | | | | | | | | | | | | | | | | | | | |
| (power plants/fertilizer factory/improved stove/etc.) | | | | | | | | | | | | | | | | | | | | | | |
| 3) Restriction of new gas connection | 1 | Sup. control | | | | | | | | | | | | | | | | | | | | |
| 2) Effective gas supply by SCADA system | 2 | Sup. control | | | | | | | | | | | | | | | | | | | | |
| (time or volume/region) | | | | | | | | | | | | | | | | | | | | | | |
| 5) Enlightenment of consumers for energy saving | 2 | Dem. control | | | | | | | | | | | | | | | | | | | | |
| **D. General** | | | | | | | | | | | | | | | | | | | | | | |
| 1) Institutional reform of gas sector | 1 | - | | | | | | | | | | | | | | | | | | | | |
| 2) Reform of policies, regulations and plans | 1 | - | | | | | | | | | | | | | | | | | | | | |
| 3) Gas price reform | 1 | Dem. control | | | | | | | | | | | | | | | | | | | | |
| 4) Introduction of alternative energy | 1 | Dem. control | | | | | | | | | | | | | | | | | | | | |
| (coal, fuel oil, renewable energy) | | | | | | | | | | | | | | | | | | | | | | |
| 5) Securing fund for the development & maintenance | 1 | - | | | | | | | | | | | | | | | | | | | | |
| 6) Promotion of private sector participation | 1 | - | | | | | | | | | | | | | | | | | | | | |
| 7) Human resource development | 1 | - | | | | | | | | | | | | | | | | | | | | |
| (planning/management/technology/O&M) | | | | | | | | | | | | | | | | | | | | | | |
| 8) Introduction of the state-art technology | 2 | - | | | | | | | | | | | | | | | | | | | | |

**Notes:** Implementation Stage  Preparation Stage

### 2.3.3 Priority of the Challenges to be assisted by Japanese ODA

As a result of preceding surveys and analysis, the challenges of natural gas sector to be assisted by the Japanese government have been summarized as shown in Table 2.3.2.

**Table 2.3.2 Approaches of the future Japanese cooperation**

| Challenges | Priority Areas | Priority | Solutions |
|---|---|---|---|
| A. Exploration and production<br>· Extent of gas reserve to be confirmed by exploration and drilling | Throughout the country (BAPEX) | 1 | Technical assistance & equipment procurement for exploration |
| B. Transmission<br>· Expand and improve pipeline network | West/South of the country | 2 | Additional parallel pipeline installation |
| · Efficient gas transmission with new comprehensive SCADA system | Throughout the country | 1 | Rehabilitation and expansion of existing SCADA system |
| C. Distribution<br>· Efficient gas distribution with new comprehensive SCADA system | TGTDCL franchise area | 2 | Provision of new SCADA system |
| · Improve supply efficiency with introduction of gas metering system | TGTDCL/ KGDCL | 2 | Installation of gas meters to domestic and industrial consumers |
| D. Others<br>· Introduction of alternative energy (renewable energy) | Throughout the country | 2 | Introduction of Solar power, wind power, mini-hydro |
| · Preparation of policy/regulations/plans for proper operation of gas sector | Throughout the country | 2 | Preparation of codes and standards |
| · Improvement of policy making, organizational management, development technology and facility maintenance by human resources development | Throughout the country | 2 | Technical assistance in seismic surveys, establishment of a laboratory |

### 2.3.4 Proposal for the ODA Loans

In keeping with the priority of challenges mentioned in Table 2.3.2, and also considering the proposals from the Bangladesh side, the following four projects are recommended in

order of highest priority as prospective projects for Japanese ODA loans in the natural gas sector.

(1) Rehabilitation and expansion of SCADA System for Natural Gas Transmission Pipeline Network (Executing Agency: GTCL)
(2) Gas transmission pipeline, Dhanua-Elenga (D-E), 30-inch, 52km (Executing Agency: GTCL)
(3) Pre-paid gas meter installation for the domestic consumers (Executing Agency: TGTDCL)
(4) Pre-paid gas meter installation for the domestic consumers (Executing Agency: KGDCL)

### 2.3.5 Proposal for the Technical Cooperation Projects

In keeping with prior challenges, prior areas and resources mentioned in Table 2.3.2, and also considering the proposals from the Bangladesh side shown in Table 2.3.1, the following two projects for BAPEX are recommended as the prospective project for Japanese technical cooperation in the natural gas sector.

(1) Seismic exploration training for BAPEX engineers
(2) Procurement of hardware & software to develop a 3D crew of BAPEX

Also, the following comment was given by the JICA Bangladesh office.

“In addition to the seismic exploration training and the procurement of hardware & software, the possibility of the technical assistance for BAPEX exploration activities such as 2D/3D seismic survey and exploratory drilling shall be examined so that JICA assistance will directly contribute to the future natural gas production.”

However, since the 2D/3D seismic survey and exploratory drilling program may take much money and be risky, it shall be reviewed and finalized later by both parties.

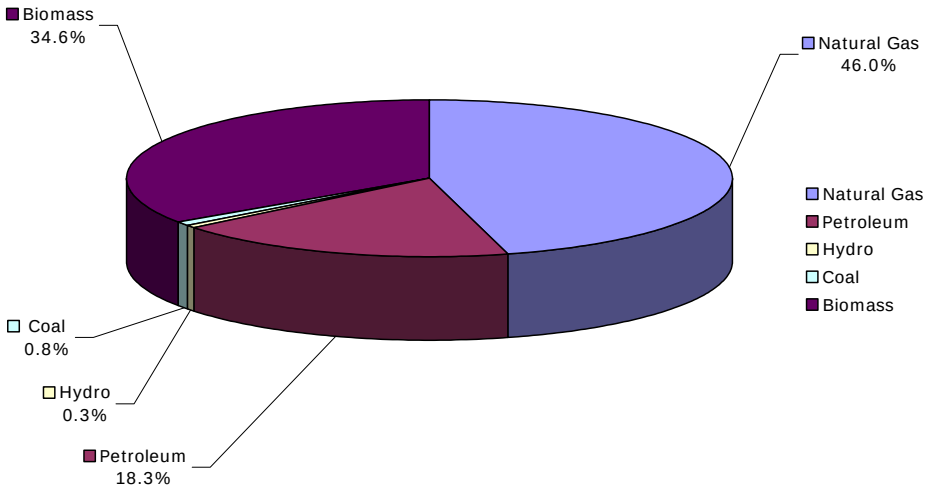
# Chapter 3 Results of the Survey

## 3.1 Present State and Challenges of Natural Gas Sector

### 3.1.1 Energy Consumption in Bangladesh

#### 3.1.1.1 Primary Energy and Commercial Energy Supply

Figure 3.1.1 shows the share of primary energy in Bangladesh at fiscal year 2008/09.

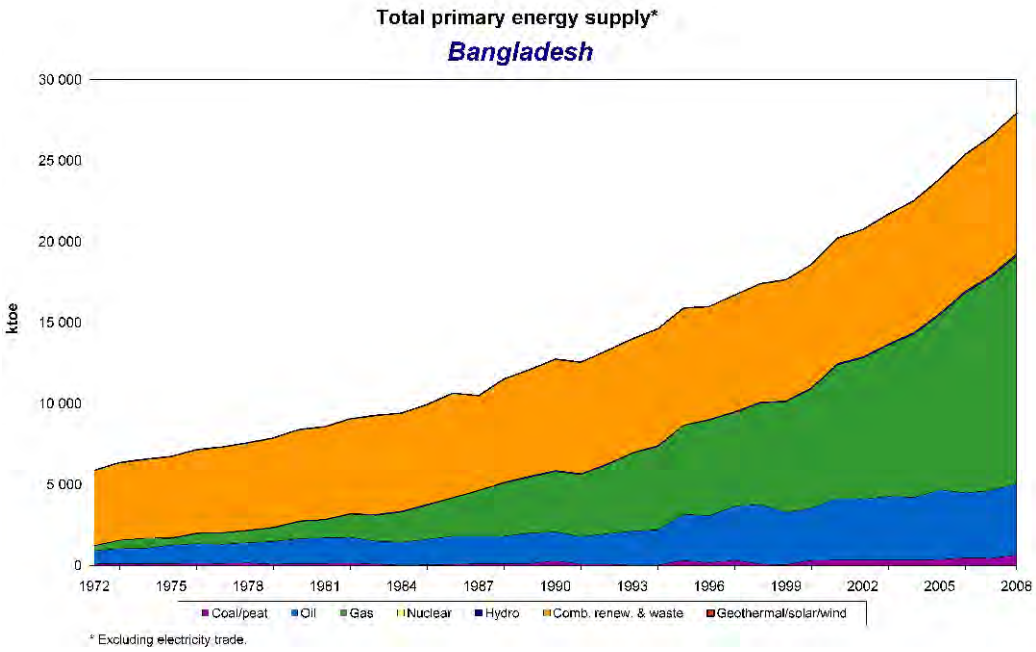



Source: EMRD

**Figure 3.1.1 Share of Primary Energy in FY 2008/09**

Natural gas accounts for 46% while biomass accounts for 35%. This illustrates high dependence on natural gas and low saturation level of commercial energy to the poverty level people.

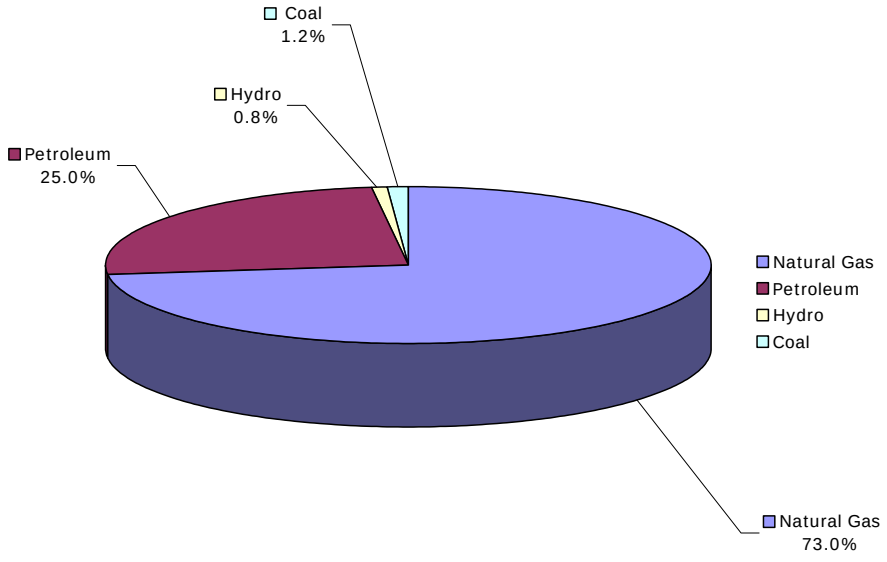
Figure 3.1.2 shows the past changes in primary energy supply in Bangladesh. The supply of natural gas has doubled in the last decade while the supply of fuel oil has not increased so much and there were almost no changes in the supply of biomass. This shows the dependence on low-priced natural gas has been increasing.




Source: IEA

**Figure 3.1.2**

Figure 3.1.3 shows the share of commercial energy in the fiscal year 2008/09.



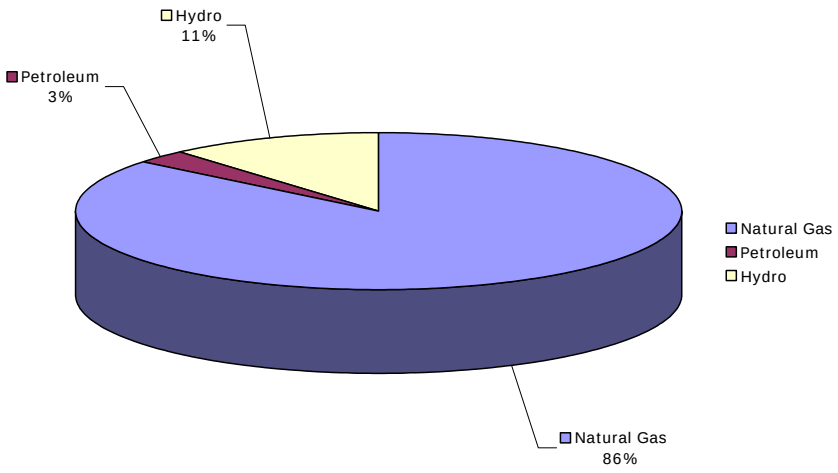

Source: EMRD

**Figure 3.1.3 Share of Commercial Energy in FY 2008/09**

Natural gas accounts for 73% of total commercial energy. This illustrates high dependence on low-priced natural gas in Bangladesh.

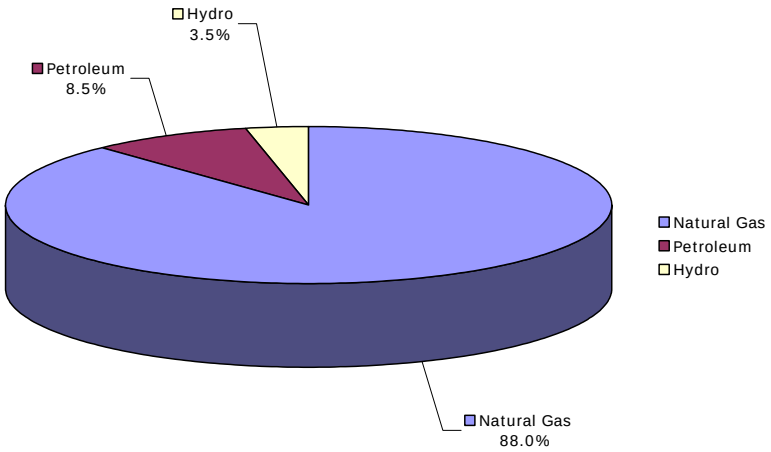
### 3.1.1.2 Power Generation Energy

Figure 3.1.4~Figure 3.1.8 shows the transition of share of power generation energy in the last two decades (1990~2010).



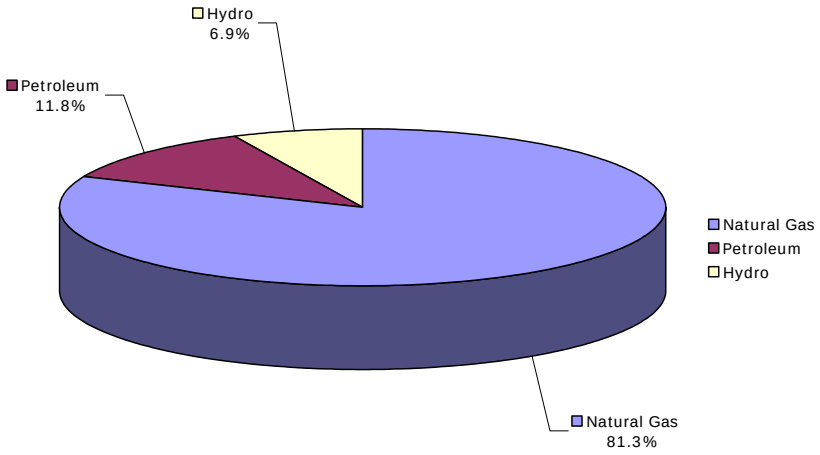

Source: BPDB

**Figure 3.1.4 Share of Power Generation Energy in 1990**



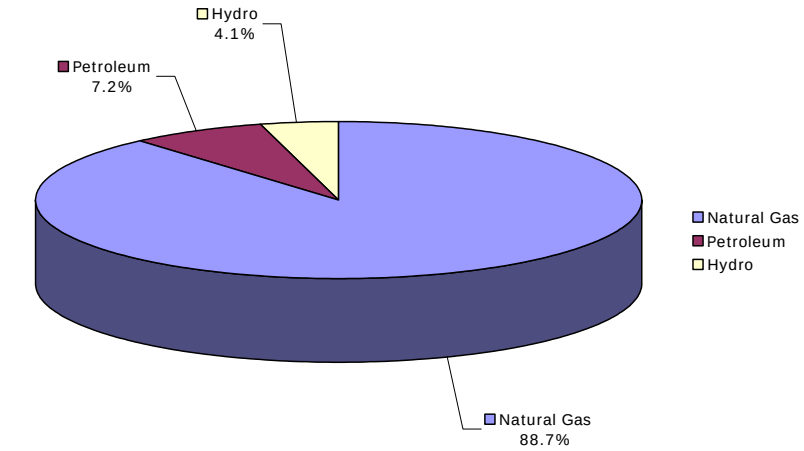

Source: BPDB

**Figure 3.1.5 Share of Power Generation Energy in 1995**



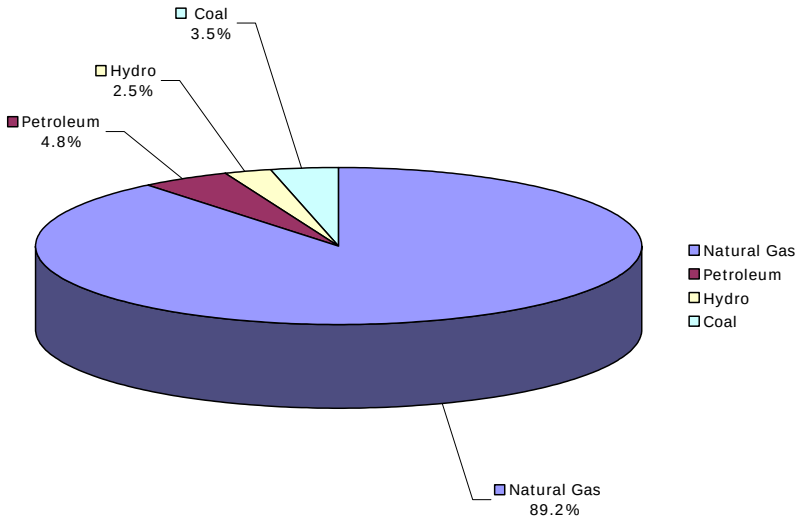

Source: BPDB

**Figure 3.1.6 Share of Power Generation Energy in 2000**




Source: BPDB

**Figure 3.1.7 Share of Power Generation Energy in 2005**




Source: BPDB

**Figure 3.1.8 Share of Power Generation Energy in 2010**

Natural gas has been accounting for nearly 90% in the power generation energy during last two decades. This illustrates very high dependence on low-priced natural gas in Bangladesh and almost no progress in the introduction of alternative energy. It is obvious that realization of the energy best mix is one of the major challenges for the GOB.

### 3.1.1.3 Comparison with Neighboring Countries

Table 3.1.1 shows the comparison with neighboring countries in Total Primary Energy Supply (TPES) and Electricity Consumption.

**Table 3.1.1 Comparison with Neighboring Countries in TPES & Elec. Consumption**

| Country | Key Indicators | | | | | | Compound Indicators | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Population (million) | GDP (billion 2000 USD) | Energy Production (Mtoe) | Net Imports (Mtoe) | TPES (Mtoe) | Electricity Consumption (TWh) | TPES/Population (toe/capita) | TPES/GDP (toe/thouand 2000 USD) | TPES/GDP (PPP) (toe/thouand 2000 USD) | Electricity Consumption/Population (kWh/capita) |
| Bangladesh | 160.00 | 73.95 | 23.39 | 4.93 | 27.94 | 32.27 | **0.17** | 0.38 | 0.09 | **208.00** |
| India | 1,139.97 | 825.77 | 468.31 | 157.89 | 620.97 | 645.25 | 0.54 | 0.75 | 0.14 | 566.00 |
| Pakistan | 166.04 | 112.53 | 63.33 | 20.21 | 82.84 | 72.44 | 0.50 | 0.74 | 0.21 | 436.00 |
| Sri Lanka | 20.16 | 24.17 | 5.07 | 4.24 | 8.93 | 8.23 | 0.44 | 0.37 | 0.09 | 409.00 |
| Nepal | 28.58 | 7.31 | 8.73 | 1.14 | 9.80 | 2.57 | 0.34 | 1.34 | 0.23 | 90.00 |

TPES per capita is much lower than other neighboring countries and electricity consumption per capita is also much lower than other neighboring countries except for Nepal. This indicates that energy and electricity are not supplied all over the country and also there are still many poverty level people who have no access to energy or electricity in Bangladesh.

### 3.1.1.4 Position of Natural Gas Sector

The increase of energy supply for sustainable economic growth and the elimination of the regional gaps in the energy supply for poverty reduction are major challenges for the energy sector in Bangladesh. However the depletion of natural gas is expected in the near future while the dependence on natural gas in the energy supply is still very high.

In order to meet these challenges, the natural gas sector is expected to:

- Increase the natural gas supply to contribute to the solution of the said energy crisis
- Eliminate the regional gas supply gaps to contribute to the said poverty reduction
- Encourage the introduction of alternative energy by gas price reform

## 3.1.2 Policies

### 3.1.2.1 National Development Plans

1) Vision 2021

The Election Manifesto of the Bangladesh Awami League. It envisages that Bangladesh will become a middle income country where poverty will be drastically reduced, and sets the targets in major fields such as politics, economy, industry, education, health, housing, energy, environment, etc. Mid and long term development policies of Bangladesh described below were prepared in the light of this Vision 2021. For natural gas sector's development it aims to increase gas production, regular survey of gas resources and well development.

2) The National Strategy for Accelerated Poverty Reduction II (Revised) FY2009-11 (NSAPR II)

This is the revision of the second Poverty Reduction Strategy Paper in the light of Vision 2021 published in December 2009.

It provides the roadmap of the following five strategic blocks for poverty reduction.

a) Ensuring participation, social inclusion and empowerment
b) Promoting good governance
c) Ensuring efficient delivery of public services
d) Caring for environment and tackling climate change
e) Enhancing productivity and efficiency through science and technology

This strategy states that the major challenges of the natural gas sector are to:

- Minimize the gas demand and supply gap
- Improve reliable estimation of gas reserves through extended exploration and development programs
- Optimize production from the existing gas fields
- Conserve and make efficient use of gas

- Make Petrobangla and its companies operationally and financially sound
- Reduce disparity of supply of gas to different areas of the country

Also it states that the Government has decided:

- To establish a Liquefied Natural Gas (LNG) terminal to import initially about 500mmcfd
- Also to explore the possibility of reviving the inter-regional gas pipeline

3) Outline Perspective Plan of Bangladesh 2010-2021 (Final Draft)

This is the long term development plan prepared in the light of Vision 2021 and published in June 2010. It provides the long-term objectives of major sectors for development of the country, and states that the objectives of the gas (and oil) sector will include:

- Increase the reserve base and production of gas through accelerated exploration, appraisal and development of gas fields, production augmentation and optimization of recovery. The transmission and distribution network will be developed in line with that.
- Give priority to the conversion of probable and possible reserves to proven ones and also to converting delineated gas resources into reserves.
- Reduction of system loss, both technical and non-technical, and improvement of end use efficiency.
- Creating equitable development opportunities through gradual expansion of gas pipelines to the southern, western and northern areas of the country.
- Popularization and expansion of domestic LPG use to discourage new domestic gas pipeline connections.
- To meet energy demand, efforts will be made for regional energy security through mutual cooperation in addition to exploring internal sources.

4) Sixth Five Year Plan FY2010-2015

This is the medium term development plan prepared for the implementation of Vision 2021 and the associated Perspective Plan 2010-2021 and was published in July 2011. It provides the specific policies and strategies to achieve the objectives described in long-term plans above.

This plan states that the main challenges facing the natural gas sector are as follows:

- Maintaining the production level of existing fields operated by national gas companies
- Undertaking exploration in new areas to expand gas reserves
- Attracting investments and technical expertise from IOCs under PSCs for exploration and development of new gas fields
- Establishing a national gas transmission network by connecting the main gas fields with the main demand centers in the greater Dhaka and Chittagong area
- Improving the technical and commercial performance of gas distribution companies to reduce distribution losses
- Diversifying the primary energy supply from natural gas to other forms of energy, given the high dependence of the economy on natural gas and limited proven gas reserves in the country and difficulties in increasing production capacity in the short and medium terms
- Arresting the declining production in gas fields operated by Petrobangla subsidiaries through timely maintenance of existing fields, drilling of additional wells, and appraisal of existing gas fields to ascertain the possibilities for additional gas production
- Adjusting end user gas prices since the prevailing gas pricing structure and high level of Government taxes do not provide adequate margins for the national gas companies to undertake the requisite investments in developing new fields
- Attracting new investments from IOCs for exploring new areas, especially the offshore blocks where the national oil companies do not have any prior experience.
- Improving energy efficiency, including the efficiency of using scarce gas resource. The prevailing practice of setting gas prices below international prices is encouraging inefficient use of gas and its use for applications for which more economical alternatives are available
- Discouraging the use of gas for captive power generation by industries using suboptimum and inefficient technologies. However, this can be done only after ensuring a reliable (in terms of both continuity and quality) supply of grid-based power.

Based on the major challenges above, the following strategy and policies are provided in this plan.

- Adoption of a time based action plan for discovering new gas fields

- Make BAPEX more effective in exploring oil and gas
- Speedy processing of tenders and signing agreements for offshore blocks
- Approval for importing liquefied natural gas by the private sector as an alternative to natural gas and building necessary infrastructure
- Reduce the supply of natural gas to those sectors where alternative energy can be used and encourage them to use alternative energy
- Finalizing the National Energy Policy and Coal policy to create opportunity for using energy from multiple sources
- Increasing financial capacity of BAPEX by forming a Gas Development Fund
- Ensuring proper pricing of gas to conserve energy and improve the financial operations of the gas sector
- Maximizing domestic production of diesel, kerosene, motor spirit (MS) and HOBC through fractionation of condensate in the country.

Further, this plan provides specific time based action plans for the natural gas sector such as a gas production augmentation plan for each gas field and import of LNG.

#### 3.1.2.2 National Energy Policy

1) National Energy Policy 1995

This is the latest national energy policy approved in 1995 which is outdated and does not reflect the present energy crisis in Bangladesh. Some update versions have been drafted so far, however none of them have been approved. Therefore the renewal of this policy is urgently required. According to the interview with EMRD during the 1st & 2nd survey in Bangladesh, the committee for the renewal of this policy has been formed, however the timeframe for the renewal is not fixed yet.

#### 3.1.2.3 Policies for Natural Gas Sector

1) Gas Sector Master Plan & Strategy 2006

This is the latest master plan for the natural gas sector prepared by Petrobangla and WB.

It indicates that the insufficient funding for investments due to the low gas price causes the natural gas supply constraint and reduces progress of institutional reform.

Also gas supply and demand up to 2025 was projected in this plan, and it was said that Bangladesh has only sufficient proven gas reserves to fully meet demand until 2011, although taking into account provable reserves this extends to 2015.

The following solutions are proposed in this plan in order to change these critical situations:

- Gas Price Reform

  The administered low gas price should be equalized to the price of replacement of fuel in five years (up to 2010).
- Institutional Reform

  Greater autonomy and financial independence should be provided to Petrobangla's affiliated companies.
- Increase of Gas Production

  16~33 tcf of natural gas should be discovered in decade.
- Reinforcement of Gas Pipeline Network

  Gas pipeline network should be reinforced by:

  - Periodical pigging
  - Construction of compressor stations at Muchai and Ashuganj
  - Construction of new pipeline between Muchai and Ashuganj
  - Construction of new pipeline between Monohordhi and Elenga
- Reinforcement of Distribution System

  Distribution system should be reinforced by:

  - System loss reduction
  - Improvement of revenue collection rate

2) Gas Sector Reform Roadmap

The Gas Sector Reform Roadmap (GSRR) was formulated in 2005 based upon mutual discussions between ADB and GOB. It recommends the policies for the following major issues in the gas sector with timeframe and the responsible entity for the implementation of each policy (see Appendix-2).

- Policy framework
- Regulatory instruments
- Sector planning
- Increased access to natural gas
- Corporate governance
- Gas sector restructuring
- Private sector participation

- Pricing reforms

EMRD reviewed the progress of implementation of policies in 2008, and it was found that implementations of policies were mostly prolonged and timeframes were revised (see Appendix-3).

3) Gas Evacuation Plan 2010-2015

This plan has been prepared jointly by Petrobangla, GTCL and TGTDCL on June 2010 in order to identify the need for development of additional transmission pipelines and associated facilities over and above the pipeline construction and compressor installation projects being currently implemented for the evacuation of the incremental gas production from different gas fields within the span of the next five years i.e. up to the fiscal year 2014-2015. The approval of this plan by the GOB is currently in progress.

In this plan the transmission pipeline network simulation was conducted based on the demand and supply projections up to 2015. As a result of this simulation 12 pipeline projects were proposed, and especially the following two pipelines are considered as essential additions.

- Moheshkhali - Anowara pipeline required for gas supply from upcoming LNG re-gasification plant in Moheshkhali
- Bibiyana - Dhanua pipeline required for incremental gas production from Chevron's gas fields.

## 3.1.3 Organization

### 3.1.3.1 Organizational Structure of Energy Sector

The energy sector of Bangladesh is under the control of the Ministry of Power, Energy and Mineral Resources (MoPEMR), and this ministry is divided into the Power Division (PD) and Energy and Mineral Resources Division (EMRD).

EMRD which controls the natural gas sector is composed of:

- Hydrocarbon unit (HCU)

  In charge of gas reserve, production and consumption assessment, gas market analysis, data management, etc.
- Geological Survey of Bangladesh (GSB)

  In charge of geological investigations for mineral resources

- Bureau of Mineral Development (BMD)

  In charge of exploration licenses, mining leases and quarry leases of all minerals except oil and gas
- Department of Explosive (DE)

  In charge of the management of explosives in the country.
- Bangladesh Petroleum Institute (BPI)

  In charge of research and development activities including human resources development of the sector.
- Petrobangla

  This corporation manages natural gas sector composed of the following affiliated companies;
  - Gas exploration and production companies: BAPEX, SGFL and BGFCL
  - Gas transmission company: GTCL
  - Gas distribution companies: TGTDCL, BGSL, JGTDSL, PGCL, KGDCL and SGCL
  - CNG/LPG: RPGCL

  and also controls mining sector composed of the following affiliated companies:
  - Coal mining company: BBCMCL
  - Granite mining company: MGMCL

  Further Petrobangla supervise IOCs' activities under PSC.
- Bangladesh Petroleum Corporation (BPC)

  The corporation controls import, refining, storage and marketing of crude and petroleum products with the following affiliated companies:
  - Refinery company: ERL
  - Lubricant blending: ELBL and SAOCL
  - LPG bottling: LPGL
  - Marketing company: POCL, MPL and JOCL

Apart from above entities Bangladesh Energy Regulatory Commission (BERC) was established in 2003 as an independent and impartial regulatory commission for the energy sector, and has the mandate to regulate Gas, Electricity and Petroleum products for the whole of Bangladesh.

Figure 3.1.9 is the organizational structure of the energy sector in Bangladesh.

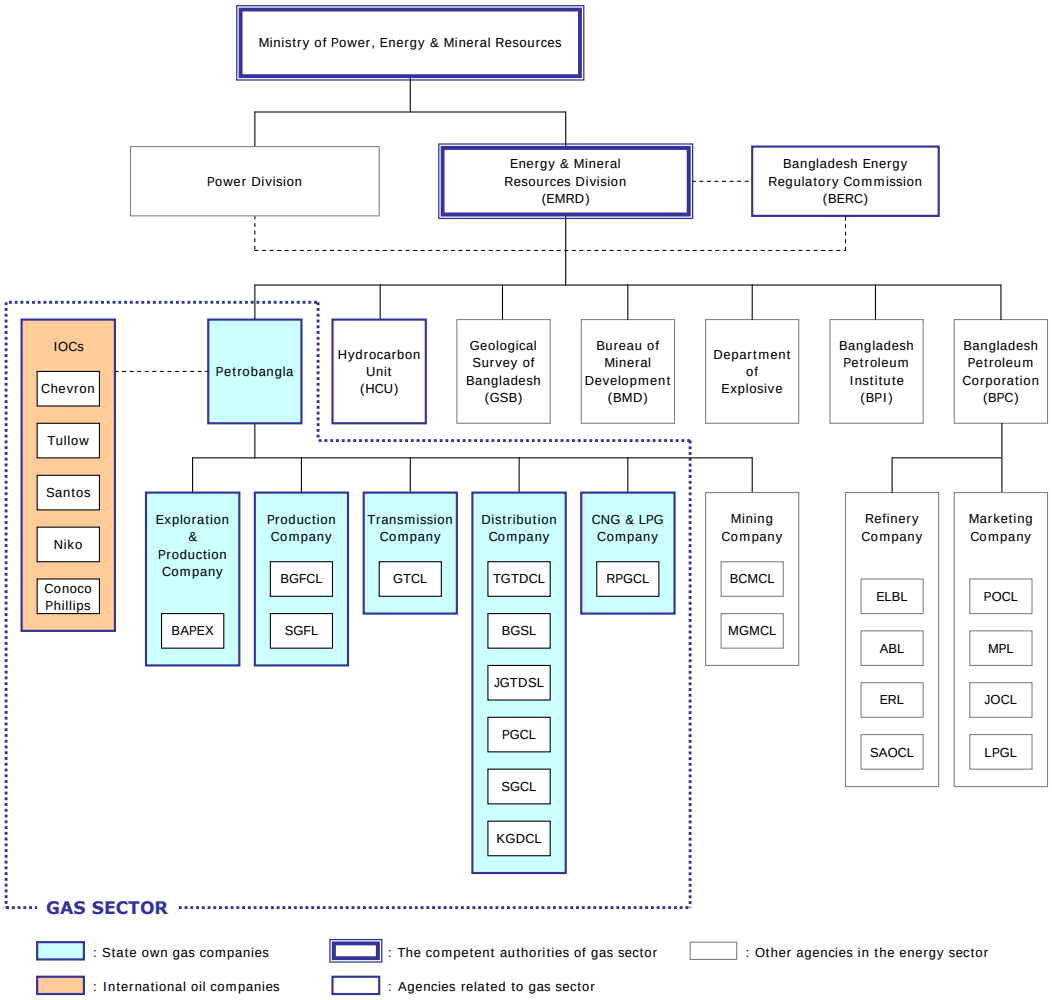



**Figure 3.1.9 Organizational Structure of Energy Sector**

### 3.1.3.2 Organizational Structure of Natural Gas Sector

(1) Outline of State-own Gas Companies (SGCs)

1) Petrobangla

- Outline

Bangladesh Minerals, Oil and Gas Corporation (BMOGC) was established in 1972 for the exploration and development of oil, gas and mineral resources of the country. The minerals related activities of the corporation were segregated and named Bangladesh Mineral Exploration and Development Corporation (BMEDC) in 1972, and the reconstituted Bangladesh Oil and Gas Corporation (BOGC) was short-named “Petrobangla” in 1974. The importation, refining and marketing of crude and petroleum products was vested with the newly formed Bangladesh

Petroleum Corporation (BPC). BOGC and BMEDC were merged into a single entity, Bangladesh Oil, Gas and Mineral Corporation (BOGMC) in 1985, and the corporation was short named “Petrobangla” and given power to hold the shares or interest in any company formed for the purpose of exploration and exploitation of oil, gas and mineral resources in 1989.

- Activities

  Petrobangla manages and controls the following activities of affiliated companies of which details are described in the next section.

  · Exploration and development of gas and oil
  · Production, Transmission and Distribution of natural gas
  · Promotion of CNG
  · Distribution of LPG, octane, petrol, diesel and kerosene produced from NGL and condensate
  · Mining and distribution of coal and granite

2) Exploration and Production Companies

- BAPEX (Bangladesh Petroleum Exploration and Production Company)

  BAPEX was established as an oil and gas exploration company in 1989 to expedite petroleum exploration activities in the country. Subsequently it was transformed into exploration-cum-production company on 2000.

  BAPEX produced 14.14 bcf natural gas from 3 gas fields Sladanadi, Fenchuganj and Shahbazpur during the fiscal year 2009/10, and exploration activities are being reinforced by procuring recent equipment.

- BGFCL (Bangladesh Gas Field Company Limited)

  BGFCL derives its origin from Pakistan Shell Oil Company Limited (PSOC) which was formed in 1956 and started its operation on Titas and Habiganj gas fields in the late sixties. GOB bought all the shares of PSOC and PSOC was renamed as BGFCL on 1975.

  BGFCL produced 258.30bcf natural gas and accounted for approximately 37% of the total gas production in Bangladesh from 5 gas fields Titas, Habiganj, Bakhrabad, Narsingdi and Meghna during the fiscal year 2009/10.

- SGFL (Sylhet Gas Field Limited)

  SGFL was originally owned by Pakistan Petroleum Ltd (PPL). After the independence of Bangladesh the company was taken over by the government, and was incorporated in the name of SGFL in 1982.

SGFL produced 57.27 bcf natural gas and accounted for approximately 8 % of total gas production in Bangladesh from 4 gas fields Sylhet (Haripur), Kailashtilla, Rashidpur and Beanibazar during the fiscal year 2009/10.

3) Transmission Company

- GTCL (Gas Transmission Company Limited)

  GTCL was incorporated in 1993 with the following objectives:

  · Centralized operation & maintenance of national gas grid
  · Expanding of national gas grid ensuring balanced supply & usage of natural gas in all regions of the country

  GTCL transmitted 487 bcf natural gas through 875 km long high pressure pipelines during the fiscal year 2009/10. GTCL also owns 193 km long pipeline for transmitting condensate.

4) Distribution Companies

- TGTDCL (Titas Gas Transmission and Distribution Company Limited)

  TGTDCL was formed in 1964 as a joint stock company of the government of Pakistan and PSOC. After the independence of Bangladesh, TGTDCL has become a 100% Government owned Company and has been placed under the administrative control of Petrobangla in 1975.

  TGTDCL is the prime energy company of Bangladesh, distributing 1.5 bcf natural gas per day to over 1.55 million consumers, and its franchise area covers Dhaka Division except for the west side of Jamuna river.

  TGTDCL distributed 528.58 bcf natural gas and accounted for approximately 74% of total gas sales in Bangladesh during the fiscal year 2009/10.

  25% of TGTDCL's share is currently held by private sector, and another 10% will be off-loaded in this fiscal year (2011/12) as a part of promotion of private sector participation in the sector.

- BGSL (Bakhrabad Gas System Limited)

  The company was originally established with the three-fold responsibilities of production, transmission and distribution in 1980. Subsequently Bakhrabad gas field was handed over to BGFCL, and major transmission pipelines were handed over to GTCL.

  BGSL is now one of the natural gas distribution companies of which the franchise area covers greater Comilla, greater Noakhali and Brahmanbaria districts.

BGSL distributed 105.47 bcf natural gas and accounted for approximately 15% of total gas sales in Bangladesh during the fiscal year 2009/10.

- JGTDSL(Jalalabad Gas Transmission and Distribution System Limited)
  JGTDSL was formed in 1986 and distributes gas in its franchise area consisting of Sylhet Division.
  JGTDSL distributed 45.45 bcf natural gas and accounted for approximately 7% of total gas sales in Bangladesh during the fiscal year 2009/10.
- PGCL (Pashchimanchal Gas Company Limited)
  PGCL was established to distribute gas in the north-west region of the country in 2000.
  PGCL distributed 25.60 bcf natural gas and accounted for approximately 4% of total gas sales in Bangladesh during the fiscal year 2009/10.
- KGDCL (Karnaphuli Gas Distribution Company Limited)
  KGDCL was formed in 2010 bifurcating greater Chittagong and Chittagong Hill Tract area under BGSL franchise, and commenced commercial activities from 1 July 2010.
- SGCL (Sundarban Gas Company Limited)
  SGCL was formed in 2009 with the objective of distributing gas to the South-East areas of the country especially covering ten district of Barisal Division including Bhola district, and will start commercial activities after the completion of gas transmission pipeline which is currently being constructed.
  49% of SGCL's share will be held by private sector as a part of promotion of private sector participation in the sector.

Figure 3.1.10 shows the franchise areas of these gas distribution companies.

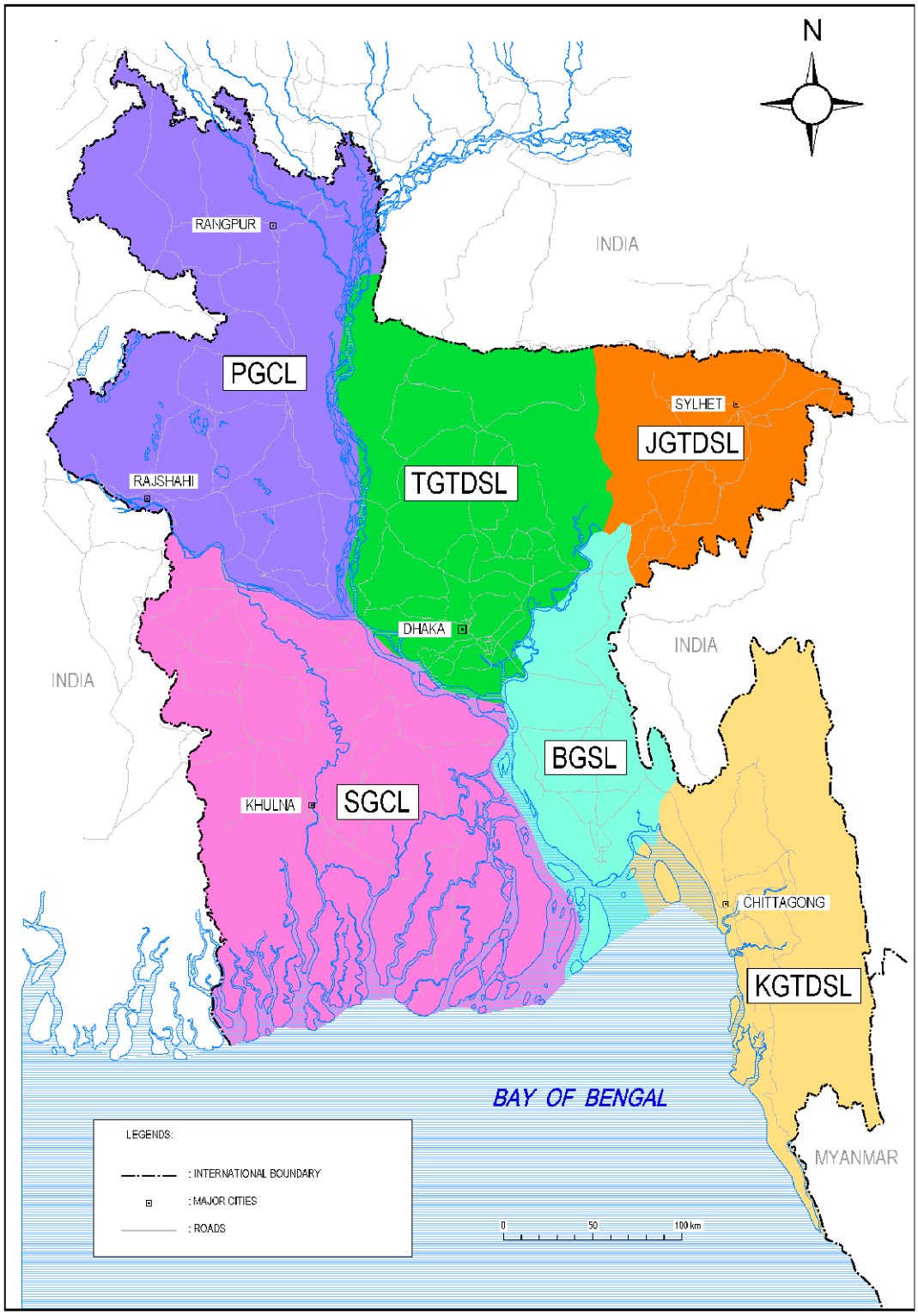



**Figure 3.1.10 Franchise Area of Gas Distribution Companies**

5) CNG & LPG Company

- RPGCL (Rupantarita Prakritik Company Limited)

  RPGCL was established in 1987 and vested with the responsibilities of promoting CNG as well as the production and distribution of LPG, petrol and diesel obtained from NGL.

(2) Correlation between Gas Companies

Figure 3.1.11 shows the organizational structure of the natural gas sector with actual gas flows.

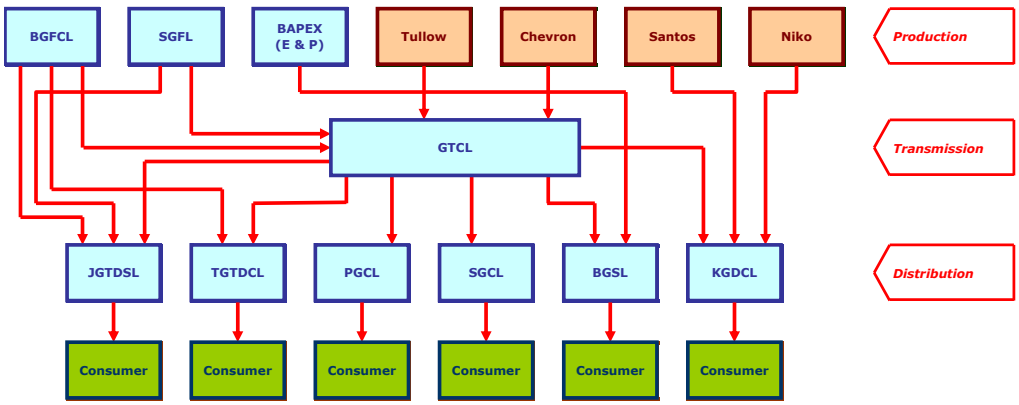



**Figure 3.1.11 Gas Sector Organizational Structure with Gas Flow**

Natural gas produced by production companies including IOCs is transmitted through GTCL's national gas grid (in some case directly to distribution companies) and distributed to customers by distribution companies.

Figure 3.1.12 is the organizational structure of the natural gas sector with financial flows showing how the revenue is distributed to the companies.

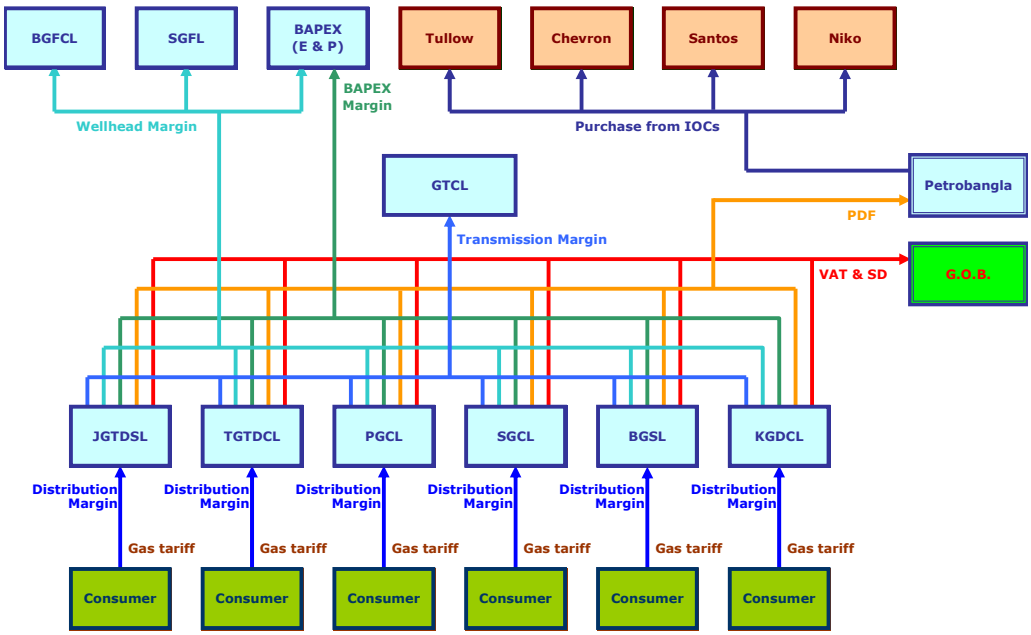



**Figure 3.1.12 Gas Sector Organizational Structure with Financial Flow**

Gas tariff is collected by distribution companies from customer in their franchise area. Then distributing companies take their margins, distribute margins to transmission, production and exploration companies according to the fixed rate, and pay VAT & SD as shown in the Table 3.1.27 of section 3.1.8.1. (payment to IOC is made through Petrobangla.)

In the natural gas trade there is no contract between production companies and the transmission company or between the transmission company and the distribution companies. State-owned gas companies do not have financial independence, and neither invest for the future nor carry out the proper maintenance.

## 3.1.4 Natural Gas Demand

### 3.1.4.1 Sectorial Gas Demand

Natural gas demand has been rapidly increasing along with the rapid economic growth in Bangladesh, and the natural gas supply has not met the demand in recent years. Currently the gas supply is 2000 mmcfd while the demand is 2500 mmcfd.

(1) History of Natural Gas Demand

Table 3.1.2, Table 3.1.3 and Figure 3.1.13 shows the sectorial annual gas sales and their growth ratios from 1980 to 2010.

**Table 3.1.2 Sectorial Annual Gas Sales (1980-2010 : annual average)**

[mmcfd]

| Fiscal Year | Power/Captive Power | Fertilizer | Industry | Domestic | Commercial | Tea/CNG | Brick Field | Total |
|---|---|---|---|---|---|---|---|---|
| 1980 - 81 | 36 | 49 | 22 | 9 | 4 | 0 | 0 | 121 |
| 1981 - 82 | 49 | 73 | 25 | 12 | 5 | 0 | 0 | 163 |
| 1982 - 83 | 60 | 71 | 27 | 14 | 5 | 0 | 0 | 177 |
| 1983 - 84 | 63 | 81 | 28 | 16 | 6 | 0 | 0 | 193 |
| 1984 - 85 | 105 | 75 | 35 | 17 | 6 | 0 | 0 | 237 |
| 1985 - 86 | 109 | 92 | 45 | 19 | 7 | 0 | 0 | 272 |
| 1986 - 87 | 142 | 96 | 51 | 19 | 9 | 0 | 0 | 317 |
| 1987 - 88 | 170 | 140 | 46 | 21 | 10 | 0 | 0 | 386 |
| 1988 - 89 | 179 | 146 | 41 | 25 | 9 | 0 | 0 | 401 |
| 1989 - 90 | 207 | 153 | 39 | 28 | 8 | 0 | 0 | 436 |
| 1990 - 91 | 226 | 148 | 36 | 29 | 8 | 2 | 0 | 450 |
| 1991 - 92 | 241 | 169 | 37 | 32 | 8 | 2 | 1 | 489 |
| 1992 - 93 | 256 | 190 | 42 | 37 | 7 | 2 | 1 | 533 |
| 1993 - 94 | 267 | 204 | 56 | 42 | 8 | 2 | 3 | 581 |
| 1994 - 95 | 294 | 221 | 66 | 52 | 8 | 2 | 3 | 645 |
| 1995 - 96 | 304 | 249 | 75 | 57 | 8 | 2 | 3 | 698 |
| 1996 - 97 | 304 | 213 | 78 | 63 | 12 | 2 | 1 | 673 |
| 1997 - 98 | 338 | 219 | 89 | 68 | 13 | 2 | 1 | 730 |
| 1998 - 99 | 386 | 227 | 98 | 74 | 13 | 2 | 1 | 800 |
| 1999 - 00 | 404 | 228 | 114 | 81 | 11 | 2 | 1 | 841 |
| 2000 - 01 | 480 | 242 | 131 | 87 | 11 | 2 | 1 | 955 |
| 2001 - 02 | 521 | 216 | 147 | 101 | 12 | 2 | 1 | 999 |
| 2002 - 03 | 522 | 263 | 175 | 123 | 12 | 2 | 1 | 1,098 |
| 2003 - 04 | 634 | 254 | 127 | 135 | 13 | 8 | 0 | 1,172 |
| 2004 - 05 | 683 | 257 | 143 | 144 | 13 | 12 | 0 | 1,254 |
| 2005 - 06 | 749 | 244 | 173 | 155 | 14 | 48 | 0 | 1,384 |
| 2006 - 07 | 776 | 256 | 212 | 173 | 15 | 35 | 0 | 1,468 |
| 2007 - 08 | 862 | 216 | 253 | 189 | 18 | 64 | 0 | 1,601 |
| 2008 - 09 | 964 | 205 | 287 | 201 | 20 | 87 | 0 | 1,764 |
| 2009 - 10 | 1,084 | 177 | 325 | 220 | 22 | 107 | 0 | 1,936 |

*Source :Petrobangla Annual Report 2010

**Table 3.1.3 Sectorial Annual Gas Sales Growth Ratio (1980-2010)**

| Fiscal Year | Power/Caprive Power | Fertilizer | Industry | Domestic | Commercial | Tea/CNG | Brick Field | Total |
|---|---|---|---|---|---|---|---|---|
| 1980 - 81 | - | - | - | - | - | - | - | - |
| 1981 - 82 | 36% | 49% | 14% | 33% | 25% | - | - | 35% |
| 1982 - 83 | 22% | -3% | 8% | 17% | 0% | - | - | 9% |
| 1983 - 84 | 5% | 14% | 4% | 14% | 20% | - | - | 9% |
| 1984 - 85 | 67% | -7% | 25% | 6% | 0% | - | - | 23% |
| 1985 - 86 | 4% | 23% | 29% | 12% | 17% | - | - | 15% |
| 1986 - 87 | 30% | 4% | 13% | 0% | 29% | - | - | 17% |
| 1987 - 88 | 20% | 46% | -10% | 11% | 11% | - | - | 22% |
| 1988 - 89 | 5% | 4% | -11% | 19% | -10% | - | - | 4% |
| 1989 - 90 | 16% | 5% | -5% | 12% | -11% | - | - | 9% |
| 1990 - 91 | 9% | -3% | -8% | 4% | 0% | - | - | 3% |
| 1991 - 92 | 7% | 14% | 3% | 10% | 0% | 0% | - | 9% |
| 1992 - 93 | 6% | 12% | 14% | 16% | -13% | 0% | 0% | 9% |
| 1993 - 94 | 4% | 7% | 33% | 14% | 14% | 0% | 200% | 9% |
| 1994 - 95 | 10% | 8% | 18% | 24% | 0% | 0% | 0% | 11% |
| 1995 - 96 | 3% | 13% | 14% | 10% | 0% | 0% | 0% | 8% |
| 1996 - 97 | 0% | -14% | 4% | 11% | 50% | 0% | -67% | -4% |
| 1997 - 98 | 11% | 3% | 14% | 8% | 8% | 0% | 0% | 8% |
| 1998 - 99 | 14% | 4% | 10% | 9% | 0% | 0% | 0% | 10% |
| 1999 - 00 | 5% | 0% | 16% | 9% | -15% | 0% | 0% | 5% |
| 2000 - 01 | 19% | 6% | 15% | 7% | 0% | 0% | 0% | 14% |
| 2001 - 02 | 9% | -11% | 12% | 16% | 9% | 0% | 0% | 5% |
| 2002 - 03 | 0% | 22% | 19% | 22% | 0% | 0% | 0% | 10% |
| 2003 - 04 | 21% | -3% | -27% | 10% | 8% | 300% | -100% | 7% |
| 2004 - 05 | 8% | 1% | 13% | 7% | 0% | 50% | - | 7% |
| 2005 - 06 | 10% | -5% | 21% | 8% | 8% | 300% | - | 10% |
| 2006 - 07 | 4% | 5% | 23% | 12% | 7% | -27% | - | 6% |
| 2007 - 08 | 11% | -16% | 19% | 9% | 20% | 83% | - | 9% |
| 2008 - 09 | 12% | -5% | 13% | 6% | 11% | 36% | - | 10% |
| 2009 - 10 | 12% | -14% | 13% | 9% | 10% | 23% | - | 10% |

*Source: Petrobangla Annual Report 2010

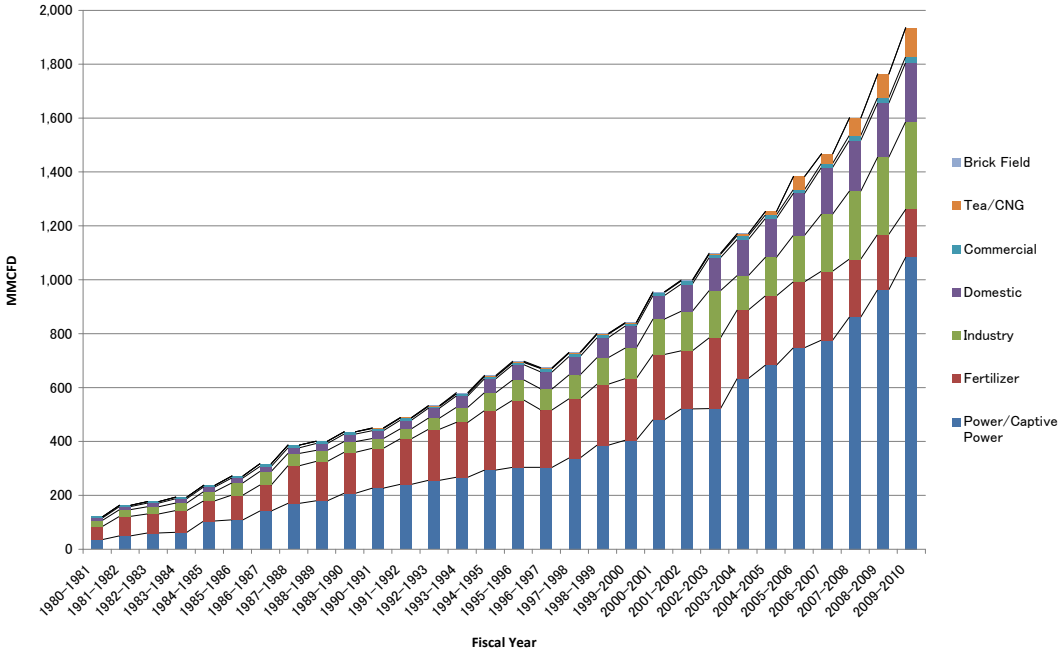



**Figure 3.1.13 Sectorial Annual Gas Sales (1980-2010)**

Since the supply has not met the demand in recent years, gas sales records do not completely reflect the past changes in the demand. However, the sectorial share of natural gas and its historical changes can be read as follows:

- Share of power sector as well as industry is being increased in pace with the development of Bangladesh economy.
- Recent shortage of natural gas is affecting the gas supply to fertilizer factories.
- Share of CNG became significant in recent years due to the rapid spread of CNG in the transport sector.

(2) The Projections for Natural Gas Demand

1) Power Sector

The following information was collected from BPDB during the 1st & 2nd survey in Bangladesh;

- Gas requirement of power sector (2010-2018)
- Power generation projects up to 2016

and accordingly, the natural gas demand projections for the power sector set in PSMP2010 were revised as shown in Table 3.1.4 and Table 3.1.5.

## Table 3.1.4 Gas Demand Projections for the Power Sector 2010-30 (Existing Power Plants)

[mmcfd]

| Power Plants | Capacity (MW) received from BPDB | Commencement | Retirement | 2010 ~ 2011 | 2011 ~ 2012 | 2012 ~ 2013 | 2013 ~ 2014 | 2014 ~ 2015 | 2015 ~ 2016 | 2016 ~ 2017 | 2017 ~ 2018 | 2018 ~ 2019 | 2019 ~ 2020 | 2020 ~ 2021 | 2021 ~ 2022 | 2022 ~ 2023 | 2023 ~ 2024 | 2024 ~ 2025 | 2025 ~ 2026 | 2026 ~ 2027 | 2027 ~ 2028 | 2028 ~ 2029 | 2029 ~ 2030 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Existing Power Plants** | | | | | | | | | | | | | | | | | | | | | | | |
| Sylhet 1X20MW | 20 | 1986 | 2014 | 6 | 6 | 6 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Kumargaon 10MW (15 years rental) | 10 | 2009 | 2024 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 0 | 0 | 0 | 0 | 0 | 0 |
| Kumargaon (3 years rental) | 48 | 2008 | 2011 | 10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Fenchuganj C.C. #1 | 91 | 1994 | 2016 | 16 | 16 | 16 | 16 | 16 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Summit Power (Mahdabdi) | 35 | 2006 | 2024 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 0 | 0 | 0 | 0 | 0 | 0 |
| Fenchuganj 3 yrs rental | 51 | 2009 | 2012 | 11 | 11 | 11 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Shahjbazar RPP 3yrs | 50 | 2008 | 2011 | 12 | 12 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Shahjbazar RPP 15yrs | 86 | 2009 | 2024 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 0 | 0 | 0 | 0 | 0 | 0 |
| Hobiganj SIPP (REB) | 11 | 2009 | 2024 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ashuganj 150MW #3 | 126 | 1986 | 2023 | 26 | 26 | 26 | 26 | 26 | 26 | 26 | 26 | 26 | 26 | 26 | 26 | 26 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ashuganj 150MW #4 | 126 | 1987 | 2023 | 26 | 26 | 26 | 26 | 26 | 26 | 26 | 26 | 26 | 26 | 26 | 26 | 26 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ashuganj 150MW #5 | 126 | 1988 | 2023 | 26 | 26 | 26 | 26 | 26 | 26 | 26 | 26 | 26 | 26 | 26 | 26 | 26 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ashuganj 2X64MW | 128 | 1970 | 2015 | 30 | 30 | 30 | 30 | 30 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ashuganj (United Ashuganj) 3yrs | 53 | 2011 | 2014 | 11 | 11 | 11 | 11 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ashuganj GT #1 | 40 | 1982 | 2014 | 13 | 13 | 13 | 13 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ashuganj GT #2 | 40 | 1984 | 2014 | 10 | 10 | 10 | 10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ashuganj 55MW Rental (3yrs) | 55 | 2010 | 2013 | 11 | 11 | 11 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ashuganj Aggreko Rental (3yrs) | 80 | 2011 | 2014 | 14 | 14 | 14 | 14 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Jangalia, Comilla | 33 | 2009 | 2024 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ashulia, Dhaka Summit SIPP, REB | 45 | 2006 | 2024 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 0 | 0 | 0 | 0 | 0 | 0 |
| Chandina, Comilla Summit SIIPP, REB | 25 | 2006 | 2024 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 0 | 0 | 0 | 0 | 0 | 0 |
| Feni SIPP 22MW | 22 | 2009 | 2024 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 0 | 0 | 0 | 0 | 0 | 0 |
| Mohipal, Feni SIPP | 11 | 2009 | 2024 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 0 | 0 | 0 | 0 | 0 | 0 |
| Barabkundu | 22 | 2009 | 2024 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 0 | 0 | 0 | 0 | 0 | 0 |
| Chittagong Shkalbaha 1X60MW | 40 | 1984 | 2019 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Rauzan 210MW #1 | 180 | 1993 | 2026 | 45 | 45 | 45 | 45 | 45 | 45 | 45 | 45 | 45 | 45 | 45 | 45 | 45 | 45 | 45 | 0 | 0 | 0 | 0 | 0 |
| Rauzan 210MW #2 | 180 | 1997 | 2028 | 42 | 42 | 42 | 42 | 42 | 42 | 42 | 42 | 42 | 42 | 42 | 42 | 42 | 42 | 42 | 42 | 42 | 0 | 0 | 0 |
| Sikalbaha 150MW | 150 | 2011 | - | 36 | 36 | 36 | 36 | 36 | 36 | 36 | 36 | 36 | 36 | 36 | 36 | 36 | 36 | 36 | 36 | 36 | 36 | 36 | 36 |
| CDC Meghnaghat | 450 | 2002 | 2026 | 68 | 68 | 68 | 68 | 68 | 68 | 68 | 68 | 68 | 68 | 68 | 68 | 68 | 68 | 68 | 0 | 0 | 0 | 0 | 0 |
| CDC Haripur | 360 | 2001 | 2026 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 0 | 0 | 0 | 0 | 0 |
| Haripur 3X33MW | 96 | 1987 | 2014 | 27 | 27 | 27 | 27 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| NEPC (Haripur BMPP) | 110 | 1999 | 2014 | 18 | 18 | 18 | 18 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Siddhirigani 210MW | 150 | 2004 | - | 31 | 31 | 31 | 31 | 31 | 31 | 31 | 31 | 31 | 31 | 31 | 31 | 31 | 31 | 31 | 31 | 31 | 31 | 31 | 35 |
| Narshingdi SIPP | 22 | 2008 | 2024 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 0 | 0 | 0 | 0 | 0 | 0 |
| Rupganj, Narayanganj | 33 | 2009 | 2024 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ghorasal 55MW #1 | 42 | 1974 | 2017 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ghorasal 55MW #2 | 42 | 1976 | 2017 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ghorasal 210MW #3 | 190 | 1986 | 2029 | 42 | 42 | 42 | 42 | 42 | 42 | 42 | 42 | 42 | 42 | 42 | 42 | 42 | 42 | 42 | 42 | 42 | 42 | 42 | 0 |
| Ghorasal 210MW #4 | 190 | 1989 | 2029 | 42 | 42 | 42 | 42 | 42 | 42 | 42 | 42 | 42 | 42 | 42 | 42 | 42 | 42 | 42 | 42 | 42 | 42 | 42 | 0 |
| Ghorasal 210MW #5 | 190 | 1994 | 2029 | 44 | 44 | 44 | 44 | 44 | 44 | 44 | 44 | 44 | 44 | 44 | 44 | 44 | 44 | 44 | 44 | 44 | 44 | 44 | 0 |
| Ghorasal 210MW #6 | 190 | 1999 | 2029 | 0 | 44 | 44 | 44 | 44 | 44 | 44 | 44 | 44 | 44 | 44 | 44 | 44 | 44 | 44 | 44 | 44 | 44 | 44 | 0 |
| Mouna, Gazipur SIPP | 33 | 2009 | 2024 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 0 | 0 | 0 | 0 | 0 | 0 |
| RPCL Mymensing | 175 | 1999 | 2025 | 26 | 26 | 26 | 26 | 26 | 26 | 26 | 26 | 26 | 26 | 26 | 26 | 26 | 26 | 26 | 0 | 0 | 0 | 0 | 0 |
| Tongi 100MW | 105 | 2005 | - | 28 | 28 | 28 | 28 | 28 | 28 | 28 | 28 | 28 | 28 | 28 | 28 | 28 | 28 | 28 | 28 | 28 | 28 | 28 | 28 |
| Tangail SIPP | 22 | 2008 | 2024 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 0 | 0 | 0 | 0 | 0 | 0 |
| Baghabari 100MW | 100 | 2001 | 2022 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Baghabari 71MW | 71 | 1991 | 2017 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| West Mont | 70 | 1999 | 2014 | 17 | 17 | 17 | 17 | 17 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ullapara SIPP | 11 | 2009 | 2024 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 0 | 0 | 0 | 0 | 0 | 0 |
| Bogra Rental (15 years) | 21 | 2008 | 2022 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Siddhirganj 2X120MW (GT unit #2) | 105 | 2010 | - | 29 | 29 | 29 | 29 | 29 | 29 | 29 | 29 | 29 | 29 | 29 | 29 | 29 | 29 | 29 | 29 | 29 | 29 | 29 | 29 |

## Table 3.1.5 Gas Demand Projections for the Power Sector 2010-30 (Upcoming Power Plants)

[mmcfd]

| Power Plants | Capacity (MW) received from BPDB | Commencement | Retirement | 2010 ~ 2011 | 2011 ~ 2012 | 2012 ~ 2013 | 2013 ~ 2014 | 2014 ~ 2015 | 2015 ~ 2016 | 2016 ~ 2017 | 2017 ~ 2018 | 2018 ~ 2019 | 2019 ~ 2020 | 2020 ~ 2021 | 2021 ~ 2022 | 2022 ~ 2023 | 2023 ~ 2024 | 2024 ~ 2025 | 2025 ~ 2026 | 2026 ~ 2027 | 2027 ~ 2028 | 2028 ~ 2029 | 2029 ~ 2030 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Upcoming Power Plants** | | | | | | | | | | | | | | | | | | | | | | | |
| Sylhet 150MW CCPP | 150 | 2011 | - | 0 | 31 | 31 | 31 | 31 | 31 | 31 | 31 | 31 | 31 | 31 | 31 | 31 | 31 | 31 | 31 | 31 | 31 | 31 | 31 |
| Fenchuganj 90MW CCPP | 105 | 2011 | ~ | 0 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 |
| Fenchuganj 100-150MW CCPP | 100 | 2012 | - | 0 | 0 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 |
| Bibiyana 300-450MW CCPP 1st unit | 222 | 2013 | - | 0 | 0 | 46 | 46 | 46 | 46 | 46 | 46 | 46 | 46 | 46 | 46 | 46 | 46 | 61 | 46 | 46 | 46 | 46 | 46 |
| Bibiyana 300-450MW CCPP 2nd unit | 222 | 2013 | - | 0 | 0 | 46 | 46 | 46 | 46 | 46 | 46 | 46 | 46 | 46 | 46 | 46 | 46 | 46 | 46 | 46 | 46 | 46 | 46 |
| Bibiyana III 450MW CCPP | 450 | 2014 | - | 0 | 0 | 0 | 0 | 68 | 68 | 68 | 68 | 68 | 68 | 68 | 68 | 68 | 68 | 68 | 68 | 68 | 68 | 68 | 68 |
| *Bibiyana IV 360MW CCPP | - | 2024 | - | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 50 | 50 | 51 | 50 | 51 | 51 |
| Shajibazar 60MW GT | 69 | 2000 | 2022 | 0 | 17 | 17 | 17 | 17 | 17 | 17 | 17 | 17 | 17 | 17 | 17 | 17 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Shajibazar 300MW CCPP | 300 | 2014 | ~ | 0 | 0 | 0 | 0 | 45 | 45 | 45 | 45 | 45 | 45 | 45 | 45 | 45 | 45 | 45 | 45 | 45 | 45 | 45 | 45 |
| *Ashuganj CCPP #1 | - | 2027 | - | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 51 | 50 | 51 | 51 |
| *Ashuganj CCPP #2 | - | 2027 | - | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 51 | 50 | 51 | 51 |
| *Ashuganj CCPP #3 | - | 2030 | - | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 51 |
| Ashuganj 150MW CCPP | 150 | 2014 | - | 0 | 0 | 0 | 0 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 |
| Ashuganj 450MW CCPP | 450 | 2015 | - | 0 | 0 | 0 | 0 | 63 | 63 | 63 | 63 | 63 | 63 | 63 | 63 | 63 | 63 | 63 | 63 | 63 | 63 | 63 | 63 |
| Ashuganj 50MW Power Plant | 50 | 2012 | - | 0 | 0 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 |
| Chandpur 150MW CC | 163 | 2011 | ~ | 0 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 |
| Meghnaghat 360MW CCPP #1 | - | 2025 | - | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 50 | 50 | 51 | 50 | 51 | 51 |
| Meghnaghat 360MW CCPP #2 | - | 2027 | - | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 51 | 50 | 51 | 51 |
| Ghorasal, Narsingdi 100MW PP | 100 | 2012 | ~ | 0 | 0 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 |
| Ghorasal 200-300MW | 290 | 2013 | ~ | 0 | 0 | 56 | 56 | 56 | 56 | 56 | 56 | 56 | 56 | 56 | 56 | 56 | 56 | 56 | 56 | 56 | 56 | 56 | 56 |
| Sirajganj 150MW | 150 | 2012 | ~ | 0 | 0 | 31 | 31 | 31 | 31 | 31 | 31 | 31 | 31 | 31 | 31 | 31 | 31 | 31 | 31 | 31 | 31 | 31 | 31 |
| Sirajganj 450MW CCPP | 300 | 2015 | ~ | 0 | 0 | 0 | 0 | 0 | 44 | 44 | 44 | 44 | 44 | 44 | 44 | 44 | 44 | 44 | 44 | 44 | 44 | 44 | 44 |
| Sirajganj 360MW CCPP #2 | - | 2030 | ~ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 51 |
| Meghnaghat Combined Cycle #2 | 220 | 2013 | - | 0 | 0 | 46 | 46 | 46 | 46 | 46 | 46 | 46 | 46 | 46 | 46 | 46 | 46 | 46 | 46 | 46 | 46 | 46 | 46 |
| Haripur 360MW CCPP | 360 | 2014 | - | 0 | 0 | 0 | 54 | 54 | 54 | 54 | 54 | 54 | 54 | 54 | 54 | 54 | 54 | 54 | 54 | 54 | 54 | 54 | 54 |
| Siddhirganj 450MW CCPP | 450 | 2013 | - | 0 | 0 | 0 | 68 | 68 | 68 | 68 | 68 | 68 | 68 | 68 | 68 | 68 | 68 | 68 | 68 | 68 | 68 | 68 | 68 |
| Siddhirganj 2X150MW | 120 | 2011 | - | 0 | 29 | 29 | 29 | 29 | 29 | 29 | 29 | 29 | 29 | 29 | 29 | 29 | 29 | 29 | 29 | 29 | 29 | 29 | 29 |
| Bheramara 360MW | 360 | 2014 | - | 0 | 0 | 0 | 0 | 54 | 54 | 54 | 54 | 54 | 54 | 54 | 54 | 54 | 54 | 54 | 54 | 54 | 54 | 54 | 54 |
| | | | | | | | | | | | | | | | | | | | | | | | |
| **Total of gas requirement for all power plants** | | | | 932 | 1080 | 1335 | 1435 | 1590 | 1570 | 1570 | 1532 | 1532 | 1532 | 1522 | 1522 | 1497 | 1397 | 1425 | 1384 | 1376 | 1371 | 1334 | 1268 |

2) Fertilizer Factories

The quantity of the natural gas supplied to fertilizer factories has been restricted in recent years due to scarce gas production. This sector does not expect the quick improvement of such situation, and is now planning to replace the old low-efficiency plants with the latest high-efficiency plants such as Shajalal fertilizer factory in Sylhet and KAFCO II in Ashuganj that are now being planned, so that more fertilizer can be produced with the limited gas supply.

According to the above information collected during the 1st & 2nd survey in Bagnladesh, the natural gas demand projections for the fertilizer factories set in PSMP2010 were revised as shown in Table 3.1.6.

**Table 3.1.6 Gas Demand Projections for the Fertilizer Factories (2010-2030)**

[mmcfd]

| Plant | Location | Years of operation | 2011 ~ 2012 | 2012 ~ 2013 | 2013 ~ 2014 | 2014 ~ 2015 | 2015 ~ 2016 | 2016 ~ 2017 | 2017 ~ 2018 | 2018 ~ 2019 | 2019 ~ 2020 | 2020 ~ 2021 | 2021 ~ 2022 | 2022 ~ 2023 | 2023 ~ 2024 | 2024 ~ 2025 | 2025 ~ 2026 | 2026 ~ 2027 | 2027 ~ 2028 | 2028 ~ 2029 | 2029 ~ 2030 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Natural Gas Fertilizer Factory (NGFF) | Sylhet | 50years | 18 | 18 | 18 | 18 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Urea Fertilizer Factory Limited (UFFL) | Ghorashal | 41years | 45 | 45 | 45 | 45 | 45 | 45 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ashuganj Fertilizer Company Limited (AFCL) | Ashuganj | 30years | 52 | 52 | 52 | 52 | 52 | 52 | 52 | 52 | 52 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Polash Fertilizer Factory Limited (PUFF) | Narshingdi | 26years | 14 | 14 | 14 | 14 | 14 | 14 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Chittagong Urea Fertilizer Limited (CUFL) | Chittagong | 24years | 52 | 52 | 52 | 52 | 52 | 52 | 52 | 52 | 52 | 52 | 52 | 52 | 52 | 52 | 52 | 52 | 52 | 52 | 52 |
| Jamuna Fertilizer Company Limited (JFCL) | Jamalpur | 20years | 45 | 45 | 45 | 45 | 45 | 45 | 45 | 45 | 45 | 45 | 45 | 45 | 45 | 45 | 45 | 45 | 45 | 45 | 45 |
| Karnaphuli Fertilizer Company Limited (KAFCO) | Chittagong | 17years | 55 | 55 | 55 | 55 | 55 | 55 | 55 | 55 | 55 | 55 | 55 | 55 | 55 | 55 | 55 | 55 | 55 | 55 | 55 |
| Shahjalal Fertilizer Company Limited (SFCL) | Sylhet | upcoming | 0 | 0 | 0 | 0 | 40 | 40 | 40 | 40 | 40 | 40 | 40 | 40 | 40 | 40 | 40 | 40 | 40 | 40 | 40 |
| KAFCO II | Ashuganj | | 0 | 0 | 0 | 0 | 0 | 0 | 85 | 85 | 85 | 85 | 85 | 85 | 85 | 85 | 85 | 85 | 85 | 85 | 85 |
| North-West Fertilizer Company Ltd | Sirajganj | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 45 | 45 | 45 | 45 | 45 | 45 | 45 | 45 | 45 | 45 |
| Gas Demand Total | | | 281 | 281 | 281 | 281 | 303 | 303 | 329 | 329 | 329 | 322 | 322 | 322 | 322 | 322 | 322 | 322 | 322 | 322 | 322 |

3) Non-Bulk (Industry, Commercial, Domestic, Captive Power, CNG, etc.)

The non-bulk gas demand forecast was developed on a franchise area basis. Within each franchise area a demand forecast was produced for each category of Industry, Domestic, Captive Power, Commercial and Compressed Natural Gas (CNG).

Historical data on the demand trends in these categories for each franchise area was collected and a regression analysis was made to assess the strength of the relationship between demand and GDP growth by using the same regression model as for the Gas Sector Master Plan 2006.

If the result of the regression analysis for a certain category presented a high relationship between demand and GDP, its demand forecast was conducted by adopting the demand growth rate implied from the regression analysis. If a result

from the regression analysis did not show a high relationship or if historical data of a category are not sufficiently available due to its recent establishment, a scenario forecast was conducted.

GDP growth rate forecast to 2030 and non-bulk demand forecast policy are as follows.

- GDP Projection

  Actual GDP growth rates in the years 2008/09 and 2009/10 were 6.0% and 5.9%, respectively. The GDP growth rate in the year 2011/12 is expected to be 7.0% by the Government of Bangladesh (GOB) and the Asian Development Bank (ADB). This increase is expected because of the free export agreement for garment products that was concluded between India and Bangladesh in September 2011. However, the IMF projected that the GDP growth rate in 2011/12 would be 6.7% due to a reduction in foreign currency remittance into Bangladesh from abroad because of the worldwide recession, and the fact that the garment industry is labor intensive and a low value added industry.

  The Survey team agreed that the GDP growth rate would be 6.7%, the same as that projected by the IMF. They hold this viewpoint because Bangladesh will be more or less affected by the worldwide recession, and even though garment exports are being promoted; the export processing zones (EPZs) are located far from the Indian boarder in Dhaka, Chittagong and Mongla along the coastal area and the inland transportation costs are high.

  The Survey team evaluates that there will be difficulty in achieving high economic growth because there are only three Bangladeshi economic drivers, namely agriculture, the garment industry, and foreign currency remittance by Bangladeshi abroad. On the other hand, the Survey team agreed with the GOB suggestion that the growth rate will increase and never decline. Moreover, the World Bank (WB) set GDP growth average around 7% in 2004/05 (Case-B) and the Survey team supports this analysis.

  Consequently, the Survey team set the per annum growth rate for every five years for the periods 2014/15, 2019/20, 2024/25 and 2029/30 at 6.7%, 7.0%, 7.3% and 7.5%, respectively. The Table 3.1.7 below shows the GDP growth rate with GDP constant prices up to 2029/30.

**Table 3.1.7 GDP Growth Rate and GDP Constant Price**

**(Unit: %)**

| No. | Year | IDA GDP Projection | | | GOB GDP Perspective | | | JST GDP Growth Rate Estimation | GDP constant price (in billion Tk) |
|---|---|---|---|---|---|---|---|---|---|
| | | Case-A | Case-B | Case-C | Perspective Plan by 2021 | Five Year Plan | GOB Estimation | | |
| 1 | 2004 - 05 | 5.5 | 6.0 | 6.5 | - | - | - | 6.0 | 2,669.739 |
| 2 | 2005 - 06 | 5.5 | 6.0 | 7.0 | - | - | - | 6.6 | 2,846.725 |
| 3 | 2006 - 07 | 5.5 | 6.0 | 7.0 | - | - | - | 6.4 | 3,029.708 |
| 4 | 2007 - 08 | 5.5 | 6.5 | 7.0 | - | - | - | 6.2 | 3,217.260 |
| 5 | 2008 - 09 | 5.5 | 6.5 | 7.5 | (real GDP) | - | - | 6.0 | 3,401.968 |
| 6 | 2009 - 10 | 5.5 | 6.5 | 8.0 | 5.9 | 6.1 | - | 5.9 | 3,608.446 |
| 7 | 2010 - 11 | 5.5 | 7.0 | 8.0 | - | 6.7 | - | 6.5 | 3,842.995 |
| 8 | 2011 - 12 | 5.5 | 7.0 | 8.5 | - | 7.0 | (IMF->) | 6.7 | 4,100.476 |
| 9 | 2012 - 13 | 5.5 | 7.0 | 8.5 | - | 7.2 | - | 6.7 | 4,375.208 |
| 10 | 2013 - 14 | 5.5 | 7.5 | 8.5 | - | 7.6 | - | 6.7 | 4,668.346 |
| 11 | 2014 - 15 | 5.5 | 7.5 | 9.0 | - | 8.0 | - | 6.7 | 4,981.126 |
| 12 | 2015 - 16 | 5.5 | 8.0 | 9.0 | 8.0 | - | 8.0 | 7.0 | 5,329.804 |
| 13 | 2016 - 17 | 5.5 | 7.5 | 8.5 | - | - | 8.0 | 7.0 | 5,702.891 |
| 14 | 2017 - 18 | 5.5 | 7.5 | 8.5 | - | - | 8.0 | 7.0 | 6,102.093 |
| 15 | 2018 - 19 | 5.5 | 7.0 | 8.5 | - | - | 8.0 | 7.0 | 6,529.240 |
| 16 | 2019 - 20 | 5.5 | 7.0 | 8.0 | - | - | 8.0 | 7.0 | 6,986.286 |
| 17 | 2020 - 21 | 5.3 | 7.0 | 8.0 | 10.0 | - | 8.5 | 7.3 | 7,496.285 |
| 18 | 2021 - 22 | 5.3 | 6.5 | 8.0 | - | - | 8.5 | 7.3 | 8,043.514 |
| 19 | 2022 - 23 | 5.3 | 6.5 | 7.5 | - | - | 8.5 | 7.3 | 8,630.691 |
| 20 | 2023 - 24 | 5.3 | 6.5 | 7.5 | - | - | 8.5 | 7.3 | 9,260.731 |
| 21 | 2024 - 25 | 5.3 | 6.5 | 7.0 | - | - | 8.5 | 7.3 | 9,936.764 |
| 22 | 2025 - 26 | - | - | - | - | - | 9.0 | 7.5 | 10,682.022 |
| 23 | 2026 - 27 | - | - | - | - | - | 9.0 | 7.5 | 11,483.173 |
| 24 | 2027 - 28 | - | - | - | - | - | 9.0 | 7.5 | 12,344.411 |
| 25 | 2028 - 29 | - | - | - | - | - | 9.0 | 7.5 | 13,270.242 |
| 26 | 2029 - 30 | - | - | - | - | - | 9.0 | 7.5 | 14,265.510 |

**Note: GDP projections of Case-A to C are from the Gas Sector Master Plan 2006 by IDA.**
**GDP growth ratio 5.9% of Perspective Plan 2021 in 2009 is the same as real figure.**
**IMF GDP forecast in 2011/12 is 6.7% by Press release (Newspaper Sep. 2011).**
**JST GDP growth and GDP between 2000/01-2009/10 are the actual figures.**
**Actual GDP constant price between 2000/01-2009/10 are by Bangladesh Bureau of Statistics.**

· Non-Bulk Demand Forecast Policy

Actual gas sale data are provided in the annual report of each gas distribution company. The gas sale data of TGTDCL, JGTDSL, PGCL, BGSL and SGCL are available for the period of 10 years, 9 years, 4 years, 1 year and 0 year respectively.

Since the gas sale data for PGCL, BGSL and SGCL was insufficient, the demand forecast for those was conducted in accordance with the result of the regression analysis for TGTDCL and JGTDSL.

**Table 3.1.8 Non-Bulk Demand Forecast Policy**

| Franchise Area | Sector/ Category | Strength of Relationship between Demand and GDP | Demand Forecast Policy |
|---|---|---|---|
| TGTDCL | Industry | $y = 0.0043x^{1.6202}$ $R^2 = 0.7683$ | Relation between demand and GDP is not strong. Demand is forecast considering the growth rate for non-bulk in Gas Evacuation Plan 2010-15. |
| | Captive Power | $y = 3E-10x^{1.6202}$ $R^2 = 0.997$ | Relation between demand and GDP is strong. Up to 2020 demand is forecast on the basis of a regression analysis. After 2020, it is forecast assuming that the captive power will be switched over to the grid during the period 2021-2030. |
| | Domestic | $y = 0.0029x^{1.6181}$ $R^2 = 0.9684$ | Relation between demand and GDP is strong and demand forecast is conducted on the basis of a regression analysis. |
| | Commercial | $y = 0.0025x^{1.3355}$ $R^2 = 0.9503$ | Relation between demand and GDP is strong and demand forecast is conducted on the basis of a regression analysis. |
| | CNG | $y = 5E-25x^{7.6712}$ $R^2 = 0.9818$ | Relation between demand and GDP is strong. Though this market has sprung up instantly due to the profusion of CNG vehicles in recent years, it is assumed that its growth rate will not continue as high from now on. Demand is forecast in consideration of the growth rate for non-bulk in the Gas Evacuation Plan 2010-15. |
| JGTDSL | Industry | $y = 2E-11x^{3.5864}$ $R^2 = 0.8692$ | Relation between demand and GDP is not strong. Demand is forecast considering the growth rate for non-bulk in the Gas Evacuation Plan 2010-15. |
| | Captive Power | $y = 9E-10x^{3.0716}$ $R^2 = 0.9552$ | Relation between demand and GDP is strong. Up to 2020 demand is forecast on the basis of a regression analysis. After 2020, it is forecast assuming that the captive power will be switched over to the grid during the period 2021-2030. |
| | Domestic | $y = 0.007x^{1.4874}$ $R^2 = 0.9919$ | Relation between demand and GDP is strong and demand forecast is conducted on the basis of a regression analysis. |

| | | | |
|---|---|---|---|
| | Commercial | $y = 0.1479x^{0.555}$<br>$R^2 = 0.8672$ | Though the relation between demand and GDP is not strong, demand volume of this market is very small. Demand forecast is conducted by using the same growth rate as TGTDCL. |
| | CNG | $y = 7E-15x^{4.45352}$<br>$R^2 = 0.9288$ | Relation between demand and GDP is strong. Demand is forecast in the same way as TGTDCL. |

Notes: y = Demand、x = GDP

Assuming that the non-bulk gas demand may be restrained by the government measures to cope with the chronic imbalance between demand and supply, the following suppression effects were considered in the non-bulk gas demand forecast.

a) Suppression effect by gas pricing reforms
   The suppression effect over the period 2013-2015 as the result of the gradual introduction of economic tariffs may reduce the demand growth rate by 2% for the relevant period.
b) Suppression effect by introduction of alternative energy
   The introduction of alternative energy such as fuel oil, coal, renewable energy, etc may reduce the demand growth rate by 2% after 2020. Also it was assumed that the captive power would be switched over to the grid completely during the period 2021-2030.

The result of the gas demand projection conducted by the Survey Team is presented in Table 3.1.9.

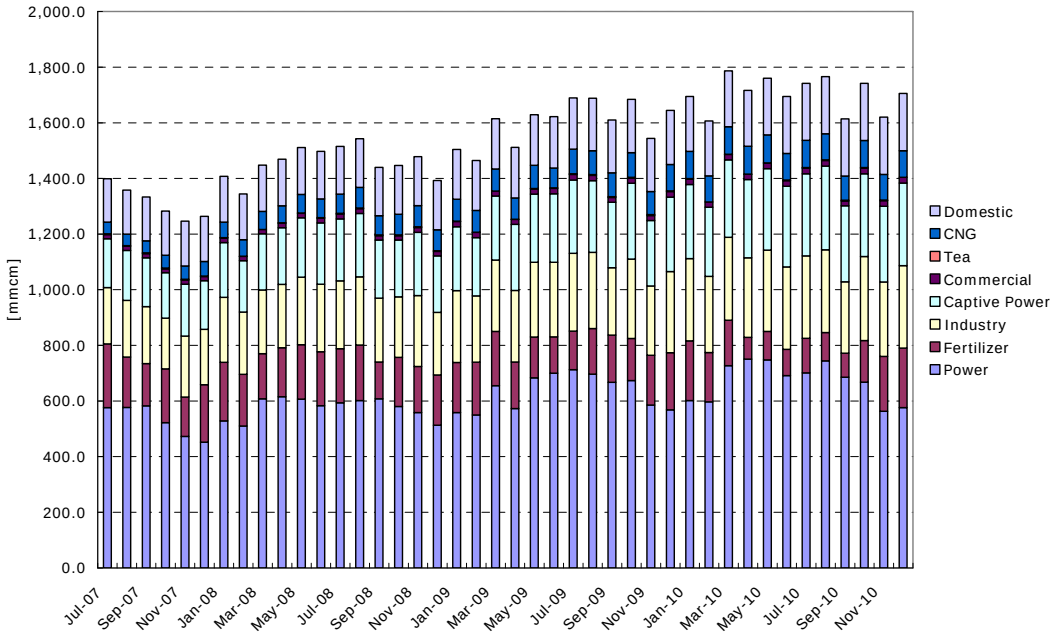
**Table 3.1.9 Sectorial Gas Demand Projection**

(MMCFD)

| Year | Power | Captive P. | Fertilizer | Industrial | Comm. | Domestic | CNG,Tea | Total |
|---|---|---|---|---|---|---|---|---|
| 2010 – 2011 | 932 | 330 | 281 | 351 | 23 | 259 | 112 | 2,289 |
| 2011 – 2012 | 1,080 | 363 | 281 | 387 | 25 | 287 | 121 | 2,544 |
| 2012 – 2013 | 1,335 | 399 | 281 | 418 | 27 | 312 | 131 | 2,903 |
| 2013 – 2014 | 1,435 | 438 | 281 | 451 | 29 | 339 | 142 | 3,115 |
| 2014 – 2015 | 1,590 | 481 | 281 | 488 | 31 | 369 | 153 | 3,393 |
| 2015 – 2016 | 1,570 | 531 | 303 | 539 | 34 | 410 | 166 | 3,554 |
| 2016 – 2017 | 1,570 | 587 | 303 | 595 | 38 | 456 | 180 | 3,729 |
| 2017 – 2018 | 1,532 | 649 | 329 | 658 | 41 | 506 | 195 | 3,910 |
| 2018 – 2019 | 1,532 | 717 | 329 | 727 | 45 | 563 | 211 | 4,125 |
| 2019 – 2020 | 1,532 | 792 | 329 | 803 | 50 | 625 | 229 | 4,360 |
| 2020 – 2021 | 1,522 | 879 | 322 | 891 | 55 | 697 | 249 | 4,615 |
| 2021 – 2022 | 1,522 | 781 | 322 | 971 | 59 | 764 | 271 | 4,690 |
| 2022 – 2023 | 1,497 | 684 | 322 | 1,058 | 64 | 839 | 295 | 4,757 |
| 2023 – 2024 | 1,397 | 586 | 322 | 1,153 | 69 | 919 | 321 | 4,766 |
| 2024 – 2025 | 1,425 | 488 | 322 | 1,256 | 74 | 1,007 | 349 | 4,921 |
| 2025 – 2026 | 1,384 | 391 | 322 | 1,372 | 81 | 1,107 | 380 | 5,036 |
| 2026 – 2027 | 1,376 | 293 | 322 | 1,499 | 87 | 1,218 | 414 | 5,209 |
| 2027 – 2028 | 1,371 | 195 | 322 | 1,637 | 95 | 1,339 | 451 | 5,411 |
| 2028 – 2029 | 1,334 | 98 | 322 | 1,789 | 103 | 1,473 | 492 | 5,610 |
| 2029 – 2030 | 1,268 | 0 | 322 | 1,954 | 111 | 1,619 | 536 | 5,811 |

### 3.1.4.2 Seasonal Fluctuation of Gas Demand

Figure 3.1.14 shows the monthly gas consumption of each sector from July 2007 to December 2010.




Source: NWPGCL

**Figure 3.1.14 Sectorial Monthly Gas Consumption (07/2007~12/2010)**

This graph indicates that gas consumption of power sector in dry season from November to February is relatively lower and gas consumption of other sectors does not fluctuate by seasons. Therefore the total gas consumption tends to decrease in dry season.

However, gas supply has not been meeting demand in recent years and monthly consumption records do not exactly mean the seasonal fluctuation of gas demand. For instance, during the interviews with related entities, there was an information that gas demand increases in dry season due to the operation of irrigation equipment.

### 3.1.4.3 Introduction of Alternative Energy

As mentioned in section 3.1.2.2, the current National Energy Policy 1995 is outdated and does not reflect the energy crises in recent years. The renewal of this policy including how to promote the use of alternative energy is expected.

The present state of the introduction of alternative energy according to the 1st & 2nd survey in Bangladesh is as follows:

- LNG

  The government determined to import initially 500 mmcfd of LNG. The LNG re-gasification plant and necessary pipeline are scheduled to be constructed by the end of 2013, and the consultant for the design and construction of re-gasification plant was

recently awarded. However, it is difficult to complete the project by the end of 2013 in consideration of remaining time and works.

- Fuel Oil

  The government is going to enhance the storage and distribution capacity to increase the import of fuel oil. Present total storage capacity of BPC is 898,990 metric ton.

- Renewable Energy

  A Renewable Energy Policy was published by the Power Division in 2008, and it aims at power generation with renewable energy at 5% (800MW) by 2015 and 10% (2000MW) by 2020. Accordingly PD is now planning concretely to achieve 500MW solar power generation by 2015.

#### 3.1.4.4 Demand Side Energy Saving

The following are the activities for demand side energy saving.

Daylight saving time was tentatively introduced in 2009. However it has not been operated again since the backing of public opinion could not be obtained.
Zonal holiday staggering for shops and the promotion of CFL bulbs proposed in NSAPR II are currently being carried out.
Further the “Bangladesh Roadmap for Energy Efficiency Improvements & Demand Side Management” was prepared and published in 2009 by WB and GTZ. It proposes 19 concrete projects for energy saving including the following projects related to natural gas sector.

- Introduction of power generation from pressure reduction in natural gas supply system
- Promotion of improved natural gas cook stoves
- Installation of meters to household and commercial gas consumers

The pilot project for meters installations is currently being carried out, however there is no remarkable movement for other projects.

Effectiveness of these activities is still very low and does not contribute to solve the recent energy crises.

### 3.1.5 Natural Gas Exploration and Production

Latest natural gas concession status is shown in Figure 3.1.15.

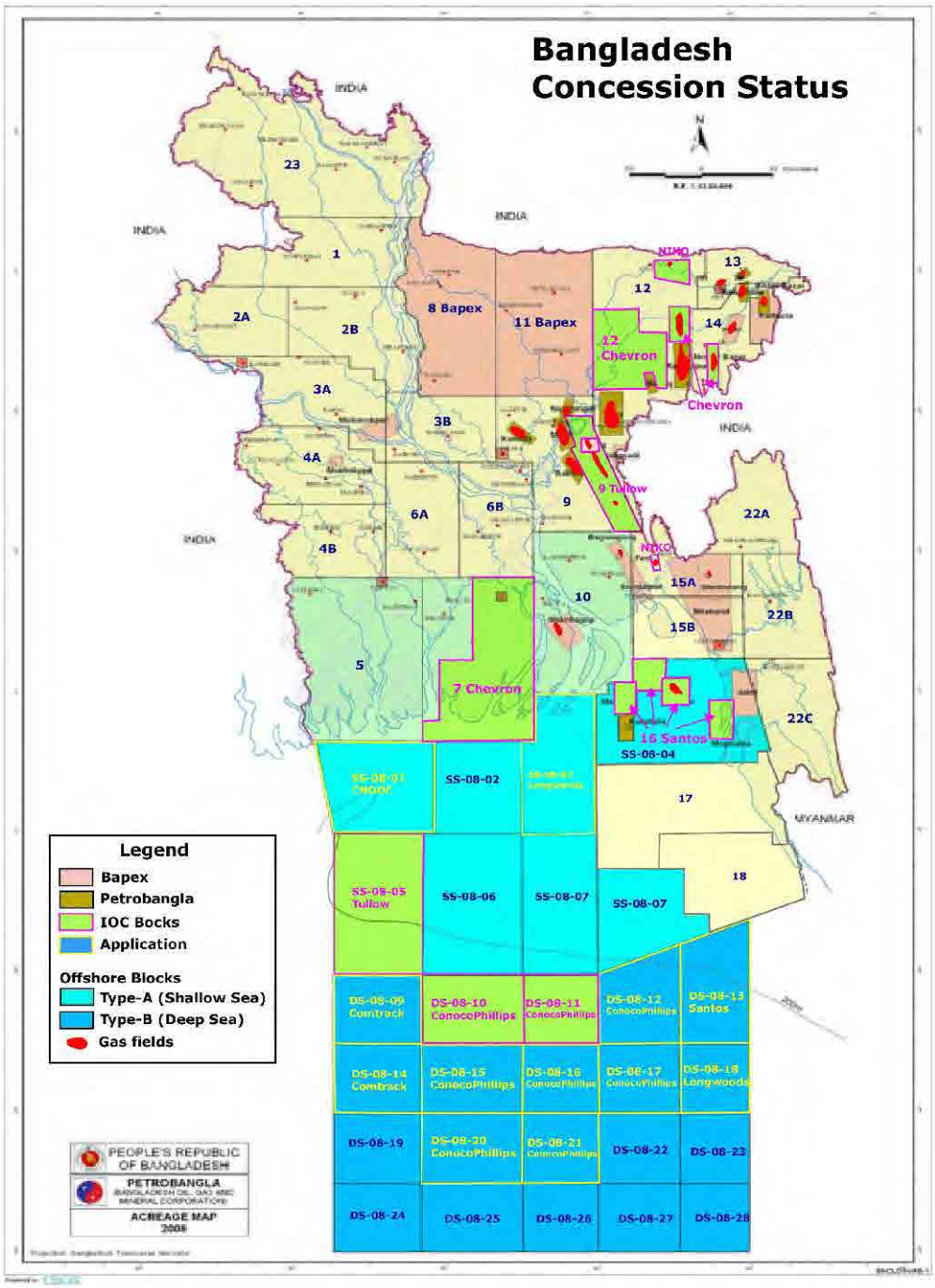



**Figure 3.1.15 Natural Gas Concession Status in Bangladesh**

### 3.1.5.1 Gas Resources

(1) Gas Reserves

The Gas Reserve Estimation 2010 conducted by Gustavson Associates who was commissioned by HCU (Hydrocarbon Unit of Energy and Mineral Resources Division) is the latest gas reserve estimation report in Bangladesh. However, only some summary tables instead of the copy of the whole report have been provided to the Survey Team because the 2010 report has not been approved by the government yet.

Therefore, by comparing the limited available data of the 2010 report with the joint assessment report of gas reserve conducted by the Norwegian Petroleum Directorate (NPD) and HCU in 2003, the comparison of gas in place and remaining reserves, and the cause of significant increase or decrease in reserves of each field were discussed.

The result of Gas Reserve Estimation 2010 is shown in Table 3.1.10, and a comparison of the assessments of 2003 & 2010 is shown in Figure 3.1.16 and Table 3.1.11.

**Table 3.1.10 Gas Reserve estimation 2010 by HCU/GA**

(BCF)

| Sl No. | Field | Operator | GIIP P1+P2 | URR P1+P2 | RF % | Cumulative Production 12/10 | Remaining Reserves 12/10 | Possible Reserves P3 |
|---|---|---|---|---|---|---|---|---|
| A. Developed Reserve | | | | | | | | |
| a. Producing | | | | | | | | |
| 1 | Bakhrabad | BGFCL | 1,825 | 1,387 | 76.0 | 711 | 676 | 65 |
| 2 | Bangola | Tullow | 730 | 621 | 85.1 | 138 | 483 | 207 |
| 3 | Beanibazar | SGFL | 225 | 137 | 60.9 | 65 | 72 | 32 |
| 4 | Bibiyana | Chevron | 5,321 | 4,532 | 85.2 | 858 | 3,674 | 457 |
| 5 | Fenchuganj | BAPEX | 483 | 329 | 68.1 | 74 | 255 | 146 |
| 6 | Habiganj | BGFCL | 3,981 | 2,787 | 70.0 | 1,762 | 1,025 | 434 |
| 7 | Jalalabad | Chevron | 1,346 | 1,128 | 83.8 | 599 | 529 | 122 |
| 8 | Kailashtila | SGFL | 3,463 | 2,880 | 83.2 | 510 | 2,370 | 346 |
| 9 | Moulavi Bazar | Chevron | 630 | 494 | 78.3 | 172 | 322 | 108 |
| 10 | Narsinghdi | BGFCL | 405 | 345 | 85.1 | 117 | 228 | 27 |
| 11 | Rashidpur | SGFL | 3,887 | 3,134 | 80.6 | 475 | 2,659 | 856 |
| 12 | Saldanadi | BAPEX | 393 | 275 | 70.0 | 63 | 212 | 128 |
| 13 | Sangu | Santos | 976 | 771 | 78.9 | 480 | 291 | 93 |
| 14 | Shahbazpur | BAPEX | 415 | 261 | 63.0 | 4 | 257 | 54 |
| 15 | Sylhet | SGFL | 580 | 408 | 70.4 | 190 | 218 | 103 |
| 16 | Titas | BGFCL | 9,039 | 7,582 | 83.9 | 3,214 | 4,368 | 754 |
| b. Production Suspended | | | | | | | | |
| 17 | Chattak (West) | SGFL | 677 | 474 | 70.0 | 26 | 448 | 253 |
| 18 | Feni | BAPEX-NIKO | 185 | 130 | 70.0 | 63 | 67 | 72 |
| 19 | Kamta | BGFCL | 72 | 50 | 70.1 | 21 | 29 | - |
| 20 | Meghna | BGFCL | 122 | 101 | 82.8 | 37 | 64 | 0 |
| Total Developed Reserve | | | 34,757 | 27,826 | 80.1% | 9,577 | 18,249 | 4,258 |
| B. Undeveloped Reserve | | | | | | | | |
| 21 | Begumganj | BAPEX | 47 | 33 | 70.0 | 0 | 33 | 76 |
| 22 | Kutubdia | BAPEX | 65 | 46 | 70.0 | 0 | 46 | - |
| 23 | Semutang | BAPEX | 654 | 318 | 48.6 | 0 | 318 | 51 |
| Total Undeveloped Reserve | | | 766 | 396 | 51.8% | 0 | 396 | 127 |
| **Total Reserve in BCF** | | | **35,522** | **28,222** | 79.5% | **9,577** | **18,645** | **4,385** |
| Total Reserve in TCF | | | 35.5 | 28.2 | 79.5% | 9.6 | 18.6 | 4.4 |

GIIP : Gas Initially In Place
URR : Ultimate Recoverable Reseves
RF : Recovery Factor
P1 : Proved P2 : Probable P3 : Possible
(Source : Gas Reserve Estimation 2010 by HCU/GA)

Annotation:

Gas Initially In Place (GIIP) means the total amount of natural gas present initially in the field underground. Recoverable Reserves or Remaining Reserves are defined as those quantities of natural gas that are estimated to be still left in the fields and commercially recoverable under the current economic and operating conditions. Cumulative Production is the total amount of gas that has been produced as of a particular time in the life of the field, and Ultimate Recoverable Reserves (URR) is an estimate of the total amount of cumulative production and recoverable reserves.

Recoverable Reserves are classified into 3 categories i.e. proved (P1), probable (P2) and possible (P3) reserve based on the degree of uncertainty of the reserve estimate.

The gas recovery factor (RF) depends on number of factors including reservoir properties, reservoir drive mechanism, operating circumstances, abandonment pressure etc. Generally, recovery factor of gas in typical gas fields range from 60% to 80%.

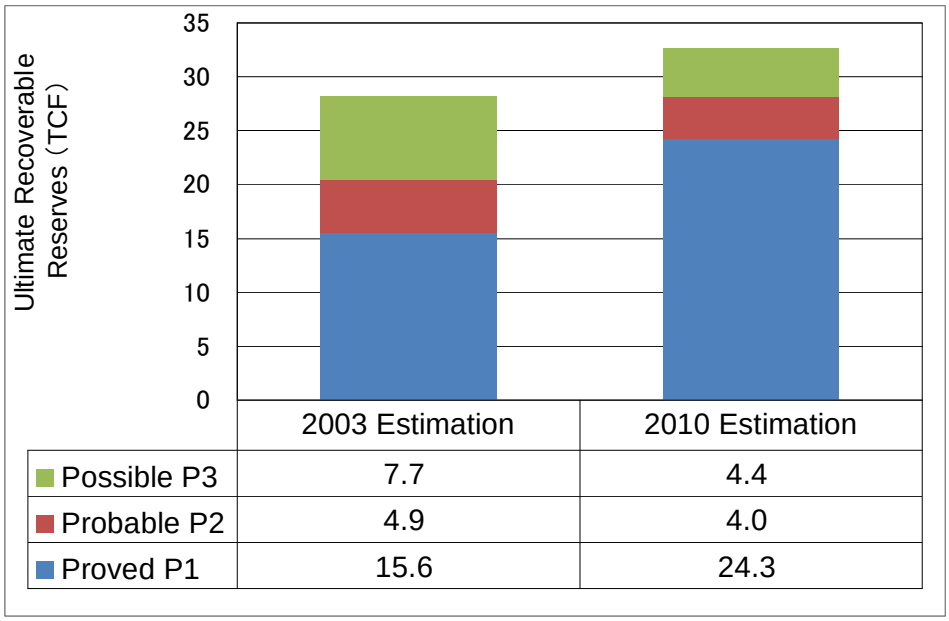



**Figure 3.1.16 Comparison of reserve estimations of 2003 and 2010 by HCU/GA**

**Table 3.1.11 Comparison of recoverable gas reserve in 2003 and 2010**

| Field | 2010 HCU/GA Estimation | | | 2003 HCU/NPD estimation | | | increase and decrease | |
|---|---|---|---|---|---|---|---|---|
| | GIIP P1+P2 | RF % | URR P1+P2 | GIIP P1+P2 | RF % | URR P1+P2 | GIIP P1+P2 | URR P1+P2 |
| Bakhrabad | 1,825 | 76% | 1,387 | 1,499 | 70% | 1,049 | 326 | 338 |
| Bangola | 730 | 85% | 621 | | | | **730** | **621** |
| Beani Bazar | 225 | 61% | 137 | 243 | 70% | 170 | (18) | (33) |
| Bibiyana | 5,321 | 85% | 4,532 | 3,145 | 76% | 2,401 | **2,176** | **2,131** |
| Fenchuganj | 483 | 68% | 329 | 404 | 70% | 283 | 79 | 46 |
| Habiganj | 3,981 | 70% | 2,787 | 5,139 | 75% | 3,852 | **(1,158)** | **(1,065)** |
| Jalalabad | 1,346 | 84% | 1,128 | 1,195 | 70% | 837 | 151 | 291 |
| Kailash Tila | 3,463 | 83% | 2,880 | 2,720 | 70% | 1,904 | **743** | **976** |
| Moulvi Bazar | 630 | 78% | 494 | 449 | 80% | 359 | 181 | 135 |
| Narsinghdi | 405 | 85% | 345 | 307 | 70% | 215 | 98 | 130 |
| Rashidpur | 3,887 | 81% | 3,134 | 2,002 | 70% | 1,401 | **1,885** | **1,733** |
| Salda Nadi | 393 | 70% | 275 | 166 | 70% | 116 | 227 | 159 |
| Sangu | 976 | 79% | 771 | 1,031 | 82% | 848 | (55) | (77) |
| Shahbazpur | 415 | 63% | 261 | 665 | 70% | 466 | (250) | (205) |
| Sylhet | 580 | 70% | 408 | 684 | 70% | 479 | (104) | (71) |
| Titas | 9,039 | 84% | 7,582 | 7,325 | 70% | 5,128 | **1,714** | **2,454** |
| Chattak (West) | 677 | 70% | 474 | 677 | 70% | 474 | 0 | (0) |
| Feni | 185 | 70% | 130 | 185 | 70% | 130 | 0 | (0) |
| Kamta | 72 | 70% | 50 | 72 | 69% | 50 | (0) | 0 |
| Meghna | 122 | 83% | 101 | 171 | 70% | 119 | (49) | (18) |
| Begumganj | 47 | 70% | 33 | 47 | 70% | 33 | (0) | (0) |
| Kutubdia | 65 | 70% | 46 | 65 | 71% | 46 | 0 | (1) |
| Semutang | 654 | 49% | 318 | 227 | 66% | 150 | 427 | 168 |
| **Total** | **35,522** | **79%** | **28,222** | **28,417** | **72%** | **20,509** | **7,105** | **7,713** |

Black:increase, Red:decrease

(Source : Gas Reserve Estimation 2010 by HCU/GA
Gas Reserve Estimation 2003 by HCU/NPD)

Gas initially in place (proved + probable) in 2010 was 35.5 TCF (Trillion Cubic Feet), and ultimate recoverable reserves (proved + probable) was 28.2 TCF. By December 2010, after producing 9.6 TCF of gas, the remaining reserves were 18.6 TCF. The revised gas estimate shows an increase of GIIP at 7.1 TCF, ultimate recoverable reserves at 7.7 TCF, and remaining reserves at 3.7 TCF compared to the 2003 estimation.

In the 2010 estimation, an increase of proved reserve at 8.7 TCF is mainly due to the upgrade from probable and possible reserve to proved reserve. In addition, the possible reserves of 13 gas fields which were not accounted for in the previous estimate were newly added.

The ultimate recoverable reserves in Titas, Bibiyana, Rashidpur and Kailash Tila fields increased by 2.5 TCF, 2.1 TCF, 1.7 TCF, 1.0TCF respectively, but decreased 1.1 TCF in Habiganj. In addition, 0.6TCF in Bangola field is newly added in the ultimate recoverable reserves. The reasons for increases or decrease in reserve are probably due to improvement in the delineation of the structure by the acquisition of new seismic and well data, the advances in seismic data processing and interpretation techniques, increasing the accuracy of decline curve methods or material balance estimate, and the use of the proper recovery factor by increasing pressure & production data.

The causes of significant increases or decrease in each field are considered as follows.

- Titas

  In the 2003 assessment, the reserve of the main producing sands of A group was estimated to be 8.533TCF according to MBAL(material balance method). However, as aquifer support was doubtful, the difference of 2.433TCF between 2003 and the previous study was considered to be in the possible category, till the time of collecting new pressure data.

  In the 2010 assessment, the increase in reserve is thought to be upgraded from possible reserve in the 2003 assessment to proved+probable reserve, and high recovery factor of 85% is used after the interpretation that the drive mechanism is the depletion type from the depleting tendency.

**Table 3.1.12 Titas Field - Comparison of reserve estimation 2003 and 2010**

| | Method | GIIP | | | RF | URR |
|---|---|---|---|---|---|---|
| | | P1+P2 | P3 | P1+P2+P3 | % | |
| 2003 Estimation | MBAL | 6.100 | 2.433 | | 70.0% | 4.270 |
| | MBAL | 1.225 | | 9.758 | 70.0% | 0.858 |
| | | 7.325 | 2.433 | | | 5.128 |
| 2010 Estimation | | 8.054 | 0.754 | | 84.8% | 6.830 |
| | | 0.985 | | 9.793 | 76.2% | 0.751 |
| | | 9.039 | 0.754 | | | 7.581 |

- Bibiyana

  Bibiyana is a relatively new gas field discovered in 1998, and started production in 2007. In the 2003 assessment, the reserve estimation was based on Unocal's reserve estimation conducted by DeGolyer and MacNaughton of USA in 2000. This estimation was conducted using data from two wells and 3D seismic data acquired in 1988-89. Although the number of wells was limited, the delineation of

the structure was considered to be reliable because 3D seismic data was used for interpretation.

On the other hand, in the 2010 assessment, 3D seismic data, and additional pressure & production data from many wells (12 development wells) were used for evaluation, so the result is considered to be highly reliable and more accurate than the previous study. The increase in reserve in the 2010 assessment is thought to be upgraded from possible reserve in the 2003 assessment to proved reserve, and a high recovery factor of 85% is used because the drive mechanism was revealed to be depletion type or gas expansion type.

**Table 3.1.13 Bibiyana field - Comparison of reserve estimation 2003 & 2010**

| | Method | GIIP | | | RF | URR |
|---|---|---|---|---|---|---|
| | | P1+P2 | P3 | P1+P2+P3 | % | |
| 2003 Estimation | Volmetric | 3.145 | 3.423 | 6.567 | 76.3% | 2.400 |
| 2010 Estimation | | 5.321 | 0.286 | 5.608 | 85.2% | 4.532 |

- Rashidpur

In the 2003 assessment, the reserve was re-estimated by the volumetric method with probability distribution using two different structure maps of the Upper sand, and a structure map of the Lower sand.

For other minor sands, because the seismic grid was rather widely spaced (3-5km) and these sands were not visible in the seismic lines, aerial extension was considered within a circle of 1km radius. In addition, p/z plot was attempted using flowing well head pressure and shut in well pressure, as the shut in bottom hole pressure was not available. Meaningful results could not be obtained due to poor data quality. Additional seismic data as well as new well data are required to determine the reserve with a higher level of confidence.

In the 2010 assessment, probable and possible reserves do not change very much, but proved reserve increased more than double the 2003 assessment. This would be because of the addition of data that can resolve many of the issues in the 2003 assessment, the drive mechanisms are interpreted as depletion or gas expansion type, and a high recovery factor of 81% is used to estimate recoverable reserve.

In this gas field, as 3D seismic data is acquired in 2010-2011 using ADB funds, a more precise reserve assessment can be expected in the future.

**Table 3.1.14 Rashidpur field - Comparison of reserve estimation 2003 & 2010**

| | Method | GIIP | | | RF | URR |
|---|---|---|---|---|---|---|
| | | P1+P2 | P3 | P1+P2+P3 | % | |
| 2003 Estimation | Volmetric | 2.002 | 1.000 | 3.002 | 70.0% | 1.401 |
| 2010 Estimation | | 3.887 | 0.949 | 4.836 | 80.6% | 3.134 |

- Kailash Tila

  In the 2003 assessment, maps and various parameters were reviewed for re-estimation and the reserve was estimated by the volumetric method with probability distribution. P/z and material balance estimates were also carried out for upper, lower and middle gas sand. These were more than double the volumetric estimate. The most likely reason for such difference in result could be aquifer support, but it was difficult to draw any conclusion. It is necessary to add pressure and production data to confirm the drive mechanism of the reservoir.

  In the 2010 assessment, the increase in reserve is thought to be from much of the possible reserve in 2003 assessment being upgraded to proved reserve using additional pressure and production data, and the drive mechanism is interpreted as depletion or gas expansion type, so a high recovery factor of 83% is used to estimate recoverable reserve.

  In this field, as 3D seismic data is acquired in 2011 using ADB funds, a more precise reserve assessment can be expected in the future.

**Table 3.1.15 Kailashtilla field-Comparison of reserve estimation 2003 & 2010**

| | Method | GIIP | | | RF | URR |
|---|---|---|---|---|---|---|
| | | P1+P2 | P3 | P1+P2+P3 | % | |
| 2003 Estimation | Volmetric | 2.720 | 1.297 | 4.017 | 70.0% | 1.904 |
| 2010 Estimation | | 3.463 | 0.305 | 3.768 | 83.2% | 2.880 |

- Habiganj

  In the 2003 assessment, GIIP of the Upper Gas Sand was estimated to be 5.1TCF by MBAL (material balance method) and was interpreted as strong water drive.

  In the 2010 assessment, although the details are unknown, it seems to be re-evaluated using new additional pressure data. GIIP of the Upper Gas Sand is estimated to be 3.8TCF, and has decreased by about 1.3TCF. This is close to the reserve of 3.63TCF estimated by the IKM study (1991). In addition, considering the strong water drive the recovery factor of 70% is used, which is lower than the recovery factor used in 2003.

**Table 3.1.16 Habiganj field - Comparison of reserve estimation 2003 & 2010**

| | Method | GIIP | | | RF | URR |
|---|---|---|---|---|---|---|
| | | P1+P2 | P3 | P1+P2+P3 | % | |
| 2003 Estimation | MBAL | 5.100 | | 5.100 | 75.0% | 3.825 |
| | *IKM | 0.039 | | 0.039 | 75.0% | 0.027 |
| 2010 Estimation | | 3.756 | 0.600 | 4.356 | 70.0% | 2.630 |
| | | 0.225 | | 0.225 | 70.0% | 0.157 |

*IKM : IKM study

(2) Undiscovered gas resource

In 2001 the United States Geological Survey (USGS) and Petrobangla conducted a joint study to assess the undiscovered gas resources of Bangladesh. The methodology has been used in assessments throughout the world, and the results are reliable.

The joint team classified Bangladesh into six units by taking into account the geological conditions, and assessed the undiscovered gas resources based on probability methods (Figure 3.1.4). In this method, geologic risk probabilities are determined for source rocks, reservoir rocks, traps, and timing of gas migration. These probabilities are multiplied to determine geologic risk for a supposed accumulation of gas and then generate probabilistic forecasts of the undiscovered gas resources of the area.

Mean (probability 95%) of the undiscovered gas resource in Bangladesh are 32.1 TCF (8.4 TCF), and the breakdown is 23.3 TCF (6.0 TCF) onshore, and 8.8 TCF (2.4 TCF) offshore to 200m water depth. Within the six units, Moderately Folded Anticline of 19.0 TCF (6.1 TCF) has the most potential, and then the Surma basin of 8.1 TCF (1.8 TCF) is in the second position. The Easternmost Extremely Folded Belt, Western Shelf and Western Platform have lower ratings.

The resource numbers calculated indicate the range of probable resources that may be discovered if Bangladesh were actively explored during the 30-year time frame after 2001. However, there have been few new exploration wells established in the country, particularly after 2000 (Figure 3.1.5). To increase gas reserve by new discoveries in Bangladesh, it is considered that more active exploration work including seismic data acquisition, will be needed in the future.

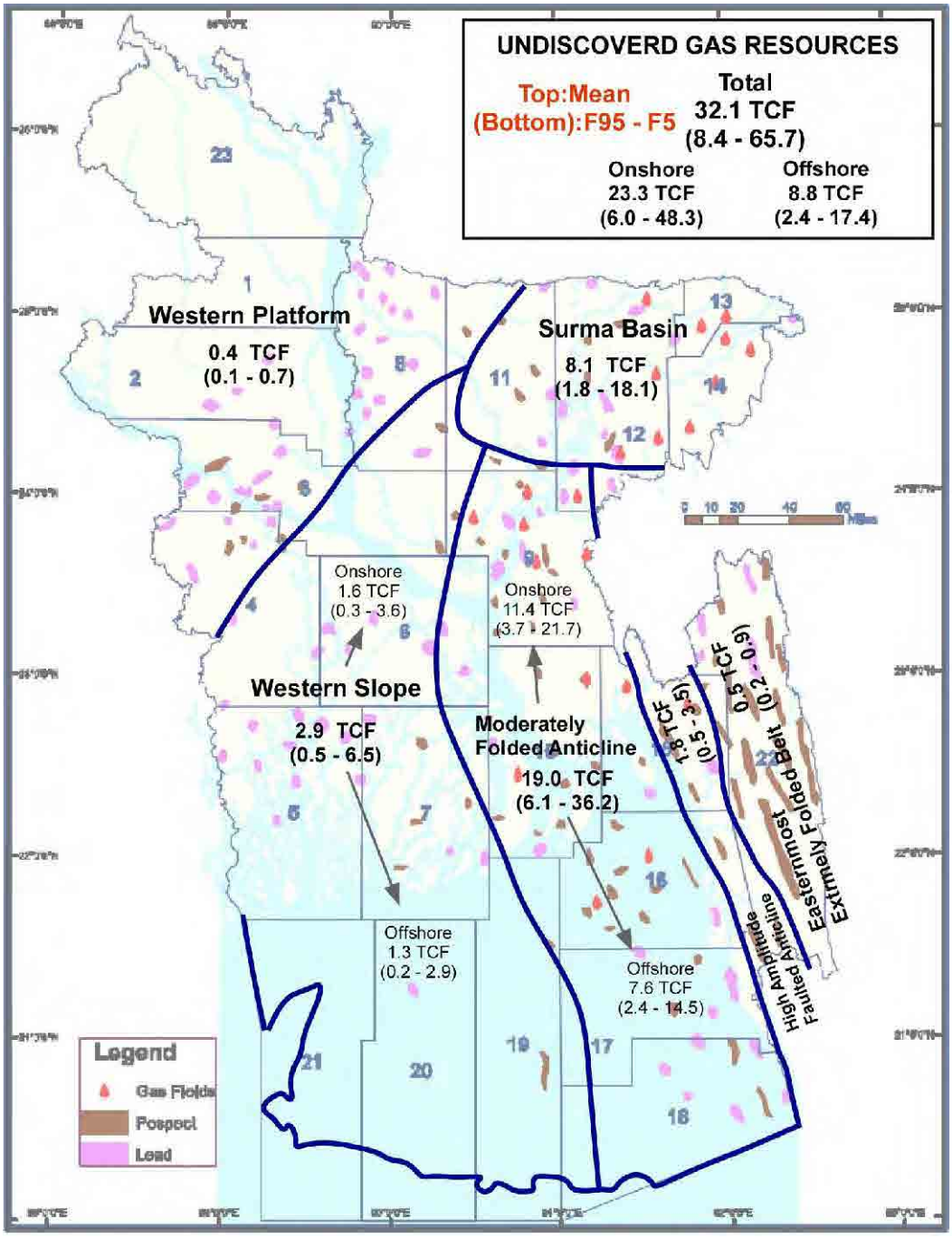



**Figure 3.1.17 Undiscovered gas resources reported by USGS/Petrobangla**

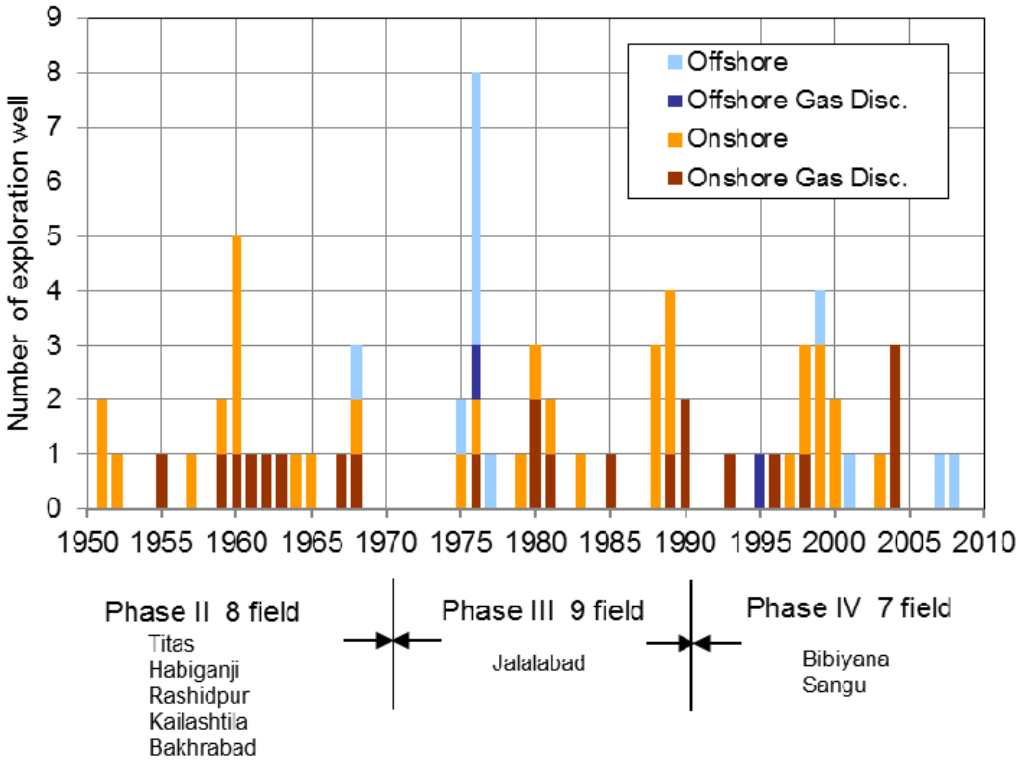



**Figure 3.1.18 Number of exploration wells in Bangladesh (1950-2008)**

### 3.1.5.2 Present State of Natural Gas Production

Present state of natural Gas Production in Bangladesh from three state-owned gas production companies (BGFCL, SGFL, BAPEX) and four International Oil Companies or IOCs (Chevron, Tullow, Santos and Niko) is shown in Table 3.1.17 below.

**Table 3.1.17 Natural Gas Production in FY2009-10**

| Company | Name of Gas Fields | Total Wells | Flowing Wells (no) | Production (Ave, Daily MMCFD) | Production (Yearly BCF) |
|---|---|---|---|---|---|
| **Petrobangla Fields:** | | | | | |
| **BGFCL** | Titas | 16 | 14 | 404.3 | 147.6 |
| | Habiganj | 11 | 9 | 235.0 | 85.8 |
| | Bakhrabad | 8 | 4 | 35.2 | 12.9 |
| | Narshingdi | 2 | 2 | 33.0 | 12.1 |
| | Meghna | 1 | 1 | 0.0 | 0.0 |
| | **Sub-Total** | **38** | **30** | **707.6** | **258.3** |
| **SGFL** | Sylhet | 3 | 1 | 3.1 | 1.1 |
| | Kailashtila | 6 | 6 | 90.5 | 33.0 |
| | Rashidpur | 7 | 5 | 48.6 | 17.7 |
| | Beanibazar | 2 | 2 | 14.8 | 5.4 |
| | **Sub-Total** | **18** | **14** | **156.9** | **57.3** |
| **BAPEX** | Saldanadi | 2 | 2 | 8.4 | 3.1 |
| | Fenchuganj | 2 | 2 | 24.7 | 9.0 |
| | Shahbazpur | 2 | 1 | 5.6 | 2.1 |
| | **Sub-Total** | **6** | **5** | **38.7** | **14.1** |
| **Petrobangla Total Production** | | **62** | **49** | **903.2** | **329.7** |
| **IOC Fields :** | | | | | |
| **Santos** | Sangu (Existing) | 7 | 6 | 36.7 | 13.4 |
| **Chevron** | Jalalabad | 4 | 4 | 162.9 | 59.5 |
| | Moulavibazar | 5 | 4 | 58.4 | 21.3 |
| | Bibiyana | 12 | 12 | 658.0 | 240.4 |
| | **Sub-Total** | **21** | **20** | **879.3** | **320.9** |
| **Niko** | Feni | 5 | 1 | 1.7 | 0.6 |
| **Tullow** | Bangura | 6 | 4 | 105.1 | 38.4 |
| **IOC Total Productionj** | | **39** | **31** | **1,022.8** | **373.3** |
| **Total (Petrobangla + IOC)** | | **101** | **79** | **1,926.0** | **703.0** |

Source: Petrobangla Annual Report 2010

Latest gas production total at the first week of Dec. 2011 increased up to approx. 2,050 mmcfd since the production from one new developed well was started and work-over jobs were completed on some wells.

### 3.1.5.3 Projections for Natural Gas Production

The survey team forecast natural gas production up to 2030 based on the following data and information collected during the 1st and 2nd survey in Bangladesh.

- Petrobangla's Gas Evacuation Plan 2010-2015
- Latest drilling and work-over plan of SGFL and BAPEX
- Latest production plan of IOCs - Chevron, Tullow and Santos
- Latest information of Gazprom's wells drilling plan
- LNG import plan which is scheduled to commence from 2014

The following gas augmentation plans were excluded from the survey team's forecast of natural gas production due to their uncertainty.

- Gas production from ConocoPhillips deep offshore 2 blocks
- Gas production by Chinese cooperation project by CNPC
- Gas production by SINOPEC and BAPEX joint venture plan

Table 3.1.18 shows gas augmentation plan of each production company till 2015, and Table 3.1.19 shows the Survey team's projections for natural gas production up to 2030.

## Table 3.1.18 Natural Gas Augmentation Plan till 2015

(Unit : MMcfd)

| Sl. No | Wells | Expected Completion | Expected Production | Executing Company | Programme Type | Remarks |
|---|---|---|---|---|---|---|
| **I. Mid Term Program - Up to Dec, 2013** | | | | | | |
| **A. Petrobangla Company** | | | | | | |
| 1 | Kapasia # 1 | Mar. 2012 | 15 | BAPEX | Exploration | |
| 2 | Shrikali # 2 | April 2012 | 15 | BAPEX | Exploration | |
| 3 | Mubarakpur # 1 | Dec. 2013 | 15 | BAPEX | Exploration | |
| 4 | Shalda # 4 | May 2013 | 15 | BAPEX | Appr./Dev. | |
| 5 | Fenchuganj # 5 | Jan. 2013 | 20 | BAPEX | Appr./Dev. | |
| 6 | Titas # 17 | Sept. 2012 | 25 | BAPEX | Appr./Dev. | |
| 7 | Titas # 18 | Jan. 2013 | 25 | BGFCL | Appr./Dev. | |
| 8 | Bakhrabad # 9 | Apr. 12 | 20 | BGFCL | Development | |
| 9 | Titas # 19, 20, 21, 22 | Jun. 12 | 100 | BGFCL | Development | **Fast Track (Drilled by Gazprom)** |
| 10 | Rashidpur # 8 | Jun. 12 | 20 | SGFL | Development | **Fast Track (Drilled by Gazprom)** |
| | | | | | | |
| **B. IOCs** | | | | | | |
| 1 | Moulvibazar | Jun. 12 | 100 | Chevron | Development | |
| 2 | Kajol | - | - | Chevron | Exploration | |
| 3 | Bibiyana | Dec. 13 | 200 | Chevron | Development | |
| 4 | Mognama | - | - | Santos | Exploration | |
| | | | | | | |
| **II. Long Term Program (2015)** | | | | | | |
| | | | | | | |
| **A. Petrobangla Companies** | | | | | | |
| 1 | Titas # 23, 24, 25 &26 | 2015 | 100 | BGFCL | Appraisal | |
| 2 | Sylhet, Kailashitilla & Rashidpur | 2015 | 80 | SGFL | Appraisal | |
| | | | | | | |
| **B. IOCs** | | | | | | |
| 1 | Mognama | - | - | Cairn | Development | |
| 2 | Kajol | - | - | Chevron | Development | |
| 3 | Moulavibazar | 2015 | 250 | Chevron | Development | |
| 4 | Bibiyana | 2015 | 250 | Chevron | Development | |
| 5 | Jalalabad | 2015 | 250 | Chevron | Development | |
| 6 | Offshore bidding round 2008 | 2015 | 200 | Chevron | Exploration | |
| | | | | | | |
| **III. Gazprom Drilling Program (Gazprom will drill 10 wells - with turn key contract)** | | | | | | |
| | Shahbazpur 3, 4 | | | | | **Drilled by Gazprom** |
| | Begumganj 3 | | | | | **Drilled by Gazprom** |
| | Semutang 6 | | | | | **Drilled by Gazprom** |
| | Shrikial 3 | | | | | **Drilled by Gazprom** |
| | | | | | | |

**Table 3.1.19 Projections for Natural Gas Production up to 2030**

[MMcfd]

| Year | Gas Evacuation Report (2010-2015) | | Prospect by Study Team | |
|---|---|---|---|---|
| | Petrobangla | IOCs | Petrobangla | IOCs |
| 2011 | 1,185 | 1,308 | 1,140 | 1,128 |
| 2012 | *1,840 | 1,448 | 1,390 | 1,498 |
| 2013 | 1,840 | 1,548 | 1,520 | 1,798 |
| 2014 | 1,850 | 1,848 | * 2,065 | 2,051 |
| 2015 | 2,020 | 2,298 | 2,115 | 2,248 |
| 2016 | No prospect in Gas Evacuation Report | | 2,380 | 2,538 |
| 2017 | | | 2,422 | 2,362 |
| 2018 | | | 2,439 | 2,004 |
| 2019 | | | 2,384 | 1,688 |
| 2020 | | | 2,341 | 1,446 |
| 2021 | | | 2,268 | 1,177 |
| 2022 | | | 2,132 | 986 |
| 2023 | | | 2,014 | 833 |
| 2024 | | | 1,908 | 653 |
| 2025 | | | 1,727 | 557 |
| 2026 | | | 1,574 | 437 |
| 2027 | | | 1,457 | 281 |
| 2028 | | | 1,178 | 258 |
| 2029 | | | 1,109 | 254 |
| 2030 | | | 1,061 | 251 |

*Import LNG (500 mmcfd) included from this year

### 3.1.5.4 Import of Natural Gas

(1) LNG (Liquefied Natural Gas)

Bangladesh government has decided to import 4 million tons (equivalent of 500 mmcfd) of LNG annually. The present state of the facilities to be constructed for LNG import are as follows:

- LNG Re-gasification and Storage Facilities

  LNG re-gasification and storage facilities will be constructed offshore of Moheshkhali by the end of 2013 and World Bank assists in the consulting service for the construction of this re-gasification facility.

  The floating re-gasification terminal will be built with BOOT or BOT and located about 1.5 kilometers from Moheshkhali Island in the Bay of Bengal. Petrobangla signed an agreement with the Australian consulting firm "Poten & Partners" to facilitate the implementation of the project.

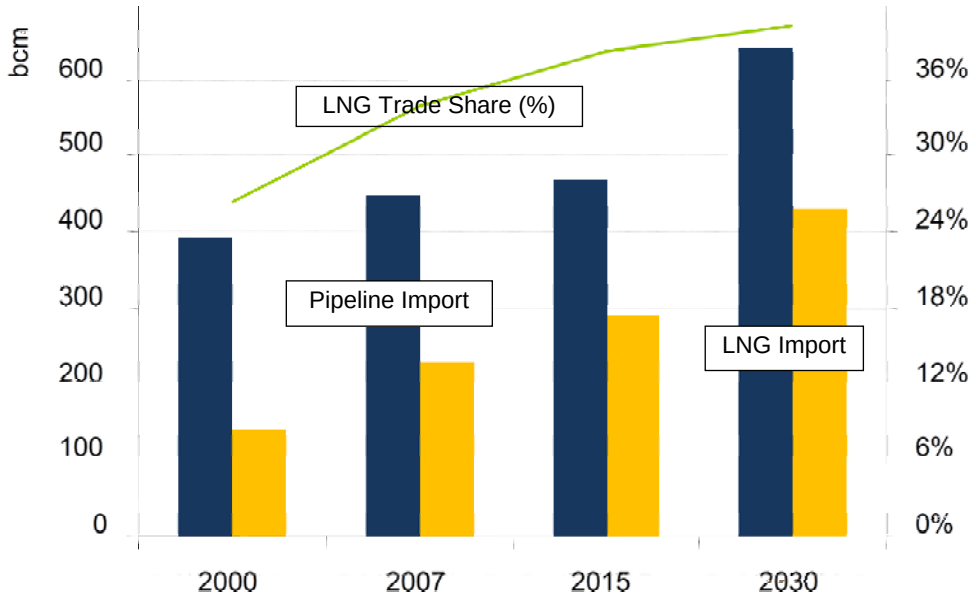
  The terminal will have facilities for berthing and mooring of LNG ships with a capacity of 138,000 to 260,000 m3 and for a LNG storage and re-gasification plant.

  Petrobangla has signed a memorandum of understanding (MOU) to import 4 million tones of LNG annually from Qatar Petroleum in 2010.

  However, latest international LNG spot market price (Japanese spot LNG) per MMBTU (equal to Mcf) is US$ 17~18/Mcf against Petrobangla's purchasing gas price from IOCs is approx. US$ 2.7/Mcf.

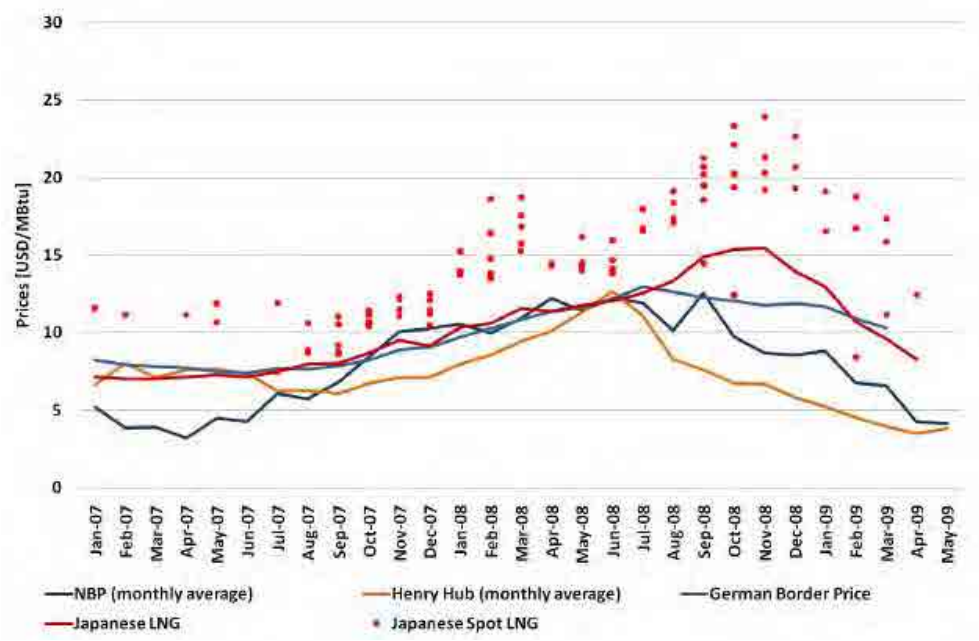
  The question comes to how the GOB can fill the gap of over US$ 15 for each Mcf of gas.

  Figure 3.1.19 shows LNG demand projection till 2030 in the world, and Figure 3.1.20 shows recent gas price per MMBTU in USA and Europa by gas pipeline and LNG spot market price to Japan.




Source : IEA World Energy Outlook 2009

**Figure 3.1.19 Natural Gas Demand Projection till 2010 in the world**




Data : IEA World Energy Outlook 2011

**Figure 3.1.20 LNG Sport Market Price in USA, Europe and Japan**

- Gas Pipeline for LNG project

  A gas pipeline (30"OD, 91 km long, 550 mmcfd) between the said LNG terminal and Anowara, the connection point to the existing gas pipeline network, is under construction and will be completed by the end of 2013 with Bangladesh's own funds.

(2) Natural Gas Import from Neighboring Countries by Pipeline

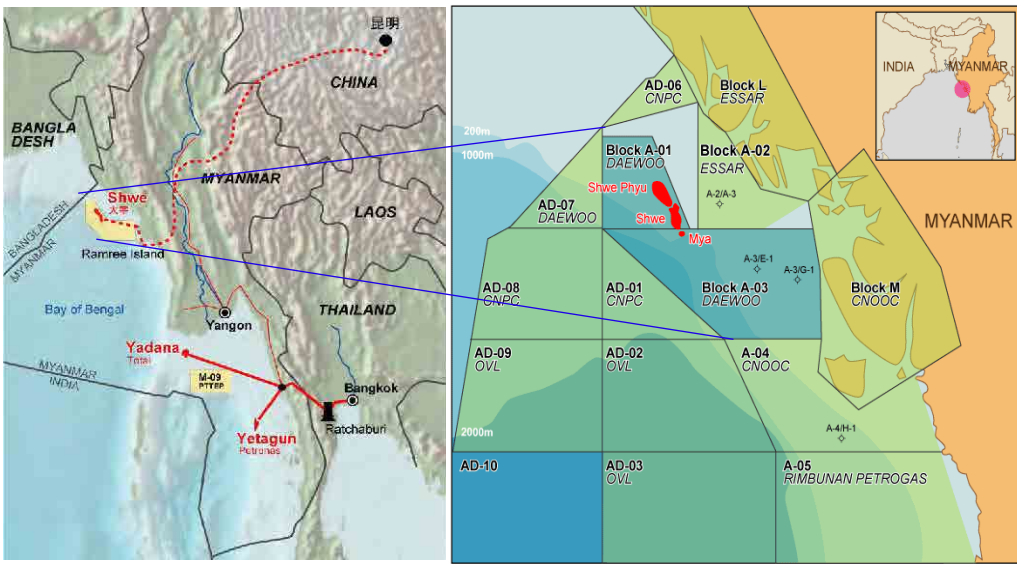
There is no concrete plan to import natural gas from neighboring countries through international pipelines. However the recent U.S and Bangladeshi officials visit to Myanmar may change the gas import scenario.

Gas import from Myanmar – At the beginning of December 2011, the U.S. Secretary of State made historic visit to Myanmar for the first time in half a century. The Bangladesh Prime Minister also made an official visit to Myanmar a few days after the U.S. visit. Both countries discussed territorial issues and made a deal to purchase of gas by Bangladesh, if new gas field discoveries are made in Myanmar waters.

Three gas fields in the Shwe area in the north-western sea of Myanmar were discovered in 2006 by PSC with Korean Daewoo and they have proved the reserve of

4.5~7.7 TCF and are scheduled to export this gas to Yunnan province in China through a 800km pipeline by 2013.

Figure 3.1.21 shows the gas development projects in Myanmar near Bangladesh border.




Gas development project in Burma　　Shwe gas fields and gas development blocks

Data : JOGMEC Oil and Natural Gas Review 2008/6/2

**Figure 3.1.21 Gas Development Project in Myanmar near Bangladesh Border**

## 3.1.6 Natural Gas Transmission

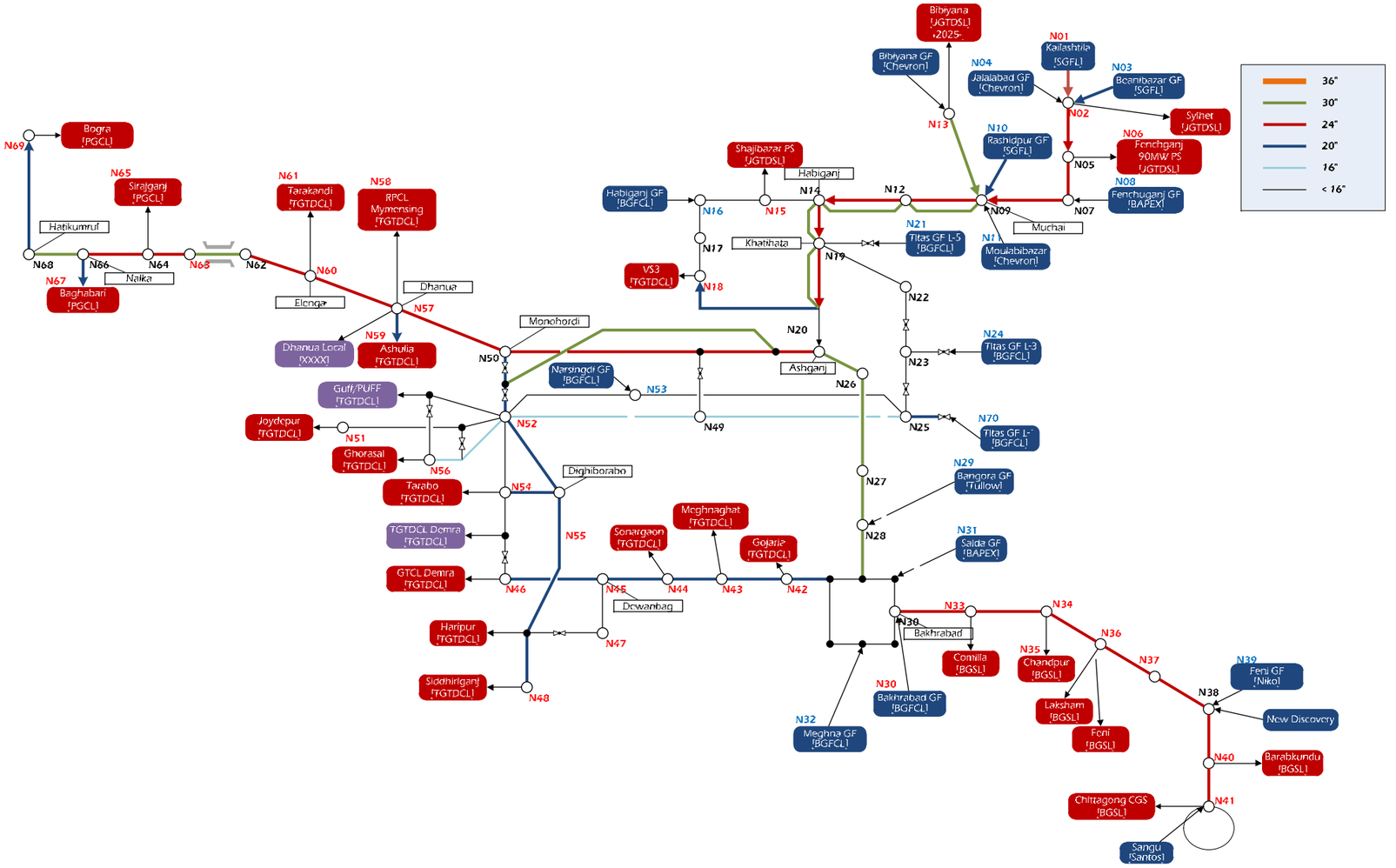
The Survey team collected the following information regarding the natural gas transmission pipelines in Bangladesh during the 1st survey in Bangladesh, excluding the downstream pipelines for distribution.

(1) Present status of existing gas grid
(2) Progress of gas pipelines under construction
(3) Latest information of planned gas pipelines
(4) Pipeline's specifications, i.e. size, thickness, length, etc.
(5) Incoming gas flow rate and pressure to gas grid
(6) Outgoing gas flow rate and pressure from gas grid

### 3.1.6.1 Present Status of Existing Gas Grid

Figure 3.1.22 shows the natural gas transmission pipeline system in Bangladesh, and Figure 3.1.23 shows the Bangladesh natural gas transmission pipeline network diagram.


**Figure 3.1.22 Bangladesh Gas Transmission Pipeline System**




**Pipeline Network Diagram**

Present (at 2011)

**Figure 3.1.23 Bangladesh Natural Gas Transmission Pipeline Network Diagram**

These figures indicate that there are many gas fields around the north-east part of Bangladesh, and the gas transmission system around the west and south-west part is inadequate to supply natural gas. Also the present system does not have enough redundancy and there are no compressors to allow the system to operate at peak load capacity.

### 3.1.6.2 Upcoming Pipelines

Gas transmission pipeline system improvements and subsequent expansions are under execution and planned. Table 3.1.20 shows the system improvement projects under execution and Table 3.1.21 shows planned projects.

**Table 3.1.20 System Improvement Projects Under Construction**

| | List of Projects | Description | Start | End | Fund |
|---|---|---|---|---|---|
| U1 | Monohordi - Dhanua Pipeline, Elenga - East Bank of Jamuna Bridge Pipeline | 37 km (Monohordi - Dhanua), 14 km (Elenga - East Bank of Jamuna Bridge), 30 inch. | 2006 | 2012 | ADB |
| U2 | Compressor at Ashuganj and Elenga | | 2011 | 2014 | ADB |
| U3 | Compressor Stations at Muchai | | 2006 | 2012 | PSC Fund |
| U4 | Hatikumrul-Ishwardi- Bheramara Pipeline | 87 km, 30 inch | 2006 | 2012 | ADB |
| U5 | Bonpara-Rajshahi Pipeline | 53 km, 12 inch | 2006 | 2012 | ADB |
| U6 | Bheremara-Khulna Pipeline | 165 km, 20 inch | 2007 | 2013 | ADB |
| U7 | Bakhrabad-Siddhirganj Pipeline | 60 km, 30 inch | 2007 | 2013 | IDA |
| U8 | Ashuganj - Bakrabad Pipeline | 60 km, 30 inch | 2011 | 2013 | GoB/ GTCL |
| U9 | Titas Gas Field to A-B Pipeline | 8 km, 24 inch | 2010 | 2012 | GTCL |
| U10 | Bibiyana - Dhanua Pipeline | 138 km, 36 inch | 2011 | 2013 | GoB/ GTCL |
| U11 | Maheshkali - Anowara Pipeline | 91 km, 30 inch | 2011 | 2012 | GoB/ GTCL |

Source: GTCL

**Table 3.1.21 Planned Projects**

| | List of Projects | Description | Start | End | Fund |
|---|---|---|---|---|---|
| P1 | Langalband (Narayanganj) - Mawa pipeline. | 40 km, 30 inch | 2011 | 2014 | - |
| P2 | Pipeline along Padma Bridge | 20km, 30 inch | 2010 | 2013 | - |
| P3 | Bakhrabad - Feni pipeline. | 91 km, 30 inch | 2013 | 2017 | - |
| P4 | Zajira - Khulna pipeline. | 110km, 30 inch | 2013 | 2017 | - |
| P5 | Bogra - Rangpur pipeline. | 100 km, 20 inch | 2013 | 2016 | - |
| P6 | Feni- Chittagong *1 | Planned in Gas Sector Master Plan 2006 (estimated for gas pipeline network analysis) | | 2025 | - |
| P7 | Dhanua – Elenga | Planned in Gas Sector Master Plan 2006 (estimated for gas pipeline network analysis) | | 2025 | - |
| P8 | West Bank of Jamuna Bridge – Nalka | Planned in Gas Sector Master Plan 2006 (estimated for gas pipeline network analysis) | | 2025 | - |
| P9 | Sunetra – Kishorganj *2 | According to new discovery gas reserve of Sunetra<br>80km, 20” | | | |

*1: This pipeline was assumed to be constructed for gas pipeline network analysis. According to GTCL interview during second survey, this pipeline will be cancelled due to LNG import.

*2: This pipeline is not embedded in the pipeline analysis model, because no information about this line was confirmed during the first survey. But the natural gas production from Sunetra is considered into the gas production demand projection as added to Bibiyana production.

No. U1 and U3 of Table 3.1.20 have started construction. The GTCL Director said that installation of the compressor at Muchai will soon be completed.

GTCL had contracted with Hyundai, Korea for U2 project on 21 October 2011.
According to the GTCL Director, “Bibiyana – Dhanua Pipeline”, No. U10 of Table 3.1.20 is very important for natural gas supply to the western part of the nation. This project will be started as a high priority.
No. U11 of Table 3.1.20, “Maheshkali- Anowara Pipeline” dedicated for LNG transportation is planned between the LNG receiving terminal and the Chittagong area following the Bangladesh LNG import plan to correct the natural gas demand and supply gap

None of the planned projects shown in Table 3.1.21 have any funding.
GTCL acknowledges that the planned projects shown in Table 3.1.21 are necessary for pipeline system improvement. Despite this, these projects have no funding.

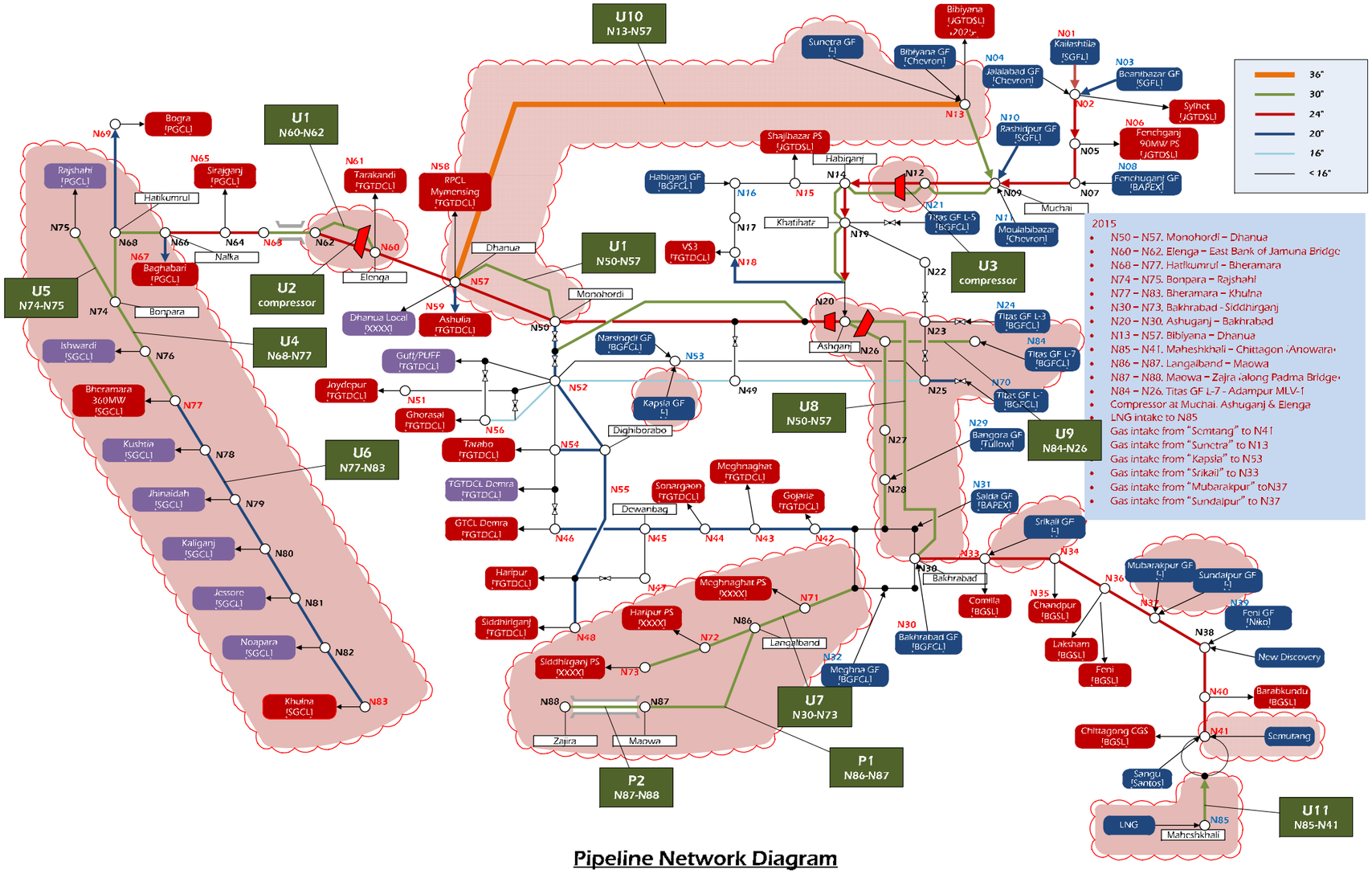
### 3.1.6.3 Gas Pipeline Network Analysis

The Survey team conducted a pipeline network analysis based on the gas supply and demand projections, and the pipeline system improvement plan to evaluate the pipeline network transmission capacity in the future, for 2015, 2020, 2025 and 2030.

JICA requested the Survey team to report the gas supply forecasts for the planned Haripur power plant, planned Bheramara power plant and KAFCO fertilizer factory with consideration of the result of the network analysis in the Interim Report, which would be issued in the middle of October, in spite of short duration after the data collection during the 1st Survey in Bangladesh (3rd Sep. – 23rd Sep.). Therefore this network analysis would be conducted with use of application software developed by Osaka Gas Engineering and minor model adjustment which was used for the “Power System Master Plan 2010 (PSMP 2010)”.

(1) Input data for gas pipeline network analysis
The Survey team transmitted the following data to Osaka Gas Engineering for gas pipeline network analysis.

1) Gas pipeline network model
Figure 3.1.24to Figure 3.1.27 show the gas pipeline network models indicating planned pipeline expansion projects.

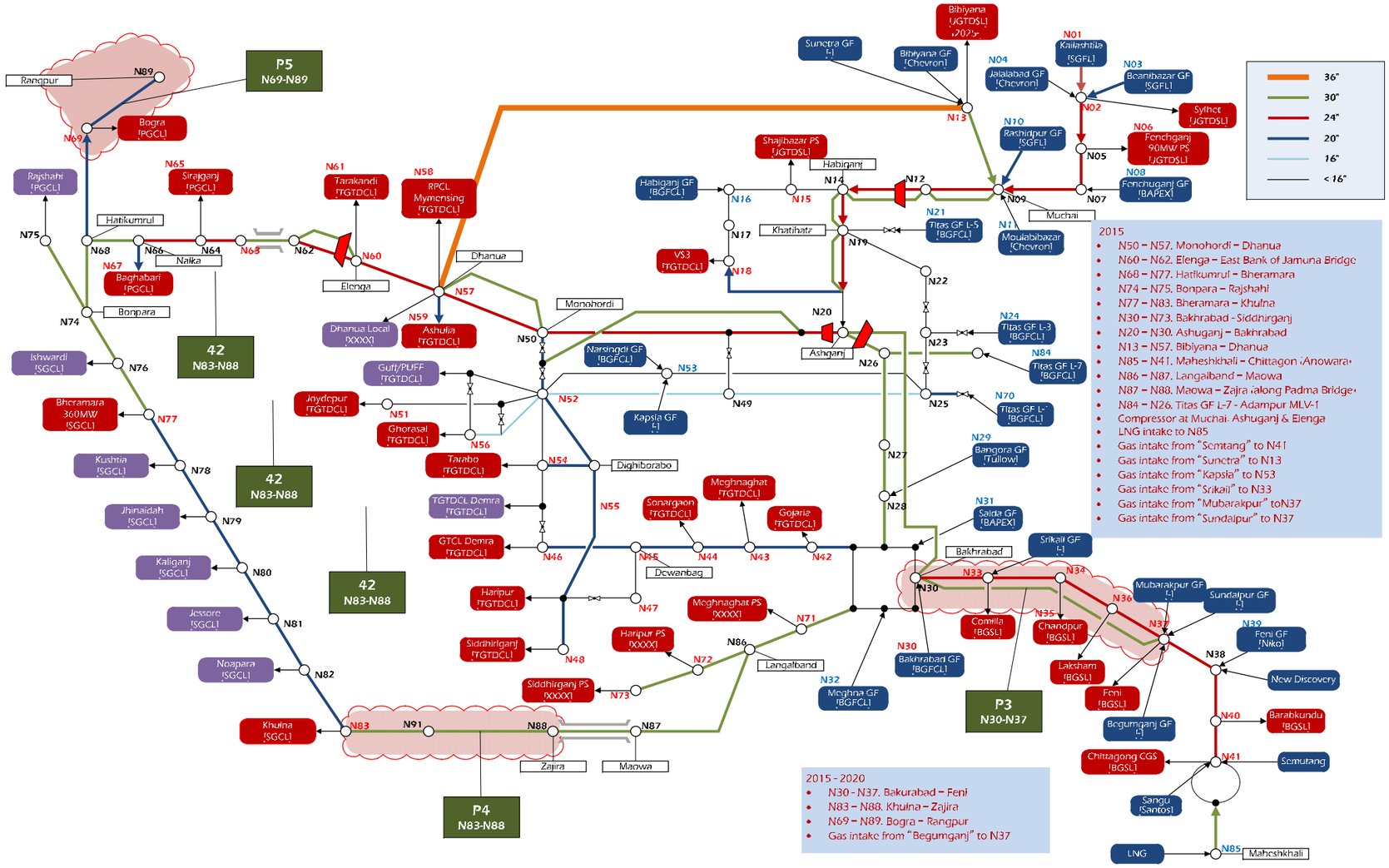



2015
- N50 – N57. Monohordi – Dhanua
- N60 – N62. Elenga – East Bank of Jamuna Bridge
- N68 – N77. Hatikumrul – Bheramara
- N74 – N75. Bonpara – Rajshahi
- N77 – N83. Bheramara – Khulna
- N30 – N73. Bakhrabad - Siddhirganj
- N20 – N30. Ashuganj – Bakhrabad
- N13 – N57. Bibiyana – Dhanua
- N85 – N41. Maheshkhali – Chittagon (Anowara)
- N86 – N87. Langalband – Maowa
- N87 – N88. Maowa – Zajira (along Padma Bridge)
- N84 – N26. Titas GF L-7 - Adampur MLV-1
- Compressor at Muchai: Ashuganj & Elenga
- LNG intake to N85
- Gas intake from "Semtang" to N41
- Gas intake from "Sunetra" to N13
- Gas intake from "Kapsia" to N53
- Gas intake from "Srikail" to N33
- Gas intake from "Mubarakpur" toN37
- Gas intake from "Sundalpur" to N37

**Pipeline Network Diagram**

Planned at 2015

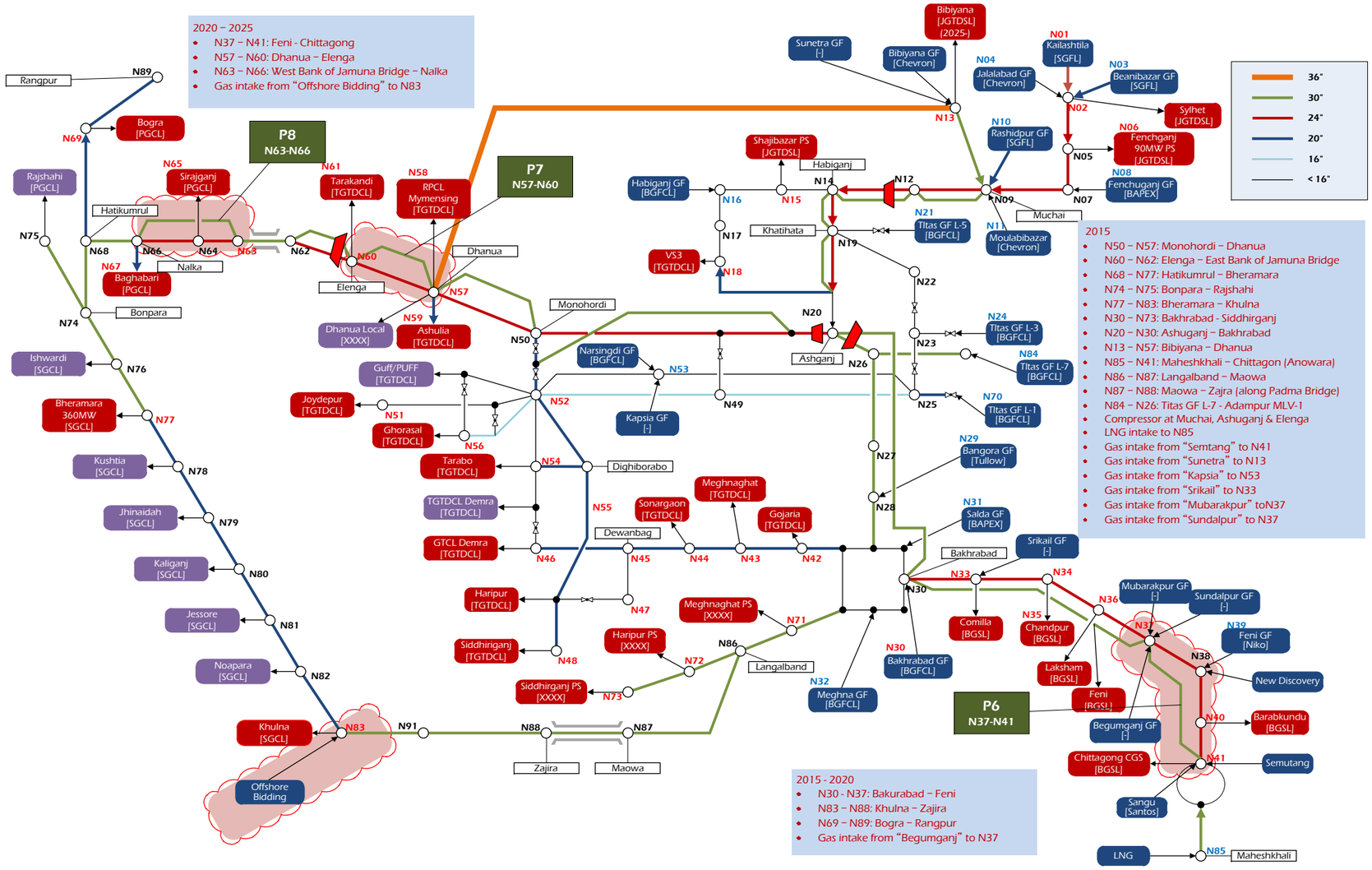
**Figure 3.1.24 – FY 2015**




**Pipeline Network Diagram**

**Planned at 2020**

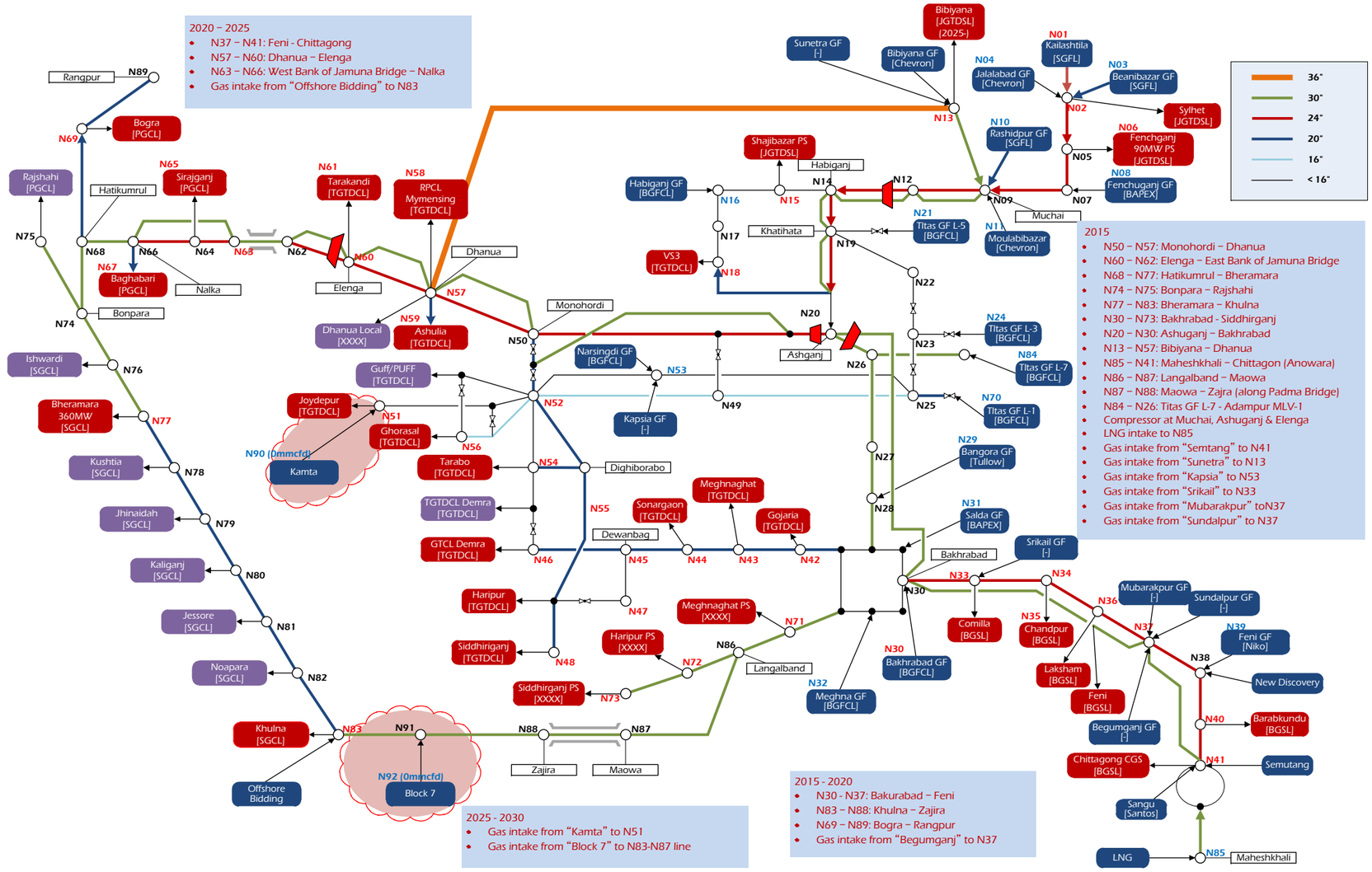
**Figure 3.1.25 – FY 2020**




**Pipeline Network Diagram**

**Planned at 2025**

**Figure 3.1.26 – FY 2025**




**Pipeline Network Diagram**

**Planned at 2030**

**Figure 3.1.27 – FY 2030**

2) Gas supply and demand forecast

Gas supply and demand forecast applied for the gas pipeline network analysis is based on the following assumptions.

a) Off-grid gas adjustment

Total gas flow volume into the pipeline network is determined by subtracting the off-grid gas volume from the total gas production volume. We used off-grid gas volume from 2011 to 2015 as it is described in the "Gas Evacuation Plan 2010-2015". Off-grid gas volume in 2016 or later is assumed to be 8% of total gas production volume.

b) Excess of supply adjustment between 2012 to 2018

Gas production between 2012 and 2018 will exceed the demand. On the other hand, gas supply will rapidly decline in 2019 and later. Excess of gas supply between 2012 and 2018 is adjusted to cover the short supply in 2019 or later.

c) Demand upper limit

We assumed that the government of Bangladesh will apply a gas demand restriction in 2019 or later when the gas supply-demand gap will start to expand. According to this scenario, gas demand will be limited to 4,500 mmcfd in 2019 and later.

Figure 3.1.28 shows the gas supply and demand adjustment.

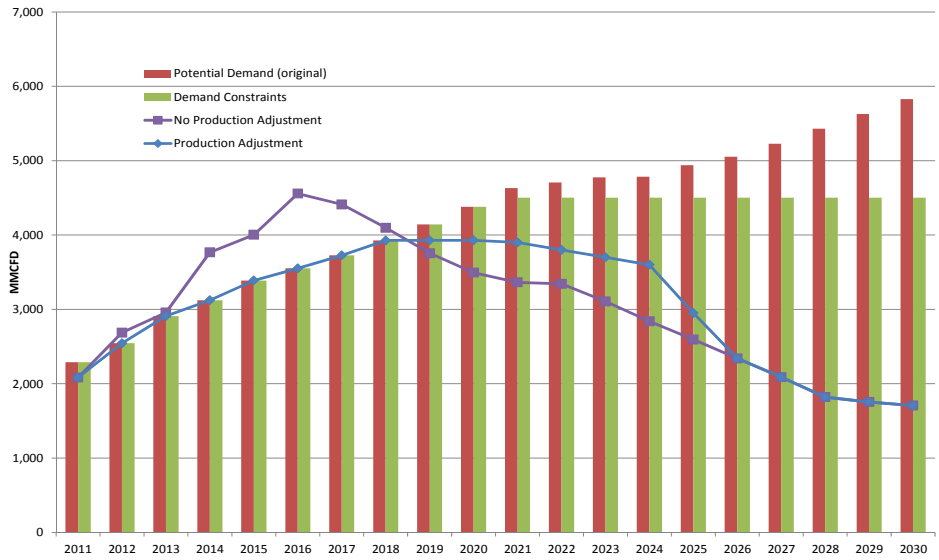



**Figure 3.1.28 Long Term Gas Production & Demand Forecast（2011～2030）**

Table 3.1.22 shows the input data for the pipeline network analysis.

**Table 3.1.22 Gas Supply & Demand Forecast**

(MMCFD)

| Node | IN/ OUT | Name | Company Area | 2015 | 2020 | 2025 | 2030 |
|---|---|---|---|---|---|---|---|
| 1 | IN | Kailashtila Gas Field | SGFL | 39.22 | 239.78 | 154.74 | 34.06 |
| 2 | OUT | Sylhet | JGTDSL | 50.80 | 72.80 | 71.20 | 71.20 |
| 3 | IN | Beanibazar Gas Field | SGFL | 16.00 | 16.00 | 0.00 | 0.00 |
| 4 | IN | Jalalabad Gas Field | - | 280.00 | 155.65 | 51.00 | 0.00 |
| 5 | - | VS-E Fenchuganj | - | | | | |
| 6 | OUT | Fenchganj PS | JGTDSL | 86.48 | 88.52 | 91.20 | 99.60 |
| 7 | OUT | Uttarbag | JGTDSL | 5.32 | 8.56 | 10.33 | 11.83 |
| 8 | IN | Fenchganj Gas Field | BAPEX | 85.00 | 30.00 | 0.00 | 0.00 |
| 9 | - | - | - | | | | |
| 10 | IN | Rashidpur Gas Field | SGFL | 46.29 | 483.26 | 463.67 | 101.77 |
| 11 | IN | Moulabibazar Gas Field | Chevron | 360.00 | 207.46 | 0.00 | 0.00 |
| 12 | - | Muchai | - | | | | |
| 13 | IN | Bibiyana Gas Field | - | 1,124.07 | 931.30 | 456.86 | 289.93 |
| 13 | OUT | Bibiyana | JGTDSL | 160.80 | 160.80 | 225.40 | 211.80 |
| 14 | - | Hobiganj | GTCL | | | | |
| 15 | OUT | Shahjibazar PS | JGTDSL | 116.80 | 135.77 | 105.35 | 114.19 |
| 16 | IN | Hobiganj Gas Field | BGFCL | 83.57 | 206.73 | 72.70 | 15.00 |
| 17 | - | - | - | | | | |
| 18 | OUT | VS3 | TGTDCL | 351.16 | 468.19 | 349.65 | 509.74 |
| 19 | - | Khatihata | - | | | | |
| 20 | - | Ashuganj | - | | | | |
| 21 | IN | Titas Gas Field Location 5 | BGFCL | 185.79 | 552.65 | 350.24 | 83.94 |
| 22 | - | - | - | | | | |
| 23 | - | - | - | | | | |
| 24 | IN | Titas Gas Field Location 3 | BGFCL | 0.00 | 0.00 | 0.00 | 0.00 |
| 25 | - | Ghatura | TGTDCL | | | | |

| Node | IN/ OUT | Name | Company Area | 2015 | 2020 | 2025 | 2030 |
|---|---|---|---|---|---|---|---|
| 26 | - | Adampur MLV-1 | - | | | | |
| 27 | - | - | - | | | | |
| 28 | - | - | - | | | | |
| 29 | IN | Bangora Gas Field | Tullow | 120.00 | 64.00 | 20.97 | 6.87 |
| 30 | IN | Bakhrabad Gas Field | BGFCL | 56.00 | 100.00 | 100.00 | 0.00 |
| 31 | IN | Salda Gas Field | BAPEX | 53.00 | 30.00 | 5.00 | 0.00 |
| 32 | IN | Meghna Gas Field | BGFCL | 10.00 | 10.00 | 3.28 | 0.00 |
| 33 | IN | Srikail | - | 15.00 | 15.00 | 4.92 | 1.61 |
| 33 | OUT | Comilla | BGSL | 19.20 | 19.20 | 0.00 | 0.00 |
| 34 | OUT | Bijra | BGSL | 18.40 | 18.40 | 18.40 | 18.40 |
| 35 | OUT | Chandpur | BGSL | 0.00 | 0.00 | 0.00 | 0.00 |
| 36 | OUT | Laksham | BGSL | 0.00 | 0.00 | 0.00 | 0.00 |
| 37 | IN | Feni | - | 30.00 | 40.00 | 19.83 | 13.22 |
| 37 | OUT | Feni | BGSL | 20.81 | 29.83 | 27.14 | 30.05 |
| 38 | - | - | - | | | | |
| 39 | IN | Feni Gas Field | Niko | 2.00 | 2.00 | 0.00 | 0.00 |
| 40 | OUT | Barabkundu | BGSL | 208.36 | 336.32 | 384.93 | 426.23 |
| 41 | IN | Chittagon City Gate Station | - | 185.00 | 185.00 | 158.62 | 108.95 |
| 41 | OUT | Chittagon City Gate Station | BGSL | 239.80 | 239.80 | 229.40 | 143.00 |
| 42 | OUT | Gojaria | TGTDCL | 0.00 | 0.00 | 0.00 | 0.00 |
| 43 | OUT | Meghnaghat | TGTDCL | 147.49 | 199.20 | 259.02 | 248.90 |
| 44 | OUT | Sonargaon | TGTDCL | 0.00 | 0.00 | 0.00 | 0.00 |
| 45 | OUT | Dewanbag | TGTDCL | 50.40 | 50.40 | 50.40 | 0.00 |
| 46 | OUT | GTCL Demra | TGTDCL | 171.98 | 283.87 | 305.13 | 317.84 |
| 47 | OUT | Haripur | TGTDCL | 298.50 | 492.69 | 529.58 | 551.64 |
| 48 | OUT | Siddhiriganj | TGTDCL | 31.20 | 31.20 | 31.20 | 35.00 |
| 49 | - | Doulatkandi | TGTDCL | | | | |
| 50 | OUT | Monohordi | TGTDCL | 4.80 | 4.80 | 0.00 | 0.00 |
| 51 | OUT | Joydepur | TGTDCL | 0.00 | 0.00 | 0.00 | 0.00 |
| 52 | OUT | - | TGTDCL | 15.02 | 24.80 | 26.65 | 27.76 |

| Node | IN/ OUT | Name | Company Area | 2015 | 2020 | 2025 | 2030 |
|---|---|---|---|---|---|---|---|
| 53 | IN | Narsingdi Gas Field | - | 48.00 | 41.73 | 20.70 | 10.93 |
| 54 | OUT | Tarabo | TGTDCL | 8.29 | 9.52 | 3.36 | 3.50 |
| 55 | OUT | Dighiborabo | TGTDCL | 0.00 | 0.00 | 0.00 | 0.00 |
| 56 | OUT | Ghorasal | TGTDCL | 356.64 | 405.78 | 417.77 | 252.94 |
| 57 | OUT | Dhanua | TGTDCL | 51.40 | 6.40 | 0.00 | 0.00 |
| 58 | OUT | RPCL Mymensing | TGTDCL | 26.40 | 26.40 | 26.40 | 0.00 |
| 59 | OUT | Ashulia | TGTDCL | 486.37 | 773.13 | 827.61 | 860.18 |
| 60 | OUT | Elenga | TGTDCL | 4.00 | 4.00 | 0.00 | 0.00 |
| 61 | OUT | Tarakandi | TGTDCL | 45.00 | 45.00 | 45.00 | 45.00 |
| 62 | - | East Bank of Jamuna Bridge | - | | | | |
| 63 | OUT | West Bank of Jamuna Bridge | PGCL | 36.43 | 83.55 | 85.34 | 137.87 |
| 64 | - | Kodda | PGCL | | | | |
| 65 | OUT | Sirajganj | PGCL | 5.23 | 8.35 | 55.14 | 56.67 |
| 66 | - | Nalka | - | | | | |
| 67 | OUT | Baghabari | PGCL | 66.83 | 35.55 | 10.14 | 11.67 |
| 68 | - | Hatikumrul | - | | | | |
| 69 | OUT | Bogra | PGCL | 10.03 | 13.15 | 10.14 | 11.67 |
| 70 | IN | Titas Gas Field Location 1 | BGFCL | 0.00 | 0.00 | 0.00 | 0.00 |
| 71 | OUT | Meghnaghat (future) | TGTDCL | 45.60 | 45.60 | 45.60 | 45.60 |
| 72 | OUT | Haripur (future) | TGTDCL | 54.40 | 54.40 | 54.40 | 54.40 |
| 73 | OUT | Siddhiriganj (future) | TGTDCL | 125.60 | 125.60 | 125.60 | 125.60 |
| 74 | - | Bonpara | SGCL | | | | |
| 75 | OUT | Rajshahi | SGCL | | | | |
| 76 | OUT | Ishwardi | SGCL | | | | |
| 77 | OUT | Bheramara | SGCL | 61.90 | 65.40 | 66.46 | 66.05 |
| 78 | OUT | Kushtia | SGCL | | | | |
| 79 | OUT | Jhinaidah | SGCL | | | | |
| 80 | OUT | Kaliganj | SGCL | | | | |
| 81 | OUT | Jessore | SGCL | | | | |

| Node | IN/ OUT | Name | Company Area | 2015 | 2020 | 2025 | 2030 |
|---|---|---|---|---|---|---|---|
| 82 | OUT | Noapara | SGCL | | | | |
| 83 | OUT | Khulna | SGCL | 7.50 | 11.00 | 12.06 | 11.65 |
| 83 | IN | Khulna | - | 0.00 | 0.00 | 0.00 | 0.00 |
| 84 | IN | Titas Gas Field Location 7 | BGFCL | 150.00 | 117.45 | 69.35 | 40.95 |
| 85 | IN | Maheshkhali | BGFCL | 500.00 | 500.00 | 500.00 | 500.00 |
| 86 | - | Langalband | TGTDCL | | | | |
| 87 | - | Maowa | - | | | | |
| 88 | - | Zajira | - | | | | |
| 89 | - | Rangpur | - | | | | |
| 90 | IN | Kamta | BGFCL | 0.00 | 0.00 | 0.00 | 0.00 |
| 91 | - | | - | | | | |
| 92 | IN | Block 7 | - | 0.00 | 0.00 | 0.00 | 0.00 |
| | | TOTAL | IN | **3,389** | **3,928** | **2,452** | **1,207** |
| | | | OUT | **3,389** | **4,378** | **4,500** | **4,500** |

(2) Results of Pipeline Network Analysis

1) Assumption

The pipeline network model has to be calibrated using actual gas flow and pressures to match the actual network behavior. These actual gas flow and pressures are not available from GTCL. Therefore the data collected in the “Power System Master Plan 2010, JICA” is applied for this analysis.

Maximum gas supply and demand volume is assumed as 1.1 times of the data in Table 3.1.22.

2) Analysis Results

The pipeline network model is divided into the following 4 regions.

Region 1: N60 and downstream

Region 2: between N20 and N60

Region 3: between N12and N20

Region 4: N12 and upstream

a) FY 2015

· Region 1

Discharge pressure, 1000 psig of the compressor installed at N60 declined gradually toward the downstream of the compressor. Minimum pressure of this region stays at more than 780 psig. Therefore the pipeline network in this region can transport a quantity equal to the gas supply and demand forecast.

· Region 2

First calculation predicted reverse flow at N30 (Bakhrabad gas field) due to N29, N30 and N31 configured as pressure constant nodes. Therefore a second calculation configuring N29, N30 and N31 as flow constant nodes derived that the pipeline network can supply gas around region 2 except for N59.

· Region 3

The 1000 psi compressor discharge pressure at N12 decreased to 619 psi toward N20.

· Region 4

All nodes except N06 had more than 1000 psi.

b) FY 2020

· Region 1 and 2

We treat regions 1 and 2 as one region due to the connection of N88 and N83.

The calculations predict insufficient supply pressure at each node of N42 to N48 and N51 to N56 along Bakhrabad through Dewanbagu to Monohordi.

The total gas supply of 3978 mmcfd is insufficient for the total gas demand of 4378 mmcfd. But N29, N30, N31, N32, N37, N39 and N53 configured as supply constant nodes can supply enough gas to maintain the supply-demand balance. Also gas fields around the north-east area produce gas as pressure constant nodes. This means there is a huge pressure drop between the north-east gas fields and Bakhrabad/Monohordi area.

At the same time, the south-west area of N64 and downstream secures sufficient supply pressure.

· Region 3 and 4

Regions 3 and 4 cannot converge due to the fact that region 2, which is downstream of regions 3 and 4, will have trouble to supply gas. But it seems

that the problem will be alleviated by the gas fields concentrated in this area, which can supply gas at high pressure.

c) FY 2025

· Regions 1 and 2
  Calculation results are the same as for FY 2020.
· Regions 3 and 4
  Calculation cannot be executed due to the same reason as for FY2020.

d) FY 2030

· Region 1 and 2
  Calculation results are the same as for FY 2020.
· Regions 3 and 4
  Calculation cannot be executed due to the same reason as for FY2020.

These analysis results are summarized as follows:

· The pipeline network model for FY 2015 predicts that the gas supply for almost all areas will be secure predicated on the compressors to be installed at N29 (Bangora gas field), N31 (Salda gas field) and N30 (Bakhrabad gas field).
· Some gas supply points around Bakhrabad – Dewanbag – Monohordi have insufficient supply pressure problems in FY 2020 and later. The pipeline models of FY 2020 and later have enough capacity to supply gas to the planned new Haripur power plant.
· Calculated pressure around Chittagong is predicted to be slightly high.
· The pipeline network model around the south-west area predicts enough capacity to handle the forecast gas demand around this area.

(3) Conclusion

The pipeline network model predicts that the gas supply will be secure to the planned Bheramara power plant, planned Haripur power plant and KAFCO fertilizer factory in each FY 2015, 2020, 2025 and 2030.

### 3.1.6.4 Regional Gap in Gas Demand & Supply

Natural Gas Production in Bangladesh is concentrated in north-east area. On the other hand, natural gas demand spreads all over the country.

For resolving this natural gas supply-demand gap between north-east production area and country wide demand area, some pipeline reinforcement projects indicated in Table 3.1.20 and Table 3.1.21 are under construction and planned.

The implementation of these projects can distribute the natural gas from the north-east supply area to the whole country demand area including the south-west area. Further importing LNG at Chittagong area will cover the south-east demand. Thus the supply-demand gap between production area and demand area will be solved.

### 3.1.6.5 Prospect of Regional Natural Gas Supply

(1) Bheramara new power plant

The analysis for Node 77 on the pipeline analysis model, in which the Bheramara new power plant is contained, is as follows;

In 2015, under the assumption that the supply would meet the demand and the compressor station (discharge pressure of 1000 psig) would be installed at Elenga (Node 60) together with other infrastructure as planned, it was confirmed that the 68mmcfd demand for gas would be transferred to Node 77 at a minimum pressure of more than 791psi.

In 2020, 2025 and 2030, it was assumed that the production capacity would decrease and the supply would not meet the demand in the gas grid. An analysis was conducted to determine whether the pipeline network would have sufficient capacity to transfer the gas to meet the demand under the condition that the gas would inflow endlessly from almost all of the gas fields to keep the supply pressure designated (without relationship to the actual demand/supply balance). Consequently, it was confirmed that the pipeline network to the new Bheramara power plant would have the capacity to transfer the gas demanded at sufficient pressure.

(2) Haripur new power plant

It was confirmed that the 60mmcfd demand for gas in 2015 would be supplied to Node 72, in which the Haripur new power plant is contained, at the sufficient pressure of 967psi.

In 2020, 2025 and 2030, as mentioned in (1) above, with the condition that the gas would inflow endlessly from almost all of the gas fields to keep the supply pressure designated without relationship to the actual demand/supply balance, it was confirmed that the pipeline network to the Haripur new power plant would have the capacity to transfer the gas to meet the demand at sufficient pressure.

(3) KAFCO fertilizer factory

It was confirmed that the 60mmcfd demand for gas in 2015 would be supplied to Node 41, in which the KAFCO fertilizer factory is contained, at the sufficient pressure of 1351psi.

In 2020, 2025 and 2030, with the same condition in the above (1) and (2), it was confirmed that the pipeline network to the KAFCO fertilizer factory would have the capacity to transfer the gas at sufficient pressure.

The government may take various measures in the future to cope with the gas demand/supply imbalance. However, it is forecast that the potential gas demand would increase to 5829mmcfd in 2030 and the gas supply would fall to 1812mmcfd in 2030 based on the latest information of natural gas reserve as shown in Figure 3.1.28.

Under such circumstances, it is not easy to secure the gas supply to the new Bheramara power plant which is located far from the existing northeast gas fields, offshore gas fields and LNG receiving terminal to be developed. In order to enable a secure gas supply in the country, measures required for demand suppression and supply augmentation, such as shown in the Table 3.1.23 below, must be systematically executed by the government. Almost all of those measures have been recommended repeatedly in various reports of WB, ADB, JICA, etc before now.

For the execution of these measures, consent and cooperation by the Bangladesh people, sufficient finance and continuous efforts are indispensable. However, the pricing policies are subject to opposing pressures and will not be agreed to by the people easily, and the movement of the gas sector restructure is slow. Consequently, various projects for the execution of such measures have ended unsuccessfully.

The Survey team has not obtained enough information to examine how the Bangladesh government will execute these measures from now on. However, judging from the current situation of the gas sector, the measures shown in Table 3.1.23 below should be executed systematically by the government to secure the preferential gas supply to the power plants (e.g. the Bheramara new power plant) which are located in areas remote from the gas fields. If the government can not execute these, a risk that the secure gas supply to the power plant would become difficult may be created.

**Table 3.1.23 Measures to be executed for secure gas supply in Bangladesh**

| Measures | Remarks (Current Situation, etc.) |
|---|---|
| 1. Demand suppression<br>1) Gas pricing restructure<br>2) Exploration and supply of alternative energy such as coal, petroleum, renewable energy<br>3) Establishment of gas metering system for domestic and industrial consumers<br>4) Education and training on energy saving and resources preservation | These measures must be taken by the government immediately and continued effectively. |
| 2. Supply restriction<br>1) Supply restriction to existing consumers（time/area）<br>2) Supply restriction to existing consumers（volume/area）<br>3) Connection restriction to new consumers | For effective and efficient supply restriction, an integrated SCADA system should be built up urgently.<br>Education and training for capacity building of operation staff must be implemented. |
| 3. Supply augmentation<br>1) Reserve upgrading from probable and possible to proved by exploration and drilling<br>2) Production augmentation for existing gas fields<br>3) Exploration of new gas fields<br>4) LNG import<br>5) Natural gas import from adjacent countries | Education and training for capacity building of operation staff will be required.<br>Sufficient funds for exploration shall be budgeted.<br>Foreign investment shall be activated. |

## 3.1.7 Natural Gas Sales

### 3.1.7.1 Sectorial Gas Sales

Sectorial gas sales are shown in Table 3.1.2 and Figure 3.1.13 in section 3.1.4.1, and Figure 3.1.29 shows the percentage of each sector’s gas sales.

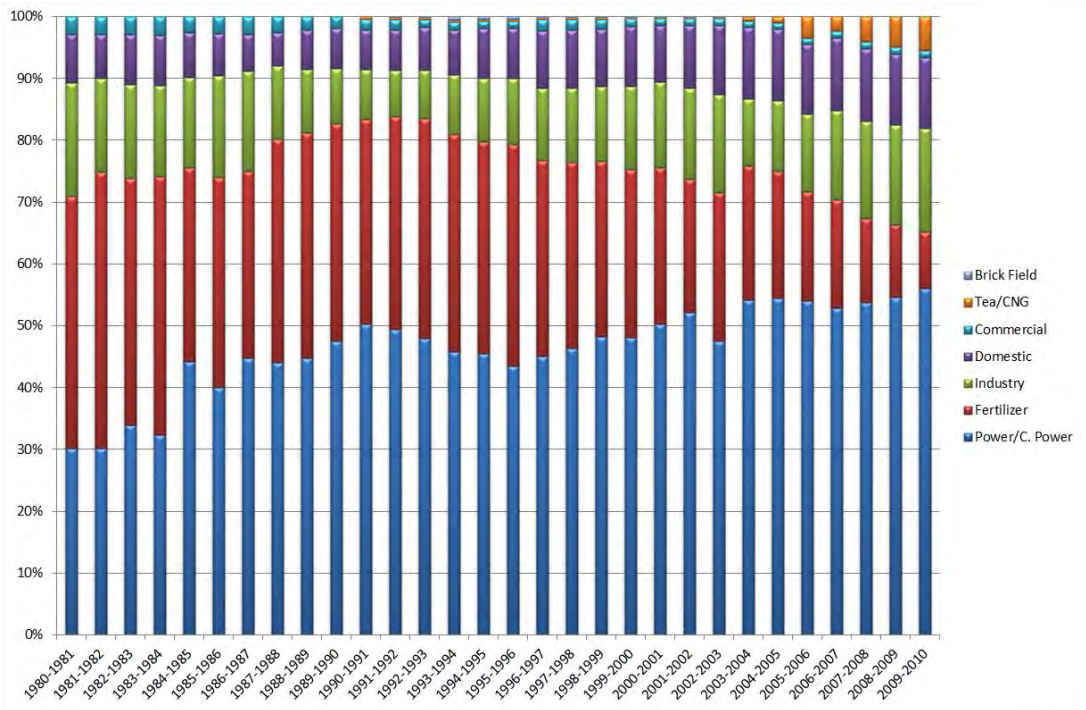



**Figure 3.1.29 Percentage of each sector's gas sales**

(1) Power/Captive Power and Fertilizer

Gas demand of the power and captive power sector has increased on an ongoing basis from 480mmcfd to 1,084 mmcfd.

On the other hand, gas demand of the fertilizer factory remains at the same level as in 1990. But the ratio of fertilizer demand to all sectors decreasesed due to the growth of power and non-bulk demand.

(2) Non-bulk (Industry, Domestic, Commercial, Tea/CNG, Brick Field)

Industry and Domestic gas demands were increasing and are 325 mmcfd and 220 mmcfd in FY 2009 respectively.

CNG and Tea Estates gas demands are very low. But CNG demand in 2004 has been increasing rapidly in recent years.

### 3.1.7.2 Regional Gas Sales

Six State Owned Gas Companies described in section 3.1.3 deal with natural gas sales in Bangladesh at present, 2011.

But two companies, SGCL and KGDCL do not have sales data due to the following reasons;

- SGCL

  No pipeline network exists at present in their sales area.

- KGDCL

  KGDCL began business activity in July 2010, and thus no sales data available in 2011.

Table 3.1.24 shows the natural gas sales of each company. Figure 3.1.30 shows the rate of each company sales performance. Figure 3.1.31 to Figure 3.1.34 show the graph of each company sales.

**Table 3.1.24 Natural Gas Sales of Each Company**

| | FY | Power | Fertilizer | Cap. P | Indstrial | Commer-cial | Domestic | CNG | Tea | Non-Bulk | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| TGTDCL | 2004 | 399.9 | 135.4 | 73.2 | 103.0 | 8.4 | 95.0 | 4.8 | 0.0 | 285 | 820 |
| | 2005 | 416.8 | 140.5 | 88.1 | 119.0 | 8.3 | 100.8 | 8.6 | 0.0 | 325 | 882 |
| | 2006 | 460.0 | 133.4 | 111.3 | 146.1 | 9.1 | 108.5 | 15.0 | 0.0 | 390 | 983 |
| | 2007 | 469.1 | 138.5 | 145.5 | 175.5 | 9.8 | 121.0 | 24.6 | 0.0 | 476 | 1,084 |
| | 2008 | 495.1 | 107.2 | 185.7 | 210.9 | 11.6 | 130.4 | 43.5 | 0.0 | 582 | 1,184 |
| | 2009 | 537.1 | 97.3 | 219.1 | 234.3 | 13.1 | 141.8 | 58.0 | 0.0 | 666 | 1,301 |
| | 2010 | 583.6 | 98.3 | 260.2 | 268.0 | 14.1 | 154.2 | 69.1 | 0.0 | 766 | 1,448 |
| BGSL | 2004 | 63.9 | 103.3 | 11.6 | 19.5 | 3.6 | 31.3 | 0.5 | 0.0 | 66 | 234 |
| | 2005 | 71.4 | 100.7 | 14.0 | 19.7 | 3.7 | 33.9 | 1.5 | 0.0 | 73 | 245 |
| | 2006 | 77.0 | 94.8 | 15.3 | 26.4 | 3.9 | 36.8 | 3.5 | 0.0 | 86 | 258 |
| | 2007 | 67.6 | 101.7 | 18.8 | 31.1 | 4.4 | 40.4 | 6.7 | 0.0 | 101 | 271 |
| | 2008 | 56.3 | 93.5 | 27.8 | 32.4 | 5.2 | 44.9 | 13.5 | 0.0 | 124 | 273 |
| | 2009 | 42.3 | 92.3 | 32.8 | 36.4 | 5.6 | 48.0 | 21.3 | 0.0 | 144 | 279 |
| | 2010 | 62.4 | 63.7 | 37.8 | 42.2 | 6.2 | 53.6 | 25.1 | 0.0 | 165 | 291 |
| JGTDSL | 2004 | 32.4 | 15.5 | 0.0 | 3.9 | 1.1 | 8.1 | 2.2 | 2.2 | 17 | 65 |
| | 2005 | 16.4 | 31.8 | 3.0 | 3.8 | 1.1 | 8.7 | 2.2 | 2.2 | 21 | 69 |
| | 2006 | 31.9 | 15.8 | 3.1 | 3.5 | 1.2 | 9.5 | 2.5 | 2.1 | 22 | 70 |
| | 2007 | 26.3 | 15.9 | 4.1 | 7.3 | 1.2 | 10.2 | 3.3 | 2.1 | 28 | 70 |
| | 2008 | 39.8 | 14.9 | 4.9 | 8.3 | 1.2 | 11.1 | 5.4 | 2.2 | 33 | 88 |
| | 2009 | 62.0 | 15.4 | 6.7 | 14.0 | 1.3 | 12.1 | 7.8 | 2.1 | 44 | 121 |
| | 2010 | 78.2 | 15.3 | 6.7 | 13.4 | 1.4 | 13.2 | 9.4 | 2.2 | 46 | 140 |
| PGCL | 2004 | 52.7 | 0.0 | 0.0 | 0.7 | 0.0 | 0.5 | 0.0 | 0.0 | 1 | 54 |
| | 2005 | 58.1 | 0.0 | 0.1 | 0.8 | 0.1 | 0.7 | 0.0 | 0.0 | 2 | 60 |
| | 2006 | 45.8 | 0.0 | 0.5 | 0.9 | 0.2 | 1.3 | 0.0 | 0.0 | 3 | 49 |
| | 2007 | 42.9 | 0.0 | 0.9 | 1.1 | 0.3 | 2.6 | 0.5 | 0.0 | 5 | 48 |
| | 2008 | 50.5 | 0.0 | 1.3 | 1.2 | 0.4 | 3.6 | 2.4 | 0.0 | 9 | 59 |
| | 2009 | 62.2 | 0.0 | 2.1 | 1.7 | 0.5 | 4.7 | 4.7 | 0.0 | 14 | 76 |
| | 2010 | 53.0 | 0.0 | 2.7 | 2.1 | 0.6 | 5.7 | 6.5 | 0.0 | 18 | 71 |
| SGCL *1 | 2004 | | | | | | | | | | |
| | 2005 | | | | | | | | | | |
| | 2006 | | | | | | | | | | |
| | 2007 | | | | | | | | | | |
| | 2008 | | | | | | | | | | |
| | 2009 | | | | | | | | | | |
| | 2010 | | | | | | | | | | |
| KGDCL *2 | 2004 | | | | | | | | | | |
| | 2005 | | | | | | | | | | |
| | 2006 | | | | | | | | | | |
| | 2007 | | | | | | | | | | |
| | 2008 | | | | | | | | | | |
| | 2009 | | | | | | | | | | |
| | 2010 | | | | | | | | | | |
| Total | 2004 | 549 | 254 | 85 | 127 | 13 | 135 | 8 | 2 | 370 | 1,173 |
| | 2005 | 563 | 273 | 105 | 143 | 13 | 144 | 12 | 2 | 420 | 1,256 |
| | 2006 | 615 | 244 | 130 | 177 | 14 | 156 | 21 | 2 | 501 | 1,359 |
| | 2007 | 606 | 256 | 169 | 215 | 16 | 174 | 35 | 2 | 611 | 1,473 |
| | 2008 | 642 | 216 | 220 | 253 | 18 | 190 | 65 | 2 | 748 | 1,605 |
| | 2009 | 704 | 205 | 261 | 286 | 20 | 207 | 92 | 2 | 868 | 1,777 |
| | 2010 | 777 | 177 | 307 | 326 | 22 | 227 | 110 | 2 | 994 | 1,949 |

*1, *2: No sales data available in 2011.

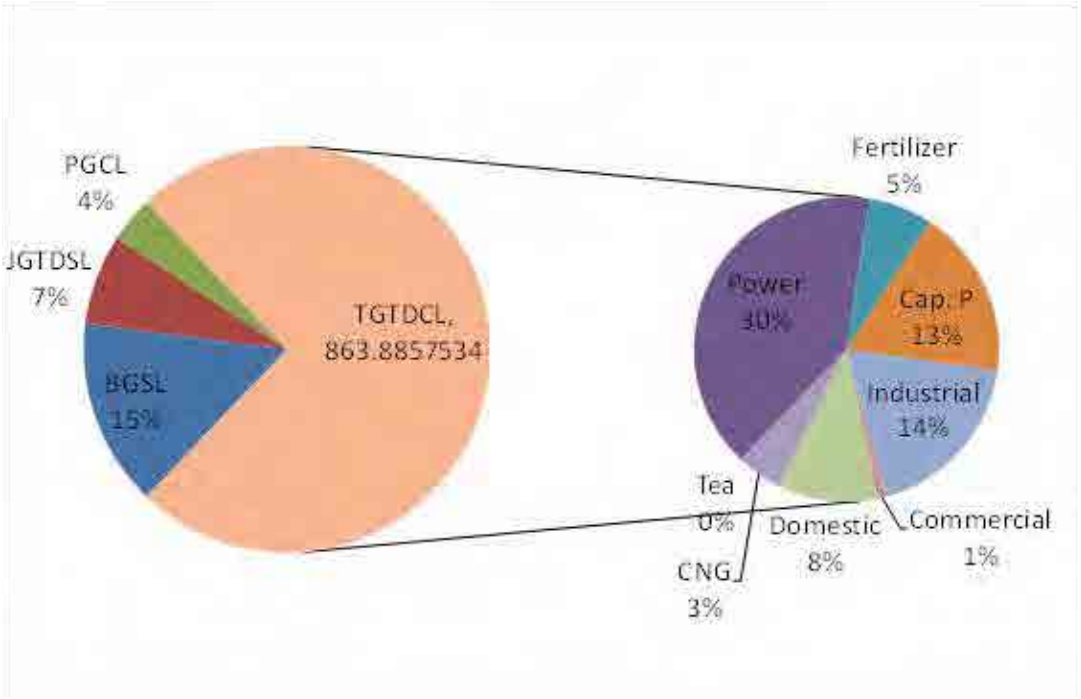



**Figure 3.1.30 Left: Share of Distribution Companies in Total Sales**
**Right: Share of each sector in TGTDCL's sales**

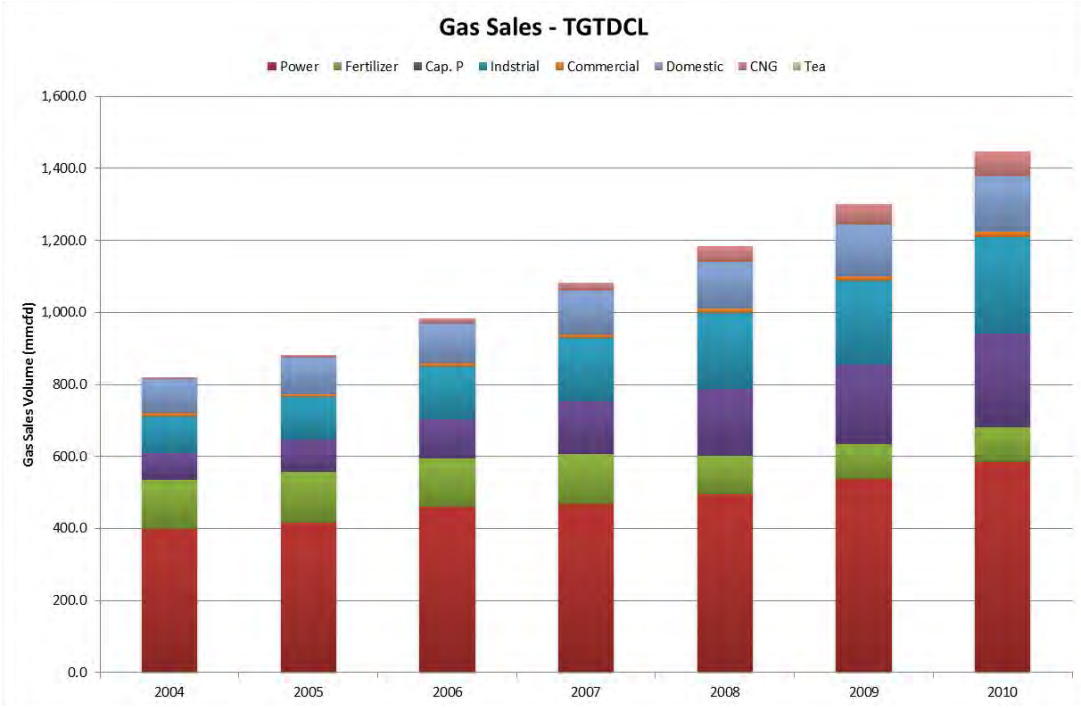



**Figure 3.1.31 Sales Performance of TGTDCL**

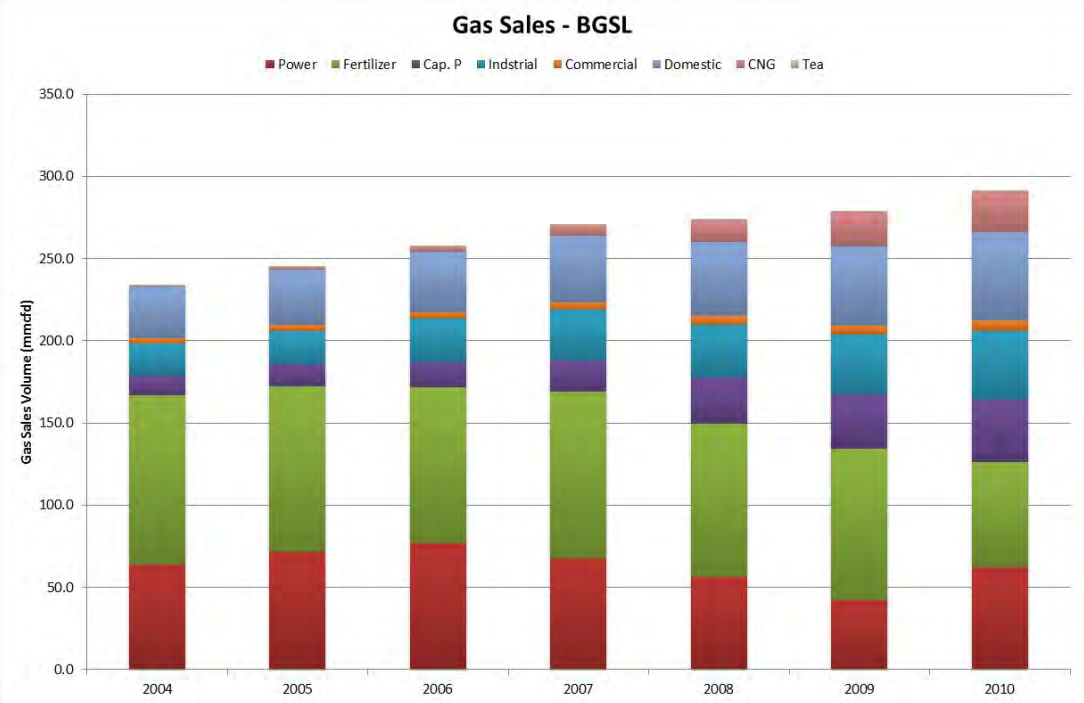



**Figure 3.1.32 Sales Performance of BGSL**

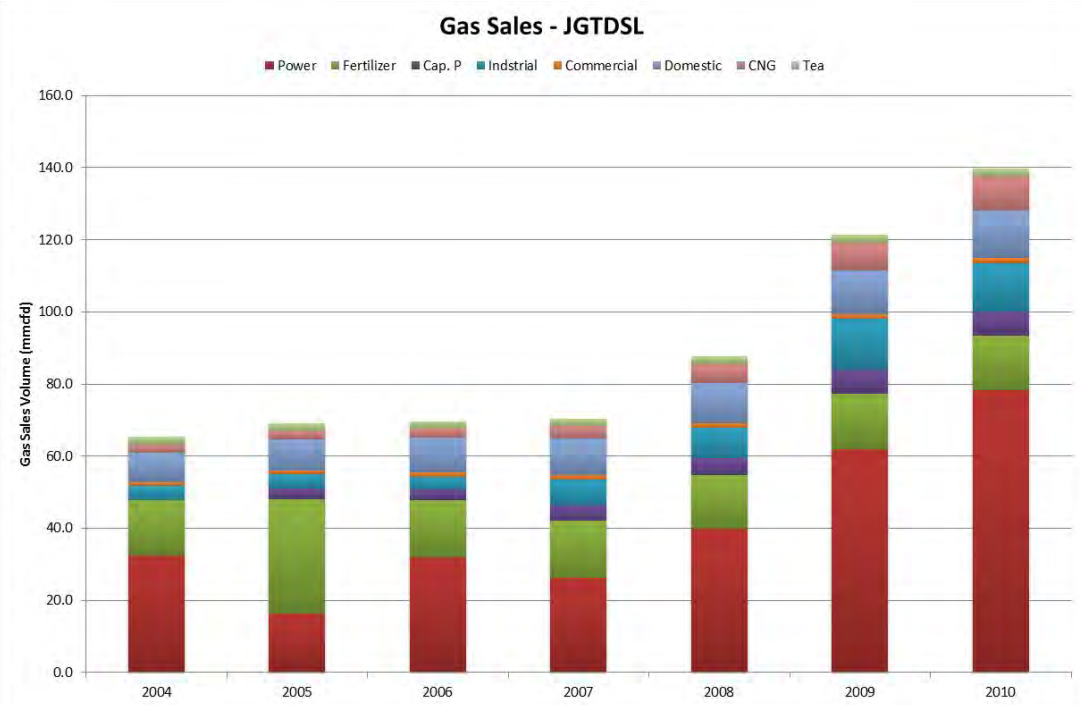



**Figure 3.1.33 Sales Performance of JGTDSL**

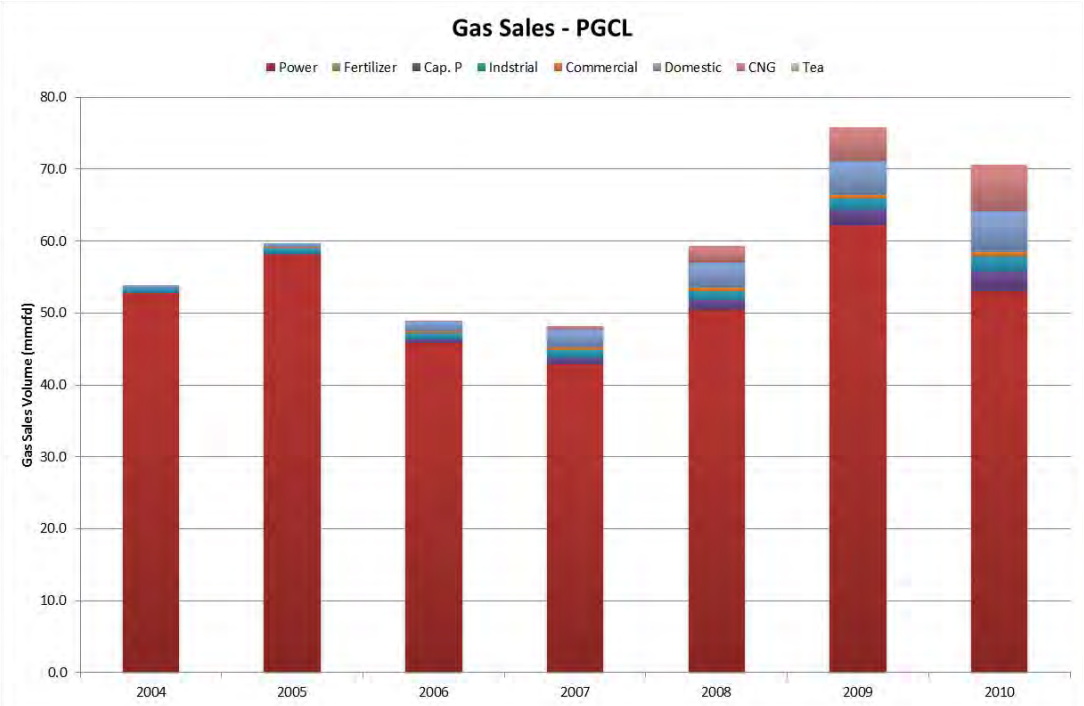



**Figure 3.1.34 Sales Performance of PGCL**

According to the above figures, sales performance of TGTDCL is very high compared to the other companies, representing 74% of all gas sales in Bangladesh. This means the gas consumption is concentrated around the Dhaka area. It also means that in most areas, except for those around Dhaka, the demand is low.

Also the company sales records show a high rate for sales for power generation. Sales for Power generation by TGTDCL amounted to 30% in 2010.

## 3.1.8 Natural Gas Tariffs and Governmental Subsidies

### 3.1.8.1 Gas Tariff

The Bangladesh Energy Regulatory Commission (BERC) was established under the BERC Act in 2003 and its main functions are as follows:

- To create a conducive environment for attracting investment including foreign direct investment for production, transmission and distribution of electricity, natural gas and petroleum products
- To establish transparent administration and operation for the energy sector
- To protect consumers' interest/rights by determining reasonable energy costs
- To allow clear process for the energy tariff adjustment

Therefore, BERC has the authority to regulate the tariffs of gas, electricity and petroleum products in Bangladesh. Recently, BERC conducted two open meetings on the draft specification regulation of petroleum products and the draft tariff regulation of petroleum products at the end of November 2011, and is trying to ensure the transparency of the process for preparing the relevant regulations.

In the natural gas sector, BERC has prepared two regulations, the gas transmission tariff regulation 2010 and the gas distribution tariff regulation 2010. These regulations are formulated in consideration of the participation of private entities and include the following procedures to approve the gas tariff in the gas transmission and distribution:

- Procedure of submitting the application for gas tariff by a Licensee
- Procedure of reviewing the application for gas tariff
- Procedure of issuing the approval for applied gas tariff

Both regulations specify in detail the standard methodology to calcurate various rates included in tariff calculations. Figure 3.1.35 shows the outline of the process to determine the gas tariff.

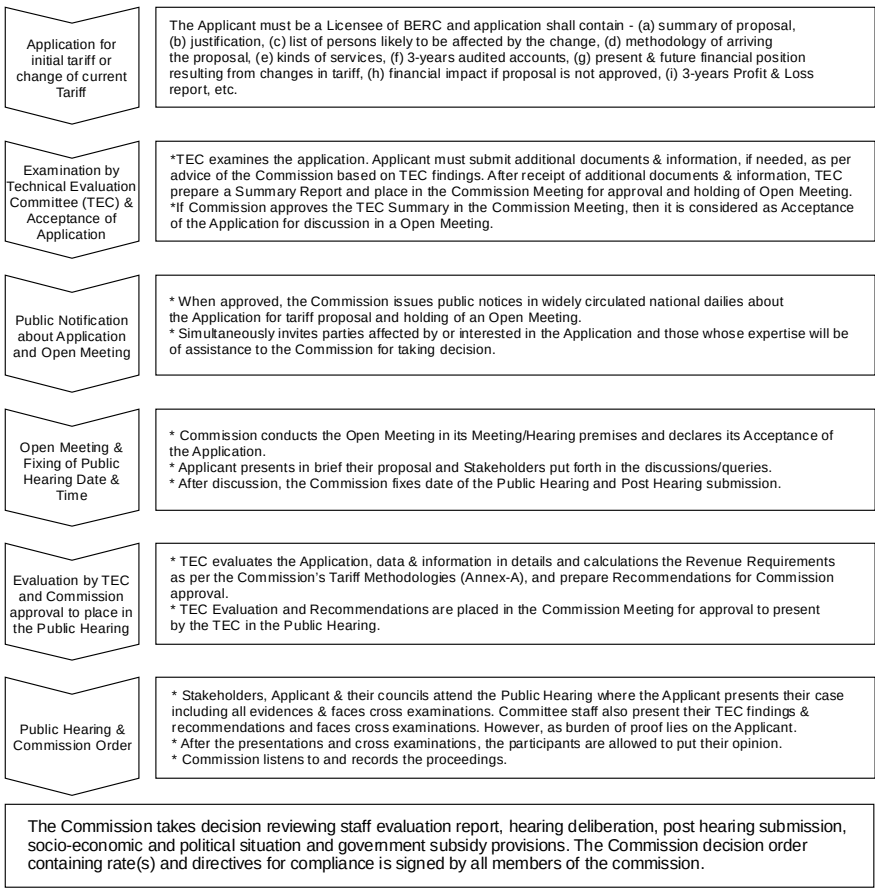



**Figure 3.1.35 Gas Tariff Decision Process Flow Chart**

Gas tariffs differ by the following customer categories. Metered rates are used for bulk consumers and fixed rates as per the cooking apparatus are used for domestic users.

- Power
- Fertilizer
- Industry
- Commercial
- Tea estates
- Captive power (emergency purposes)
- Compressed natural gas (CNG)
- Seasonal (ex. brick making)
- Domestic (volume charging tariff)
- Domestic (fixed tariff)

Table 3.1.25 and Table 3.1.26 show the past and current natural gas tariffs at metered rate and fixed rate respectively.

## Table 3.1.25 Natural Gas Tariff in Bangladesh (At Metered Rate)

**(Unit: Taka/mcf)**

| No. | Effective From | Power | Fertilizer | Industry | Commer-cial | Tea Estate | Captive Power | CNG Feed Gas | Seasonal (brick) | Domestic (metered) |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 29.07.68 | 1.20 | 1.20 | 2.52 | 6.00 | - | - | - | - | 6.00 |
| 2 | 28.06.69 | 1.60 | 1.60 | 2.92 | 6.40 | - | - | - | - | 6.40 |
| 3 | 19.06.74 | 3.72 | 3.72 | 7.20 | 12.00 | - | - | - | - | 8.40 |
| 4 | 01.07.74 | - | - | - | - | - | - | - | - | 12.00 |
| 5 | 01.12.77 | 5.00 | 5.00 | 9.00 | 13.00 | - | - | - | - | 13.00 |
| 6 | 02.06.79 | 6.25 | 6.25 | 16.00 | 17.00 | - | - | - | - | 16.00 |
| 7 | 07.06.80 | 7.75 | 7.75 | 18.00 | 19.00 | - | - | - | - | 18.00 |
| 8 | 07.06.81 | 9.30 | 9.30 | 27.75 | 28.00 | - | - | - | - | 20.00 |
| 9 | 01.07.82 | 10.50 | 10.50 | 31.00 | 31.00 | - | - | - | - | 27.00 |
| 10 | 30.06.83 | 11.50 | 11.50 | 36.00 | 36.00 | - | - | - | - | 34.00 |
| 11 | 27.06.84 | 13.05 | 13.05 | 36.00 | 45.20 | - | - | - | 51.00 | 34.00 |
| 12 | 30.06.85 | 15.66 | 15.66 | 43.20 | 54.24 | - | - | - | 61.20 | 40.80 |
| 13 | 28.06.86 | 19.09 | 19.09 | 52.14 | 65.39 | - | - | - | 78.30 | 44.88 |
| 14 | 18.06.87 | 24.82 | 24.82 | 52.14 | 85.00 | 72.30 | - | - | 78.30 | 56.10 |
| 15 | 01.07.88 | 28.54 | 28.54 | 59.96 | 97.75 | 83.15 | - | - | 90.05 | 56.10 |
| 16 | 01.07.89 | 33.00 | 28.54 | 70.00 | 110.00 | 83.15 | - | - | - | 65.13 |
| 17 | 01.07.90 | 37.95 | 32.82 | 80.42 | 126.50 | 95.62 | - | - | - | 74.76 |
| 18 | 01.07.91 | 39.08 | 33.98 | 85.23 | 134.22 | 100.62 | - | - | 106.19 | 74.76 |
| 19 | 01.05.92 | 43.05 | 37.39 | 93.74 | 134.22 | 110.16 | - | 43.05 | 116.67 | 82.12 |
| 20 | 01.03.94 | 47.57 | 41.34 | 103.07 | 147.53 | 113.26 | - | - | 128.28 | 82.12 |
| 21 | 01.12.98 | 54.70 | 47.54 | 118.53 | 169.05 | 130.56 | 86.37 | - | 147.52 | 94.87 |
| 22 | 01.09.00 | 62.90 | 54.67 | 136.31 | 194.40 | 149.80 | 99.11 | - | 169.65 | 109.02 |
| 23 | 01.01.02 | 65.98 | 57.48 | 143.57 | 205.30 | 157.16 | 104.21 | - | 143.57 | 114.40 |
| 24 | 01.09.02 | 70.00 | 60.00 | 140.00 | 220.00 | 140.00 | 100.00 | - | 220.00 | 120.07 |
| 25 | 15.02.03 | - | - | - | - | - | - | 70.00 | - | - |
| 26 | 01.07.04 | 72.45 | 62.15 | 145.20 | 228.50 | 145.20 | - | - | 228.50 | 126.02 |
| 27 | 01.09.04 | - | - | - | - | - | 103.50 | - | - | - |
| 28 | 01.01.05 | 73.91 | 63.41 | 148.13 | 233.12 | 148.13 | 105.59 | - | 233.00 | 129.98 |
| 29 | 25.04.08 | - | - | - | - | - | - | 282.30 | - | - |
| 30 | 01.08.09 | 79.82 | 72.92 | 165.91 | 268.09 | 165.91 | 118.26 | - | - | 146.12 |
| 31 | 12.05.11 | - | - | - | - | - | - | 509.70 | - | - |
| 32 | 19.09.11 | - | - | - | - | - | - | 651.29 | - | - |

**Source: Petrobangla & TGTDCL**

**Table 3.1.26 Natural Gas Tariff for Domestic Users (At Fixed Rate)**

(Unit: Taka/month)

| No. | Effective From | Domestic Metered (Taka/mcf) | Cooker One Burner | Cooker Two Burners | Additional Burner | One Oven or Grill | Additional Oven or Grill | One Grill | Additional Grill | Water Heater up to 20 gal | Water Heater over 20 gal | Dryer Each | Refrigerator | Gas Light Garden | Gas Light Room |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 29.07.68 | 6.00 | 6.00 | 10.00 | 3.00 | 10.00 | 5.00 | 10.00 | 5.00 | 20.00 | 25.00 | 30.00 | - | - | - |
| 2 | 28.06.69 | 6.40 | 6.30 | 10.50 | 3.15 | 10.50 | 5.25 | 10.50 | 5.25 | 21.00 | 26.25 | 31.50 | - | - | - |
| 3 | 19.06.74 | 8.40 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 4 | 01.07.74 | 12.00 | 15.00 | 28.00 | 8.00 | 28.00 | 14.00 | 28.00 | 14.00 | 56.00 | 70.00 | 84.00 | - | - | - |
| 5 | 01.12.77 | 13.00 | 16.00 | 30.00 | 9.00 | 30.00 | 15.00 | 30.00 | 15.00 | 60.00 | 75.00 | 90.00 | 75.00 | - | - |
| 6 | 02.06.79 | 16.00 | 20.00 | 36.00 | 12.00 | - | - | - | - | - | - | - | - | - | - |
| 7 | 07.06.80 | 18.00 | 22.00 | 40.00 | 14.00 | 34.00 | 17.00 | 34.00 | 17.00 | 68.00 | 84.00 | 101.00 | 84.00 | 10.00 | 9.00 |
| 8 | 07.06.81 | 20.00 | 25.00 | 45.00 | 16.00 | 38.00 | 19.00 | 38.00 | 19.00 | 76.00 | 93.00 | 112.00 | 93.00 | 20.00 | 10.00 |
| 9 | 01.07.82 | 27.00 | 35.00 | 65.00 | 27.00 | 58.00 | 29.00 | 58.00 | 29.00 | 117.00 | 146.00 | 175.00 | 117.00 | 27.00 | 14.00 |
| 10 | 30.06.83 | 34.00 | 45.00 | 80.00 | 34.00 | 74.00 | 37.00 | 74.00 | 37.00 | 147.00 | 184.00 | 220.00 | 147.00 | 34.00 | 17.00 |
| 11 | 27.06.84 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 12 | 30.06.85 | 40.80 | 60.00 | 100.00 | 41.00 | 89.00 | 45.00 | 89.00 | 45.00 | 177.00 | 211.00 | 265.00 | 177.00 | 41.00 | 21.00 |
| 13 | 28.06.86 | 44.88 | 66.00 | 110.00 | 45.00 | 97.00 | 49.00 | 97.00 | 49.00 | 194.00 | 242.00 | 291.00 | 194.00 | 45.00 | 23.00 |
| 14 | 18.06.87 | 56.10 | 80.00 | 130.00 | 56.00 | 121.00 | 61.00 | 121.00 | 61.00 | 242.00 | 303.00 | 364.00 | 242.00 | 56.00 | 28.00 |
| 15 | 01.07.88 | - | 92.00 | 150.00 | 64.00 | 139.00 | 70.00 | 139.00 | 70.00 | 278.00 | 348.00 | 419.00 | 278.00 | 64.00 | 32.00 |
| 16 | 01.07.89 | 65.13 | 100.00 | 170.00 | 74.00 | 161.00 | 81.00 | 161.00 | 81.00 | 322.00 | 403.00 | 485.00 | 322.00 | 74.00 | 37.00 |
| 17 | 01.07.90 | 74.76 | 115.00 | 195.00 | 85.00 | 185.00 | 93.00 | 185.00 | 93.00 | 370.00 | 463.00 | 558.00 | 370.00 | 85.00 | 43.00 |
| 18 | 01.07.91 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 19 | 01.05.92 | 82.12 | 126.00 | 215.00 | 90.00 | 203.00 | 100.00 | 203.00 | 100.00 | 407.00 | 509.00 | 614.00 | 407.00 | 93.00 | 47.00 |
| 20 | 01.03.94 | - | 160.00 | 250.00 | 93.00 | - | - | - | - | - | - | - | - | - | - |
| 21 | 01.12.98 | 94.87 | 185.00 | 290.00 | - | - | 102.00 | - | 102.00 | - | - | - | - | - | - |
| 22 | 01.09.00 | 109.02 | 210.00 | 330.00 | - | - | - | - | - | - | - | - | - | - | - |
| 23 | 01.01.02 | 114.40 | 275.00 | 350.00 | 98.00 | 215.00 | 108.00 | 215.00 | 108.00 | 428.00 | 535.00 | 645.00 | 428.00 | 98.00 | 50.00 |
| 24 | 01.09.02 | 120.07 | 325.00 | 375.00 | - | - | - | - | - | - | - | - | - | - | - |
| 25 | 15.02.03 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 26 | 01.07.04 | 126.02 | 340.00 | 390.00 | - | - | - | - | - | - | - | - | - | - | - |
| 27 | 01.09.04 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 28 | 01.01.05 | 129.98 | 350.00 | 400.00 | - | - | - | - | - | - | - | - | - | - | - |
| 29 | 25.04.08 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 30 | 01.08.09 | 146.12 | 400.00 | 450.00 | - | - | - | - | - | - | - | - | - | - | - |

Source: TGTDCL

The details of procedure how the gas tairff of each category is determined are not announced, however in general, the gas tariffs for the power and fertilizer sectors that are essential for the people's livelihood and agriculture are set at lower prices while the gas price for the commercial category is set at a relatively high price.

For domestic users, different fixed rates are set for different appliances, however these fixed gas rates are not properly collected due to unauthorized additional installations without notice.

For the impartial collection of gas rates as well as to encourage the efficient use of natural gas, TGTDCL is currently implementing a pilot project for the installation of gas meters for domestic users. Prompt promotion of gas meters to domestic users is expected.

### 3.1.8.2 Gas Tariff Distribution

As shown in Table 3.1.27, 55% of the revenue from gas sales goes to the GOB and 45% of the same is divided between Petrobangla and its affiliated gas companies. Petrobangla makes payments to IOCs according to the Production Sharing Contract (PSC).

**Table 3.1.27 Gas Tariff Distribution**

(Unit: Taka cm)

| No. | Customer Category | GOB Margin (55%) | | | Petrobangla Margin (45%) | | | | | | | | Total End Users Price |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | VAT | SD | Sub-total | PDF Margin | BAPEX Margin | DWMB | Wellhead Margin | Transportation Margin | Distribution Margin | GDF | Sub-total | |
| 1 | Power | 0.368 | 1.183 | 1.551 | 0.317 | 0.048 | 0.040 | 0.225 | 0.320 | 0.225 | 0.094 | 1.269 | 2.82 |
| 2 | Fertilizer | 0.337 | 1.083 | 1.419 | 0.268 | - | 0.040 | 0.225 | 0.320 | 0.155 | 0.153 | 1.161 | 2.58 |
| 3 | Feed Gas for CNG | 3.000 | 9.650 | 12.650 | 6.100 | 0.110 | 0.200 | 0.300 | 0.320 | 0.156 | 3.164 | 10.350 | 23.00 |
| 4 | Captive Power | 0.545 | 1.754 | 2.299 | 0.456 | 0.048 | 0.040 | 0.225 | 0.320 | 0.591 | 0.201 | 1.881 | 4.18 |
| 5 | Industry | 0.764 | 2.459 | 3.223 | 0.766 | 0.048 | 0.040 | 0.225 | 0.320 | 0.955 | 0.283 | 2.637 | 5.86 |
| 6 | Tea-estate | 0.764 | 2.459 | 3.223 | 0.766 | 0.048 | 0.040 | 0.225 | 0.320 | 0.955 | 0.283 | 2.637 | 5.86 |
| 7 | Commercial | 1.235 | 3.973 | 5.209 | 1.336 | 0.048 | 0.040 | 0.225 | 0.320 | 1.735 | 0.558 | 4.262 | 9.47 |
| 8 | Domestic | 0.673 | 2.165 | 2.838 | 0.709 | 0.048 | 0.040 | 0.225 | 0.320 | 0.725 | 0.255 | 2.322 | 5.16 |

**Note: VAT = value added tax, SD = supplementary duty, PDF = price deficit fund, DWMB = deficit wellhead margin for BAPEX, GDF = gas development fund.**

**Source: Petrobangla 2011**

The GOB's margin (55%) is composed of Supplementary Duty (SD) and Value Added Tax (VAT), and Petrobangla's margin (45%) is composed of the following margins. Rate of each margin differs by customer category:

- Price Deficit Fund (PDF) Margin

  The fund to purchase the natural gas from IOCs
- BAPEX Margin

  The margin to BAPEX for exploration
- Deficit Well Head Margin for BAPEX

  The additional well head margin for BAPEX's gas production
- Wellhead Margin

  The margin to gas production companies (BAPEX, BGFCL and SGFL)
- Transportation Margin

  The margin to gas transmission company (GTCL)
- Distribution Margin

  The margin to gas distribution companies (TGTDCL, JGTDSL, BGSL, PGCL, KGDCL and SGCL)
- Gas Development Fund (GDF)

  The fund reserved for natural gas development

### 3.1.8.3 Governmental Subsidies

The national exchequer is shown in Table 3.1.28. In the fiscal year 2011/12 the revenue projection is Taka 1,183 billion and the expenditure projection is Taka 1,635 billion. Therefore the total deficit on the national exchequer is Taka 452 billion and it tends to increase year by year.

The revenue is 72% of the expenditure. The deficit (28%) is covered by the loans from local & foreign banks (25%) and foreign grants (3%).

**Table 3.1.28 National Budget in 2011/12 at Glance**

(Unit: million Taka)

| No. | Description | Actual 2009/10 | Budget 2010/11 | Budget 2011/12 | Share in Expenditure 2011/12 |
|---|---|---|---|---|---|
| 1 | Revenue | 759,050 | 928,470 | 1,183,850 | 72.37 |
| 2 | Tax Revenue | 624,850 | 760,420 | 957,850 | 58.55 |
| 3 | Non-tax Revenue | 134,200 | 168,050 | 226,000 | 13.82 |
| 4 | Expenditure | 1,016,070 | 1,321,700 | 1,635,890 | 100.00 |
| 5 | Development Expenditure | 281,150 | 427,700 | 506,420 | 30.96 |
| 6 | Non-development Expenditure | 731,670 | 857,860 | 1,029,030 | 62.90 |
| 7 | Net Outlay for Food Account | -8,490 | 2,410 | 6,310 | 0.39 |
| 8 | Loans & Advances | 9,300 | 32,230 | 94,130 | 5.75 |
| 9 | Structural Adjustment Expenditure | 2,440 | 1,500 | 0 | 0.00 |
| 10 | Balance of Revenue/Expenditure | -257,020 | -393,230 | -452,040 | -27.63 |
| 11 | Financing | 250,740 | 393,230 | 452,040 | 27.63 |
| 12 | Domestic Borrowing | 158,200 | 236,800 | 272,080 | 16.63 |
| 13 | Foreign Borrowing | 60,360 | 108,340 | 130,580 | 7.98 |
| 14 | Foreign Grants | 32,180 | 48,090 | 49,380 | 3.02 |
| 15 | Balance | -6,280 | 0 | 0 | 0.00 |

**Source: Ministry of Finance**

Descriptions of governmental subsidies were picked up from the national budget (MOF Website: BUDGET AT A GLANCE, Economic Analysis of Non-Development & Development Expenditure) and tabulated in Table 3.1.29. Since the subsidy for Fuel and Energy is not described in the relevant document. it is not mentioned in the said table. The agricultural sector is a large subsidy user with Taka 45,000 million accounting for 48% of total subsidies, which are estimated at Taka 93,010 million in 2011/12.

**Table 3.1.29 Subsidies in National Budget in 2011/12**

(Unit: million Taka)

| No. | Description | Actual 2009/10 | Budget 2010/11 | Budget 2011/12 |
|---|---|---|---|---|
| 1 | Public Services | 15,990 | 25,590 | 31,090 |
| 2 | Defense Service | 2,710 | 2,940 | 3,180 |
| 3 | Public Order & Safety | 4,040 | 4,730 | 5,060 |
| 4 | Social Security & Welfare | 3,090 | 3,300 | 8,540 |
| 5 | Fuel & Energy | - | - | - |
| 6 | Agriculture | 49,220 | 40,060 | 45,000 |
| 7 | Sub-total | 75,050 | 76,620 | 92,870 |
| 8 | Total Budget | 75,060 | 76,680 | 93,010 |

**Source: Ministry of Finance**

According to the information from the newspaper, the usage of governmental subsidies are increasing in each category and total probable allocation will reach at Taka 351 billion (21% of expenditure projection, Taka 1,635 billion) as shown in Table 3.1.30. The usage of subsidy is already over the allocation in budget at Taka 204 billion in the middle of November 2011.

**Table 3.1.30 Allocation of Governmental Subsidies**

(Unit: million Taka)

| No. | Item | Allocation in Budget | Demand | Probable Allocation |
|---|---|---|---|---|
| 1 | BPC | 35,000 | 167,000 | 120,000 |
| 2 | Agriculture | 45,000 | 116,000 | 80,000 |
| 3 | PDB | 52,000 | 100,000 | 74,000 |
| 4 | BJMC | 29,000 | 29,000 | 29,000 |
| 5 | Export | 22,000 | 27,000 | 27,000 |
| 6 | Food | 16,770 | 16,770 | 16,770 |
| 7 | Others | 5,000 | 5,000 | 5,000 |
| 8 | Total | 204,770 | 460,770 | 351,770 |

**Note: BJMC is Bangladesh Jute Mills Corporation**

**Source Daily Star 21st Nov. 2011**

Comparing Table 3.1.29 with Table 3.1.30, the subsidy for agricultural sector in 2011/2012 of the former is same as the one of the later. Also, total of subsidies in Table 3.1.29 becomes Taka 180 billion and is not different so much from the total (Taka 204.8 billion) of Table 3.1.30, provided that both of Taka 35 billion (BPC) and Taka 52 billion (PDB) in Table 3.1.30 are considered as a subsidy for Fuel and Energy in Table 3.1.29. Accordingly, information in Table 3.1.30 seems to be reliable to some extent.

Total provable allocation of subsidies for BPC and PDB is Taka 194 billion, and this accounts for almost 2.2% of GDP projection (Taka 8973 billion) in 2011/2012.

Table 3.1.31 shows the implicit subsidy for natural gas sector in 2011/2012 with applying the calculation method similar to the one used in WB's Review (Bangladesh Public Expenditure and Institutional Review, Volume II). It was assumed in the WB's Review above that the prices at which Petrobangla purchases gas from International Oil Companies (IOC) reflects the marginal costs of domestic production. Using the recent data of gas purchase price from IOC, selling price and sale volume, the implicit subsidy (forgone revenue) in the range of Taka 77.4 billion annually is calculated. This accounts for 0.9% of GDP projection (Taka 8973 billion) in 2011/2012.

**Table 3.1.31 Implicit Subsidy for Gas Sector in 2011/2012**

| Sector | Unit Cost (US$/MCF) of IOC Purchases | Unit Selling Price (US$/MCF) | Margin | Sales BCF (2011/2012) | Implicit Subsidy Billion of Taka |
|---|---|---|---|---|---|
| Power | 2.66 | 1.31 | -1.35 | 394.2 | -38.32 |
| Captive P. | 2.66 | 1.31 | -1.35 | 132.5 | - |
| Fertilizer | 2.66 | 1.31 | -1.35 | 102.6 | -9.97 |
| Industrial | 2.66 | 1.31 | -1.35 | 141.3 | -13.73 |
| Comm. | 2.66 | 1.31 | -1.35 | 9.1 | -0.89 |
| Domestic | 2.66 | 1.31 | -1.35 | 104.8 | -10.18 |
| CNG,Tea | 2.66 | 1.31 | -1.35 | 44.2 | -4.29 |
| Total | | | | 928.6 | -77.38 |

Data Source: Gas unit prices (Petrobangla),
Gas volumes (Survey Team)
Exc. Rate 1.0US$ = 72.0Tk

So far, Petrobangla and its affiliated companies do not depend on any governmental subsidies. Though the gas selling prices are lower than international market prices, Petrobangla group is profitable and contributes to the National Treasury. However, the share of indigenous low-priced natural gas in total energy demand will be diminishing. Governmental subsidy will be applied to natural gas sector unless GOB adjusts the final consumer tariffs properly when LNG and petroleum are imported.

In the assumption that the present gas selling price (weighted average 1.31US$/MCF), the gas purchases cost from IOC (2.66US$/MCF), the LNG international spot price (17US$/MCF) and the revenue distribution system in the natural gas sector will not be changed, the production/transmission/distribution expenditure and sales revenue in 2015 and 2020 are estimated as shown in Table 3.1.32. As a result, the loss of Taka 22.9 billion and Taka 187.7 billion occurs in 2015/2016 and 2021/2021 respectively and also the direct governmental subsidy will be required inevitably. (Refer to the Appendix -7)

**Table 3.1.32 Future Governmental Subsidies**

(Unit: Million Taka)

| | 2015/2016 | 2020/2021 |
|---|---|---|
| Gas Sales Volume | 1,296 BCF (3,551MMCFD) | 1,382 BCF (3,787MMCFD) |
| Production expenditure | 196,960 | 389,800 |
| Sales Revenue | 174,040 | 202,100 |
| Loss (Subsidy) | 22,920 | 187,700 |

The future government subsidy for energy sector will be a huge amount if the subsidy for gas sector presented in Table 3.1.32 is added to the subsidy for BPC and PDB. So, its impact to the governmental budget may be enormous.

The decision of the usage of governmental subsidy should be made based on the condition of the national exchequer including power, agriculture, industry, etc. under the stringent governmental budget. Also the GOB depends on the weakest drivers of the national economy, namely agriculture, garment products export and foreign currency remittance by Bangladeshi abroad.

The increase of subsidy is difficult in such weak economies. So the implementation of the natural gas sector project should take advantage of a public private partnership (PPP) scheme without any usage of subsidy.

### 3.1.9 Financial Condition of Natural Gas Sector Enterprises

(1) Petrobangla Group's Contribution to National Exchequer

Petrobangla and Petrobangla's affiliated companies are state-owned gas companies (SOGCs) and not pursuing profits like private companies. In order to evaluate the financial condition of SOGCs, the national financial condition should also be evaluated.

A rating company has made an analysis of the country risks and an evaluation of international enterprises. The Bangladeshi sovereign rank by Standard & Poor's as of June 2011 is BB- (BB minus) for long-term local currency and for long-term foreign currency. This rating is the same as Mongolia, El Salvador, Gabon and Venezuela and is evaluated as relatively stable. On the other hand, the BB- rating means that the country of Bangladesh is evaluated as being in the venture rank.

The OECD rating for Bangladeshi country risk for export credit in 2010 is index 6, raised from index 5 in 1999. The increase in the rating produced a good evaluation as a stable country on the same level as Cambodia, Sri Lanka, Honduras and Kenya.

Petrobangla and Petrobangla's affiliated companies apply a consolidated accounting system. According to the consolidated balance sheet table and income statement table, only the MGMCL showed a loss for after tax profit in 2009/10. MGMCL is an affiliated company of Petrobangla, their function is granite mining, which is not related to the natural gas sector. On the other hand, in the previous year, BAPEX, MGMCL, BCMCL and Petrobangla all had deficits, which were brought forward, so the total

profit is Taka 2,722 million for the whole of the Petrobangla group. BCMCL, which had a deficit, is a coal mining enterprise and not related to the natural gas sector group. Petrobangla has a huge deficit at Taka 37,176 million. However, in the aggregate, the Petrobangla group, including its all affiliated companies, is profitable.

## Table 3.1.33 Petrobangla Consolidated Balance Sheet as of June 30, 2010

**(Unit: million Taka)**

| No. | Item Heading | BGSL | JGTDSL | TITAS | PGCL | BGFCL | SGFL | BAPEX | RPGCL | GTCL | MGMCL | BCMCL | PB | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | SALES | | | | | | | | | | | | | |
| 2 | Gas sales - inter group | - | - | - | - | 17,872.08 | 4,227.30 | 403.87 | - | - | - | - | 17,712.13 | 40,215.37 |
| 3 | Gas sales - end costumers | 16,000.66 | 5,470.63 | 63,794.89 | 2,833.68 | - | - | - | 206.75 | - | - | - | - | 88,306.61 |
| 4 | Oil, condensate and other products | - | - | - | - | 1,404.52 | 6,437.49 | 80.03 | 2,344.64 | - | 264.87 | 4,674.34 | 3,433.53 | 18,639.42 |
| 5 | PB's share of PG | - | - | - | - | - | - | - | - | - | - | - | 24,249.49 | 24,249.49 |
| 6 | PB's share of PC | - | - | - | - | - | - | - | - | - | - | - | 4,828.25 | 4,828.25 |
| 7 | Supplementary duty & Value Added Tax (SD & VAT) | - | - | - | - | -16,320.12 | -4,672.11 | - | -295.75 | - | -18.99 | -233.45 | - | -21,540.41 |
| 8 | Transmission charges inc line rent | - | - | - | - | - | - | - | - | 4,525.67 | - | - | - | 4,525.67 |
| 9 | Contribution from group companies for exploration | - | - | - | - | - | - | 400.43 | - | - | - | - | - | 400.43 |
| 10 | Successful wells and fields transferred to group companies | - | - | - | - | - | - | - | - | - | - | - | - | 0.00 |
| 11 | Management Charge to co's projects | - | - | - | - | - | - | - | - | - | - | - | 220.49 | 220.49 |
| 12 | Other operational income | 197.07 | 136.51 | 762.19 | 28.52 | - | - | 533.04 | 31.68 | - | 91.89 | - | 9.62 | 1,790.52 |
| 13 | TOTAL REVENUE (2 to 12) | 16,197.73 | 5,607.14 | 64,557.07 | 2,862.20 | 2,956.48 | 5,992.68 | 1,417.38 | 2,287.32 | 4,525.67 | 337.77 | 4,440.90 | 50,453.50 | 161,635.83 |
| 14 | COST OF SALES | | | | | | | | | | | | | 0.00 |
| 15 | Gas & condensate purchase: inter company | 8,599.24 | 3,442.79 | 44,316.10 | 1,715.92 | 23.90 | - | - | 1,434.00 | - | - | - | - | 59,531.95 |
| 16 | Gas purchase: IOC | - | - | - | - | - | - | - | - | - | - | - | 36,415.19 | 36,415.19 |
| 17 | Contribution to BAPEX for exploration (GDF) | 677.12 | 292.35 | 2,709.08 | 138.69 | - | - | 584.26 | - | - | - | - | - | 4,401.51 |
| 18 | Unsuccessful exploration | - | - | - | - | - | - | - | - | - | - | - | - | 0.00 |
| 19 | Production cost inc depreciation | - | - | - | - | 380.38 | 1,648.73 | - | 111.42 | - | 129.65 | 3,216.20 | - | 5,486.38 |
| 20 | Transmission charges: inter company | 797.45 | 114.95 | 3,068.50 | 224.25 | - | - | - | - | - | - | - | 8,631.50 | 12,836.65 |
| 21 | Transmission costs inc depreciation | 20.33 | 114.87 | 34.38 | - | - | - | - | - | 1,407.04 | - | - | - | 1,576.63 |
| 22 | Distribution cost inc depreciation | 345.00 | - | 838.76 | - | - | - | - | - | - | - | - | - | 1,183.76 |
| 23 | Distribution cost of condensate & other products | - | - | - | - | - | 43.39 | - | 4.95 | - | - | - | - | 48.34 |
| 24 | Price Deficit Fund (PDF) | 1,869.58 | 803.76 | 3,006.88 | 500.38 | - | - | - | - | - | - | - | - | 6,180.60 |
| 25 | Group service charges | 40.92 | 12.14 | 112.16 | 2.85 | 20.47 | 50.60 | 11.27 | 7.18 | 70.25 | - | 19.76 | - | 347.60 |
| 26 | Administrative cost/HCDF | 823.09 | 416.86 | 1,684.96 | 170.89 | 823.89 | 428.64 | 89.69 | 101.06 | - | 160.41 | 415.44 | 339.41 | 5,454.34 |
| 27 | TOTAL COST OF SALES (15 to 26) | 13,172.74 | 5,197.74 | 55,770.81 | 2,752.98 | 1,248.64 | 2,171.36 | 685.23 | 1,658.61 | 1,477.29 | 290.07 | 3,651.41 | 45,386.10 | 133,462.95 |
| 28 | OPERATIONAL PROFIT (13 - 27) | 3,024.99 | 409.40 | 8,786.26 | 109.22 | 1,707.84 | 3,821.32 | 732.15 | 628.72 | 3,048.38 | 47.70 | 789.49 | 5,067.40 | 28,172.88 |
| 29 | Other income | 108.02 | 35.93 | 363.93 | 14.60 | 5.96 | 6.29 | 6.02 | 3.24 | 79.76 | 6.58 | 140.92 | 0.00 | 771.25 |
| 30 | FINFNCIAL COST | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 31 | Interest expense | 7.47 | 11.32 | 92.65 | 25.43 | 86.05 | 20.39 | 13.30 | 75.56 | 298.00 | 293.82 | 0.00 | 0.00 | 923.98 |
| 32 | Less interest income | 506.82 | 143.60 | 1,295.59 | 52.85 | 283.04 | 783.53 | 195.05 | 140.44 | 548.98 | 6.23 | 0.00 | 92.03 | 4,048.15 |
| 33 | NET INTEREST (31 -32) | -499.35 | -132.28 | -1,202.94 | -27.42 | -196.99 | -763.15 | -181.74 | -64.88 | -250.98 | 287.58 | 0.00 | -92.03 | -3,124.17 |
| 34 | Translation of exchange rate of loan | - | - | - | - | - | - | - | - | 0.15 | - | - | - | 0.15 |
| 35 | Intangible provided for previous year written off | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 36 | NET PROFIT BEFORE CONTRIBUTION (28 +29 -33 - 34 - 35) | 3,632.36 | 577.61 | 10,353.13 | 151.25 | 1,910.79 | 4,590.75 | 919.91 | 696.84 | 3,378.97 | -233.31 | 930.41 | 5,159.44 | 32,068.16 |
| 37 | Less worker's participation in profits | 172.97 | 28.71 | 493.01 | 7.20 | 95.54 | 229.54 | 43.81 | 34.84 | 160.90 | 0.00 | 46.52 | 0.00 | 1,313.03 |
| 38 | NET PROFIT BEFORE TAXATION (36 - 37) | 3,459.39 | 548.90 | 9,860.13 | 144.05 | 1,815.25 | 4,361.22 | 876.10 | 661.99 | 3,218.07 | -233.31 | 883.89 | 5,159.44 | 30,755.12 |
| 39 | Less provision for taxation | 1,297.27 | 175.80 | 2,527.07 | 54.02 | 680.72 | 1,635.46 | 328.54 | 248.25 | 235.78 | 0.00 | 290.36 | 0.00 | 7,473.25 |
| 40 | NET PROFIT FOR THE YEAR AFTER TAXATION (38 - 39) | 2,162.12 | 373.11 | 7,333.06 | 90.03 | 1,134.53 | 2,725.76 | 547.57 | 413.75 | 2,982.29 | -233.31 | 593.54 | 5,159.44 | 23,281.88 |
| 41 | Add: Profit brought forward from previous year | 4,899.40 | 2,245.17 | 7,317.60 | 301.07 | 8,845.89 | 8,513.66 | -1,355.20 | 1,068.84 | 8,870.31 | -697.98 | -109.61 | -37,176.96 | 2,722.18 |
| 42 | Add: Profit brought forward from previous year PSC | - | - | - | - | - | - | - | - | - | - | - | - | 0.00 |
| 43 | Add/deduct: Prior year adjustment | -1,000.89 | -3.45 | 18.55 | -6.36 | -11.50 | 283.07 | -2.25 | -1.35 | 23.32 | - | - | 0.86 | -700.00 |
| 44 | DISTRIBUTABLE PROFIT (40 to 43) | 6,060.63 | 2,614.83 | 14,669.21 | 384.74 | 9,968.92 | 11,522.49 | -809.89 | 1,481.23 | 11,875.93 | -931.29 | 483.92 | -32,016.66 | 25,304.06 |
| 45 | Less: Dividend paid | 382.38 | 80.11 | 2,997.64 | 6.93 | 225.72 | 559.95 | - | 82.68 | 432.64 | - | - | - | 4,768.05 |
| 46 | BALANCE TRANSFER TO BALANCE SHEET (44 to 45) | 5,678.25 | 2,534.72 | 11,671.57 | 377.81 | 9,743.20 | 10,962.54 | -809.89 | 1,398.55 | 11,443.29 | -931.29 | 483.92 | -32,016.66 | 20,536.01 |
| 47 | Total 2008-2009 | 4,899.41 | 2,245.17 | 7,317.60 | 301.07 | 8,845.89 | 8,513.66 | -1,355.20 | 1,068.84 | 8,870.31 | -697.98 | -109.61 | -37,176.96 | 2,722.18 |

**Source: Petrobangla**

# Table 3.1.34 Petrobangla Consolidated Income Statement as of June 30, 2010

(Unit: million Taka)

| No. | Item Heading | BGSL | JGTDSL | TITAS | PGCL | BGFCL | SGFL | BAPEX | RPGCL | GTCL | MGMCL | BCMCL | PB | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | CAPITAL AND RESERVES | | | | | | | | | | | | | |
| 2 | Share capital | 3,706.87 | 449.19 | 8,571.55 | 525.53 | 2,624.76 | 884.32 | 0.50 | 785.67 | 1.10 | 17.50 | 3,156.30 | 1.50 | 20,724.80 |
| 3 | Capital reserves | 683.95 | 254.62 | 754.69 | - | 1,539.83 | 3,527.13 | 12,357.48 | - | 13,488.29 | 3,147.08 | - | 11,365.40 | 47,118.48 |
| 4 | Revenue reserves | 5,678.25 | 2,624.57 | 11,671.57 | 393.00 | 9,897.67 | 10,962.54 | -1,140.37 | 1,398.55 | 11,443.29 | -931.29 | 483.93 | 24,656.60 | 77,138.31 |
| 5 | TOTAL CAPITAL AND RESERVES (2 to 4) | 10,069.07 | 3,328.39 | 20,997.82 | 918.53 | 14,062.26 | 15,373.99 | 11,217.61 | 2,184.22 | 24,932.69 | 2,233.30 | 3,640.23 | 36,023.50 | 144,981.60 |
| 6 | LONG TERM BORROWINGS | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 7 | Unsecured loans - Local sources | 21.67 | 131.59 | 0.06 | 502.21 | 106.95 | 147.58 | 1,290.46 | 747.42 | 3,936.41 | 3,201.48 | 4,915.37 | 128.40 | 15,129.59 |
| 8 | Unsecured loans - Foreign sources | 99.17 | 192.59 | 2,148.66 | 0.00 | 2,099.96 | 673.99 | 0.00 | 1,100.12 | 9,411.45 | 9.07 | 2,550.32 | - | 18,285.31 |
| 9 | TOTAL LONG TERM BORROWINGS (7 to 8) | 120.84 | 324.18 | 2,148.72 | 502.21 | 2,206.91 | 821.57 | 1,290.46 | 1,847.54 | 13,347.86 | 3,210.55 | 7,465.69 | 128.40 | 33,414.91 |
| 10 | OTHER LONG TERM LIABILITIES | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 11 | Pension fund | - | - | 499.63 | - | - | - | - | - | - | - | - | - | 499.63 |
| 12 | Provision for gratuity/leave pay | - | 46.76 | 176.84 | - | - | 11.09 | 145.95 | 22.51 | - | - | - | 75.67 | 478.81 |
| 13 | Provident Fund | - | - | 418.01 | - | - | - | - | - | - | - | - | - | 418.01 |
| 14 | Customer's security deposits | 3,775.02 | 674.61 | 6,870.60 | - | - | - | - | 1.94 | - | - | - | - | 11,322.18 |
| 15 | Other long term liabilities | 35.35 | - | - | 199.51 | 9,540.99 | - | -134.05 | 792.58 | - | 4,688.96 | - | 38.00 | 15,161.33 |
| 16 | TOTAL OTHER LONG TERM LIABILITIES (11 to 15) | 3,810.37 | 721.37 | 7,965.09 | 199.51 | 9,540.99 | 11.09 | 11.90 | 817.03 | 0.00 | 4,688.96 | 0.00 | 113.67 | 27,879.95 |
| 17 | TOTAL CAPITAL EMPLOYED (5 + 9 + 16) | 14,000.27 | 4,373.93 | 31,111.62 | 1,620.24 | 25,810.16 | 16,206.64 | 12,519.97 | 4,848.79 | 38,280.55 | 10,132.80 | 11,105.92 | 36,265.56 | 206,276.45 |
| 18 | REPRESENTED BY: | | | | | | | | | | | | | |
| 19 | FIXED ASSETS: | | | | | | | | | | | | | |
| 20 | Fixed assets at cost or valuation, less depreciation | 2,617.58 | 1,580.91 | 11,275.35 | 1,305.35 | 4,714.34 | 1,335.69 | 337.09 | 2,397.55 | 18,718.24 | 9,369.78 | 8,117.89 | 317.30 | 62,087.06 |
| 21 | Proved properties less depreciation | - | - | - | - | 8,649.46 | 3,582.84 | 2,380.58 | - | - | - | - | - | 14,612.87 |
| 22 | Capital work-in-progress | 166.56 | 37.74 | 132.52 | - | 1,816.50 | 748.22 | 1,480.69 | 213.01 | 10,393.50 | 662.45 | - | 12.83 | 15,664.02 |
| 23 | TOTAL FIXED ASSETS (20 to 22) | 2,784.14 | 1,618.65 | 11,407.87 | 1,305.35 | 15,180.29 | 5,666.75 | 4,198.36 | 2,610.55 | 29,111.74 | 10,032.23 | 8,117.89 | 330.13 | 92,363.95 |
| 24 | Intangible assets at cost less amortization | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 29.70 | 0.00 | 1.33 | 0.00 | 0.00 | 31.03 |
| 25 | OTHER ASSETS | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 26 | Bank deposits | 5,295.89 | 1,669.82 | 15,150.24 | 458.41 | 2,103.51 | 8,869.12 | - | 1,386.67 | 7,244.73 | - | 2,522.58 | 4,576.47 | 49,277.45 |
| 27 | Contractors security | 1,911.02 | 364.30 | - | - | - | - | - | - | - | - | - | - | 2,275.32 |
| 28 | Loans to employees | 248.71 | 114.59 | 699.88 | 20.08 | 132.87 | 29.78 | - | 16.49 | - | - | 2.14 | 134.52 | 1,399.06 |
| 29 | Other assets/Hydrocarbon Dev. Fund | 34.68 | 30.69 | - | - | 3,758.82 | 28.73 | - | - | 227.98 | - | 518.55 | 18.48 | 4,617.92 |
| 30 | TOTAL OTHER ASSERTS (26 to 29) | 7,490.30 | 2,179.39 | 15,850.12 | 478.50 | 5,995.20 | 8,927.63 | 0.00 | 1,403.16 | 7,472.71 | 0.00 | 3,043.28 | 4,729.47 | 57,569.75 |
| 31 | CURRENT ASSETS: | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 32 | Inventories of stores & other materials | 535.35 | 215.53 | 1,819.26 | 89.45 | 196.50 | 1,294.94 | 3,631.46 | 284.18 | 322.66 | 359.34 | 869.19 | - | 9,617.84 |
| 33 | Advances, deposits and prepayments | 1,951.15 | 1,081.87 | 345.88 | 74.54 | 64.88 | 76.40 | 351.57 | 737.10 | 962.44 | 822.13 | 298.40 | 117.88 | 6,884.22 |
| 34 | Trade accounts receivable (exc Group a/cs) | 2,773.65 | 1,434.87 | 14,110.57 | 358.08 | 1,071.10 | 1,990.06 | 1,046.47 | 526.37 | 6.00 | 49.82 | - | 28,568.93 | 51,935.91 |
| 35 | Inter Project accounts | - | - | - | - | - | - | - | - | - | - | 0.33 | - | 0.33 |
| 36 | Advance payment of income tax | - | - | - | - | - | - | - | - | - | - | - | - | 0.00 |
| 37 | Cash and bank balances | 3,679.21 | 634.38 | 6,172.20 | 269.77 | 1,457.43 | 34.18 | 1,285.37 | 514.65 | 1,010.44 | 63.76 | 429.44 | 15,380.32 | 30,931.15 |
| 38 | Other current assets | 254.75 | - | 802.95 | - | 2,582.38 | 1,633.22 | 2,728.08 | - | - | -4.18 | 365.89 | - | 8,363.09 |
| 39 | TOTAL CURRENT ASSETS (32 to 38) | 9,194.11 | 3,366.64 | 23,250.86 | 791.84 | 5,372.28 | 5,028.80 | 9,042.95 | 2,062.30 | 2,301.54 | 1,290.87 | 1,963.24 | 44,067.13 | 107,732.54 |
| 40 | GROUP COMPANY ACCOUNTS: | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 41 | Gas purchases & transmission | -2,601.67 | -901.68 | -10,213.60 | -588.97 | 4,423.36 | 1,140.66 | - | - | 1,736.31 | - | - | - | -7,005.59 |
| 42 | BAPEX & Hydrocarbon Dev. Fund transfers | -179.83 | -312.74 | -1,700.45 | -202.34 | - | - | - | - | - | - | - | - | -2,395.36 |
| 43 | Equity share | - | - | - | - | - | - | - | - | - | -72.26 | - | 4.20 | -68.06 |
| 44 | Other current account | -253.10 | -54.79 | -255.26 | 26.85 | 124.80 | 82.90 | -12.88 | -0.28 | 60.76 | - | - | -1,480.33 | -1,761.34 |
| 45 | TOTAL GROUP COMPANY ACCOUNT (41 to 44) | -3,034.61 | -1,269.20 | -12,169.32 | -764.46 | 4,548.16 | 1,223.56 | -12.88 | -0.28 | 1,797.07 | -72.26 | 0.00 | -1,476.14 | -11,230.35 |
| 46 | CURRENT LIABILITIES: | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 47 | Trade creditors & accruals (exc Group a/cs) | 879.92 | 617.76 | 6,297.39 | 40.81 | 4,212.63 | 2,419.14 | 383.11 | 406.67 | 486.19 | - | 0.01 | 8,133.98 | 23,877.61 |
| 48 | Workers Profit Participation Fund | 172.97 | 28.71 | 494.25 | 7.20 | 95.54 | 229.54 | - | 34.84 | 160.90 | - | 46.52 | - | 1,270.48 |
| 49 | Current portion of long term loans | 73.10 | 58.74 | 436.27 | 88.95 | 294.91 | 264.85 | -3.20 | - | 869.48 | - | - | - | 2,083.10 |
| 50 | Interest payable | -0.49 | - | - | - | 1.97 | - | - | - | 237.64 | - | - | - | 239.12 |
| 51 | Taxation on profits | 1,308.18 | 816.34 | - | 54.02 | 680.72 | 1,635.46 | 328.54 | 815.13 | 648.29 | - | 290.36 | - | 6,577.03 |
| 52 | Other current liabilities | - | - | - | - | - | 91.11 | - | - | - | 1,119.37 | 1,681.60 | 3,251.05 | 6,143.14 |
| 53 | TOTAL CURRENT ALIABILITIES (47 to 52) | 2,433.67 | 1,521.56 | 7,227.91 | 190.97 | 5,285.77 | 4,640.09 | 708.45 | 1,256.64 | 2,402.51 | 1,119.37 | 2,018.49 | 11,385.03 | 40,190.47 |
| 54 | NET CURRENT ASSETS (39 + 45 - 53) | 3,725.83 | 575.88 | 3,853.63 | -163.60 | 4,634.66 | 1,612.27 | 8,321.61 | 805.38 | 1,696.09 | 99.24 | -55.25 | 31,205.97 | 56,311.72 |
| 55 | TOTAL NET ASSETS (23 + 24 + 30 + 54) | 14,000.27 | 4,373.93 | 31,111.62 | 1,620.24 | 25,810.16 | 16,206.64 | 12,519.97 | 4,848.79 | 38,280.55 | 10,132.80 | 11,105.92 | 36,265.56 | 206,276.45 |
| 56 | Total as at 30 June 2009 | 12,430.15 | 4,023.22 | 26,650.95 | 1,603.58 | 24,271.28 | 13,851.01 | 8,720.00 | 2,632.26 | 28,201.57 | 9,714.49 | 11,321.02 | 22,679.93 | 166,099.44 |

**Source: Petrobangla**

Income statement of Petrobangla group is outlined as follows:

According to the financial division of Petrobangla, the total gas sales to end customers is Taka 88,306 million, and 52% of the total gas sales is for Petrobangla group and 48% is for IOCs. Disbursement to IOCs is the sum of IOCs' gas purchase (Taka 36,415 million) and Price Deficit Fund (Taka 6,180 million).

Accordingly, the disbursement to Petrobangla group is Taka 45,919 million which is 52% of the total gas sales. From this disbursement to Petrobangla group, 55% is paid to the GOB as SD & VAT (Taka 21,540 million) which is almost the same as Taka 25,255 million by calculation (55% of Taka 45,919 millilon).

The detailed condition of tax payments depends on the contents of the PSC with IOCs, however IOCs should pay 15% value added tax (VAT) and/or 27.5% income tax. If IOCs pays 15% VAT on natural gas sales of Taka 42,386 million, the amount of VAT will be Taka 6,357 million.

Petrobangla group generates before tax profit and pay income tax at Taka 7,473 million. More over Petrobangla group pays dividends at Taka 4,768 million from after tax net profit.

Therefore, contribution to the national exchequer by the natural gas sector is at Taka 40,138 million including disbursement to the GOB at Taka 21,540 million, VAT of IOCs at Taka 6,357 million, income tax by Petrobangla group at Taka 7,473 million and dividend to national exchequer at Taka 4,768 million.

This amount of contribution is the same as 45% of total gas sales at Taka 88,306 million and 25% of total revenue at Taka 161,635 million. The GDP in 2009/10 was Taka 6,943,243 million. Accordingly Petrobangla group's contribution to GDP is 0.6% of GDP at current price and they supports national exchequer greatly.

**Table 3.1.35 GDP of Bangladesh**

**(Unit: million Taka)**

| Year | 2005/06 | 2006/07 | 2007/08 | 2008/09 | 2009/10 | Average GDP Growth (%) |
|---|---|---|---|---|---|---|
| GDP | 4,157,279 | 4,724,769 | 5,458,223 | 6,147,952 | 6,943,243 | 13.68 |

**Source: Sixth Five Year Plan**

Even though state owned enterprises of Petrobangla group contribute to the GOB, the GOB controls all activities of Petrobangla group. BERC has a right to set power &

energy tariffs under the law, however GOB still has a casting board to set the tariffs. And the GOB also holds the power to set the distribution rate of natural gas sales, payment amount of income tax and amount of dividends.

(2) Financial Conditions of Petrobangla's Affiliated Companies

The profit of each affiliated company is being improved by introducing the following new fund and margin:

- Gas Development Fund (GDF)
- Deficit Well Head Margin for BAPEX (DWMB)

However, finance condition of Petrobangla in the fiscal year 2009/10 has a huge deficit of Taka 32 billion in order to provide services to affiliated companies. In order to improve the financial situation, group companies require a further detailed review for the allocation of sales revenue. Hereinafter, finance situation of affiliated companies are evaluated. (refer to Appendix-8: Financial Statements of Petrobangla Affiliated Companies).

1) Exploration and Production Companies

BAPEX is the only natural gas exploration company in the Petrobangla group and also BAPEX is the production company. BAPEX should explore and develop a new gas fields since over-demand and supply shortage of natural gas. For this exploration and development purpose, BAPEX received new allocation of DWMB, and also BAPEX could receive the saved GDF. BAPEX is improving the ratio of ([total sales]/[fixed assets]) and the ratio reached 33% in 2009/10. BAPEX borrowed the long-term debt till 2009/10, however the financial situation will be better if BAPEX could use GDF.

BGFCL and SGFL are the natural gas production companies. The total-sales to fixed-assets ratio of SGFL shows relatively high, because of the small production, and small-investment to production facilities. On the other hand, BGFCL has a large production scale and large internal reserves. However, the finance situation of SGFL and BGFCL are good in condition.

2) Transmission Company

GTCL is the only natural gas transmission company among the Petrobangla group, and GTCL is receiving an allocation of gas transmission margin from gas sales. The average ratio of sales/fixed assets is stable at 18 percent. GTCL has a larger

equity capital for their country wide of gas transmission pipeline facility. And also the retained earning is huge. GTCL's financial situation is in good condition.

3) Distribution Companies

TGTDCL, BGSL, PGCL and JGTDSL are the natural gas distribution companies.

TGTDCL has a huge Dhaka City market that is the political and economical center and has a lot of industries, commercials and household. The ratio of total sales/fixed assets of TGTDCL is relatively high and stable because there are a lot of large scale of industries, variety of commerce businesses and many high-income families. TGTDCL is using long-term loan for investment in gas distribution pipeline network for stable gas supply in the market area.

JGTDSL market is stable and less utilizes the long-term loan among affiliated companies.

BGSL had a Chittagong division market that is the second largest market with 15% of the national market, and a new distribution company KGDCL was recently established in the BGSL market area. Therefore they invested for separating the distribution network as per divided service area using long-term debt a lot.

PGCL invested in the distribution network for future connection with gas transmission line. Therefore PGCL utilized long-term debt.

Concerning about the gas distribution companies, the financial conditions are very stable.

4) CNG Company

RPGCL is the sole manufacturer and distributor of CNG among Petrobangla Group. CNG market has grown significantly since CNG sales price kept lower price as compared to gasoline price. On the other hand, Government has gradually raised the CNG price from 2008 for the shortage of natural gas supply. Therefore, the ratio of total sales/fixed assets in 2009/10 of RPGCL is lowered for adjusting the CNG supply as compared to the previous year. In addition, RPGCL promoted CNG sales and invested in their facilities using long-term loan, therefore the long-term debt/fixed assets ratio is increased. However the financial condition of RPGCL is still good.

According to the ADB appraisal standard, all Petrobangla group companies keep the self financing ratio of 30%. And debt service ratio of SGFL, TGTDCL, BGSL and JGTDSL are also within the ADB standard. Petrobangla group as a whole, they are the

excellent group companies contributing to government exchequer and it is possible to meet with the ADB financial requirement by adjusting the profit distribution.

Petrobangla Group should invest in the development of new gas fields more intensively in order to ensure the demand and supply balance, and also they need to invest in the expansion of transmission and distribution pipelines. Therefore, further adjustment in the profit distribution among group companies is needed for balanced return on investment.

## 3.1.10 Participation of Private Sector in Natural Gas Sector

### 3.1.10.1 Investment Climate in Bangladesh

Private investment climate in Bangladesh is ranked at 122nd out of 183 countries in "Doing Business" by the World Bank (WB) and International Finance Corporation (IFC). The rank of this 122nd is reasonable.

**Table 3.1.36 Comparison of Investment Climate**

**(Unit: Rank as of 183)**

| No. | Items | Bangladesh | India | Pakistan | Sri Lanka | Nepal |
|---|---|---|---|---|---|---|
| | The Business Environment in Rank | 122 | 132 | 105 | 89 | 107 |
| 1 | Starting Business | 86 | 166 | 90 | 38 | 100 |
| 2 | Dealing with Construction Permits | 82 | 181 | 20 | 111 | 140 |
| 3 | Getting Electricity | 182 | 98 | 166 | 95 | 99 |
| 4 | Registering Property | 173 | 97 | 125 | 161 | 24 |
| 5 | Getting Credit | 78 | 40 | 67 | 78 | 67 |
| 6 | Protecting Investors | 24 | 46 | 29 | 46 | 79 |
| 7 | Paying Taxes | 100 | 147 | 158 | 173 | 86 |
| 8 | Trading Across Boarders | 115 | 109 | 75 | 53 | 162 |
| 9 | Enforcing Contracts | 180 | 182 | 154 | 136 | 137 |
| 10 | Resolving Insolvency | 107 | 128 | 74 | 42 | 112 |

**Source: Doing Business by WB and IFC in 2012**

The detailed evaluation of item (6), protecting of investors, ranked high at 24th out of 183, on the other hand item (9), enforcing contracts, ranked low at 180th. The item (3), getting electricity, is the worst rank in the world and dropped from 168th.and discourage the Investors.

The private investment in Bangladesh is coordinated by the Board of Investment (BOI). The investment in export processing zone (EPZ) is coordinated by Bangladesh Export

Processing Zone Authority (BEPZA). BOI and BEPZA set up attractive incentives for investor and thereby have attracted domestic and foreign investments.

Current investment priority projects are in all categories, except five negative projects like arms, etc. The investment incentives by BOI and BEPZA are applied to those priority projects, however, the BEPZA incentives expired at the end of 2011. After that only BOI incentives are applied to any investment.

The GOB newly formulated the economic zone (EZ) act in 2010 and established Bangladesh Economic Zone Authority (BEZA), the GOB wishes to promote EPZs and new EZs. BEPZA is a very new authority, and the detailed EZ functions are not established at this moment.

There are three types of investments, namely 100% foreign investment, joint venture between foreign and local entities and 100% local investment. Any type of investment is available for establishment of area development such as EPZ and EZ.
A build-operate-transfer (BOT) scheme or a public-private-partnership scheme which was recommended by ADB could be applied for investment in Bangladesh. Especially, the huge investment required for a transmission gas pipeline and LNG terminal project are welcome under the BOI rule.

The front end engineering design (FEED) is in process by Petrobangla for the LNG receiving terminal. This may promote private investment in gas sector, and the investment in gas distribution pipeline and its operation & maintenance in economic zones is also expected.

In the interview with BOI and BEPZA, they explained that they do not handle the investment in natural gas sector and that the promotion of investment in the natural gas sector is handled by Petrobangla. Generally speaking, area wide development and huge scale of development should be taken care by BOI which is directly connected to the prime ministers office. In Bangladesh, the GOB/BOI is recommended to deal directly with the investment in natural gas sector rather than entrusting it to Petrobangla.

### 3.1.10.2 Private Investment in Natural Gas Sector

The ADB's report, "Report and Recommendation of the President to the Board of Directors, Feb 2010. No.38164", proposes the following models for private investments, however there is no physical movement for these models as of now.

- Model 1: City Gas Distribution Model
  Gas tairff collection and gas sales distribution services for 25 years concession
- Model 2: Gas distribution and service contract model
  Gas meter-reading and gas tariff collection for non-bulk and domestic customers services for 5~10 years
- Model 3: LPG distribution & retailing model
  LPG bottling and distribution services at natural gas off-grid area
  (Similar service to CNG distribution system service)

### 3.1.10.3 International Oil Companies (IOCs)

Four IOCs (Tullow, Santos, Chevron and Niko) are evolved in exploration and production of natural gas from onshore and offshore fields under PSC with Petrobangla. The present activities and future plans of each IOC based on the information collected during the 1st and 2nd survey in Bangladesh are mentioned below:

(1) Tullow Bangladesh Ltd.

Tullow discovered Bangora/Laimai gas field in 2004, and is now producing natural gas from 4 wells at 105 mmcfd. Cumulative gas production at Dec 2009 was 99 bcf and the remaining gas reserve will be 522 bcf. This suggests that 19% of total reserves have already been produced. The Bangora/Laimai field gas production will be increased to 120 mmcfd in 2011 and this production rate will be flat till 2015, then gradually decrease to 50 mmcfd in 2020. Water production has started from this field and it may be required to convert one well to a water injection well without spending money to construct a water treatment facility for disposal. Sand production is also expected to start soon.

The 3D seismic survey on the new Bangura South structure has been completed and the seismic analysis is in progress in Dublin.

Offshore bidding round 2008: Tullow has won the shallow water PSC block (DSS-08-05), however, due to the maritime border dispute with India, the signing of the PSC is postponed.

(2) Santos Sangu Field Ltd.

Cairn Energy discovered the Sangu gas field in 1996 in offshore block 16. This was the first offshore gas field in Bangladesh. Sangu gas field is producing 37 mmcfd from 6 wells on Sangu offshore platform (water depth: 10 m). But the production had dropped from 160 mmcfd in the initial years to 37 mmcfd in 2010.

At the end of 2010, Santos acquired PSC Block-16 and Sangu gas field from Cairn Energy. Cumulative gas production at Dec 2009 was 466 Bscf and the remaining gas reserve is 304 bcf. This suggests that about 60% of total reserves have already been produced. The production rate will be flat at around 35 mmcfd till 2015, then gradually diminish and will die after 2020.

After taking over the Cairn's operation, Santos proposed to rationally increase gas prices to Bangladeshi policy makers and Santos won the right to sell their natural gas directly to private buyers at market price. After Santos got this free market gas rights, 3 well exploration programs began with a jack-up rig from the end of September 2011. The first well "Sangu South", which is located about 5 km south of the Sangu platform was spud in Sept. 2011. However, the well was abandoned due to the unexpected abnormal high pressure before reaching to the targeted depth.

The second well "Sangu-11" is in the new reservoir and drilling was in progress from the Sangu platform at the end of Dec. 2011.

The third well will be located 4 km north-east of Sangu platform. This prospect is called the "North-East Sangu". If this reservoir is successful, 6 slot jackets will be constructed and a 16 inch x 4 km pipeline will tie back to Sangu platform.

Santos's gas processing plant in Chilimpur on the outskirts of Chittagong has a handling capacity of 500 mmcfd of gas, and the pipeline to the Sangu Platform is 20" which has capacity to handle 700 mmcfd. Therefore even if all of these 3 exploration drilling are successful, Chittagong processing facility has enough capacity to process the gas from these gas platforms and the gas will be supplied directly to the Chittagong area.

Santos has a development plan for the Magnama and Hatiya prospects in the same block in the near future and a substantial quantity of additional gas will be available for Chittagong and the national grid, if Santos operations meet success.

(3) Chevron

Chevron currently holds interest in four producing PSC blocks in Bangladesh ( blocks 7, 12, 13 and 14) and the largest gas producing IOC operating company in Bangladesh.

Chevron's average gas output of around 975 mmcfd from three fields: Jalalabad, Moulavi Bazar and Bibiyana which are producing about 48 per cent of the country's total output of around 2,045 mmcfd in 2010.

- Bibiyana gas field ;
  Bibiyana gas field was discovered in 1998. The field is one of the most significant natural gas discoveries in Bangladesh in both quality and size of the reserve. The field produced 748 mmcfd from 12 wells in Dec. 2011 and there are plans to drill 6 development wells by 2013 with an expected additional 360 mmcfd production rate. A 3-D seismic survey was conducted to identify reserve potential in Bibiyana gas field in 2009, and the reserve redetermination study showed the field contains a much larger reserve than originally thought.

- Jalalabad gas field ;
  Chevron operates the Jalalabad gas field in Block 13 in northeastern Bangladesh. The field produced 159 mmcfd from 4 wells and there are plans to drill 3 development wells by 2013 with expected gas production of about 100 mmcfd.

- Moulavi Bazar gas field ;
  Chevron produces natural gas from the Moulavi Bazar Field in Block 14 in northeastern Bangladesh. The field produced 42 mmcfd from 4 wells and there are plans to drill 9 development wells by 2013 with an expected additional 540 mmcfd production rate but this is based on the well appraisal results.
  Chevron conducted a 3D seismic survey in Moulvibazar field in 2008.

- Exploring Block 7
  Chevron has a 43 percent interest in Block 7 in the southwest of Bangladesh. In 2010, Chevron attempted to drill an exploration well at Char-Kajol structure in Block-7. Unfortunately, this was a failure as the company found it "not economically viable."

(4) Niko

Due to the dispute between Niko Resources and Petrobangla over compensation for two gas blowout accidents at Tangratila in Sunamganji district in 2005, gas production from the Niko-BAPEX operated Feni Gas field in Block 15 was only 1.7 mmcfd down

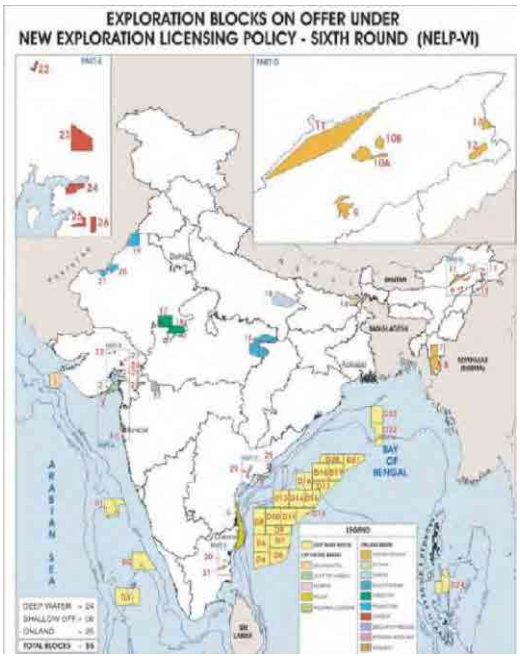
from 35 mmcfd in the initial years of production. The production has ceased recently. No gas evacuation plan will be undertaken unless this dispute is resolved.

(5) ConocoPhillips Bangladesh Exploration 10/11 Ltd. (Offshore bidding round-2008)

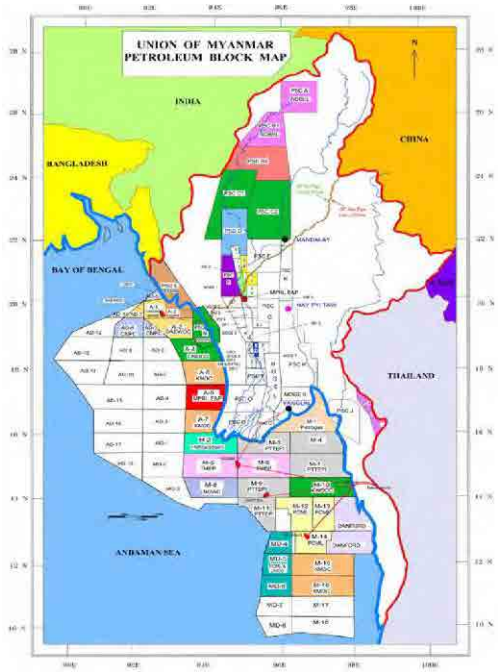
ConocoPhillips signed a production sharing contract with Petrobangla in June 2011 to explore in parts of the two deep sea offshore blocks (DS-08-10 and DS-08-11) that span a total area of 5,158 square kilometers, 200~250 km from Chittagong, where the water is 1,000~1,500 meters deep. But, ConocoPhillips can only explore 70% of DS-08-10 and 85% of DS-08-11 with the rest in limbo until Bangladesh resolves the maritime boundary dispute with India and Myanmar. Under the PSC, ConocoPhillips has up to nine years to carry out the exploration work; five years for the primary exploration, including a 1,000 km seismic survey and drilling of one well, and two extensions of two years each. ConocoPhillips plans to initiate seismic surveys in these two blocks in February 2012.

Bangladesh is trying to resolves the maritime boundary dispute with India and Myanmar. Bangladesh went to the UN body - United Nations Convention on the Law of the Sea (UNCLOS) - to settle the dispute.

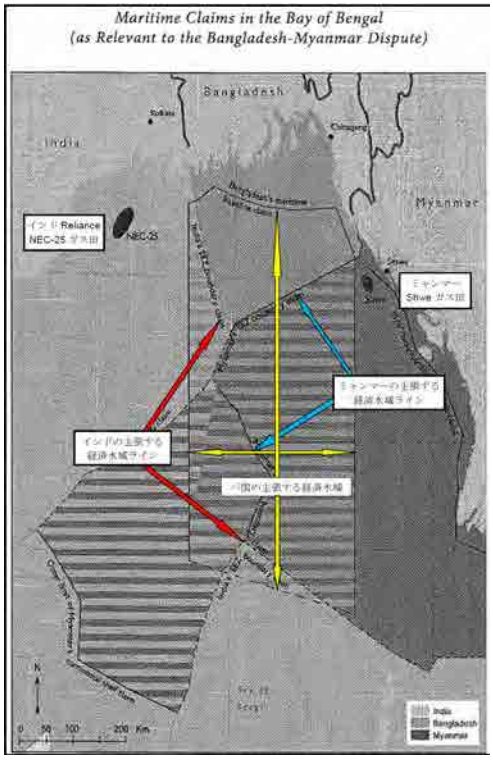
Figure 3.1.36 shows Exclusive Economic Zone: EEZ of India, Myanmar and Bangladesh.




Exploration Blocks of India




Exploration Blocks of Myanmar




Source：The Maritime Boundary Dispoue between Bangladesh and Myanmar.

The National Bureau of Asian Research, Seattle, Washinton July 2010

**Figure 3.1.36 EEZ (Exclusive Economic Zone) of India and Myanmar**

(6) Drilling plans by Gazprom

Russian gas giant conglomerate Gazprom and the GOB has nearly reached agreement (turn-key project) to drill about 10 wells by two Russian drilling rigs and crew. These 10 wells are ; 4 wells in Titas gas field for BGFCL, 1 well in Shahbazpur gas field for BAPEX, 2 wells in Semutang, 1 well in Sandalpur and 1 well in Rashidpur for SGFL.

(7) Joint venture project with CNPC in Chittagong Hill Tracts area (Block-22)

BAPEX is negotiating joint venture agreement with CNPC which is the biggest petrochemical conglomerate in China, to explore and develop in Chittagong Hill Tracts area (Block-22). They are now waiting GOB approval. CNPC will provide the drilling rig, personnel, equipment and consumables.

(8) Offshore bidding round 2011

Petrobangla is waiting GOB approval for the offshore bidding round-2011 which was originally scheduled in June 2011. Time of bidding, number of blocks and a model contract are not announced yet.

Figure 3.1.37 shows Bangladesh PSC Blocks Status in 2011.

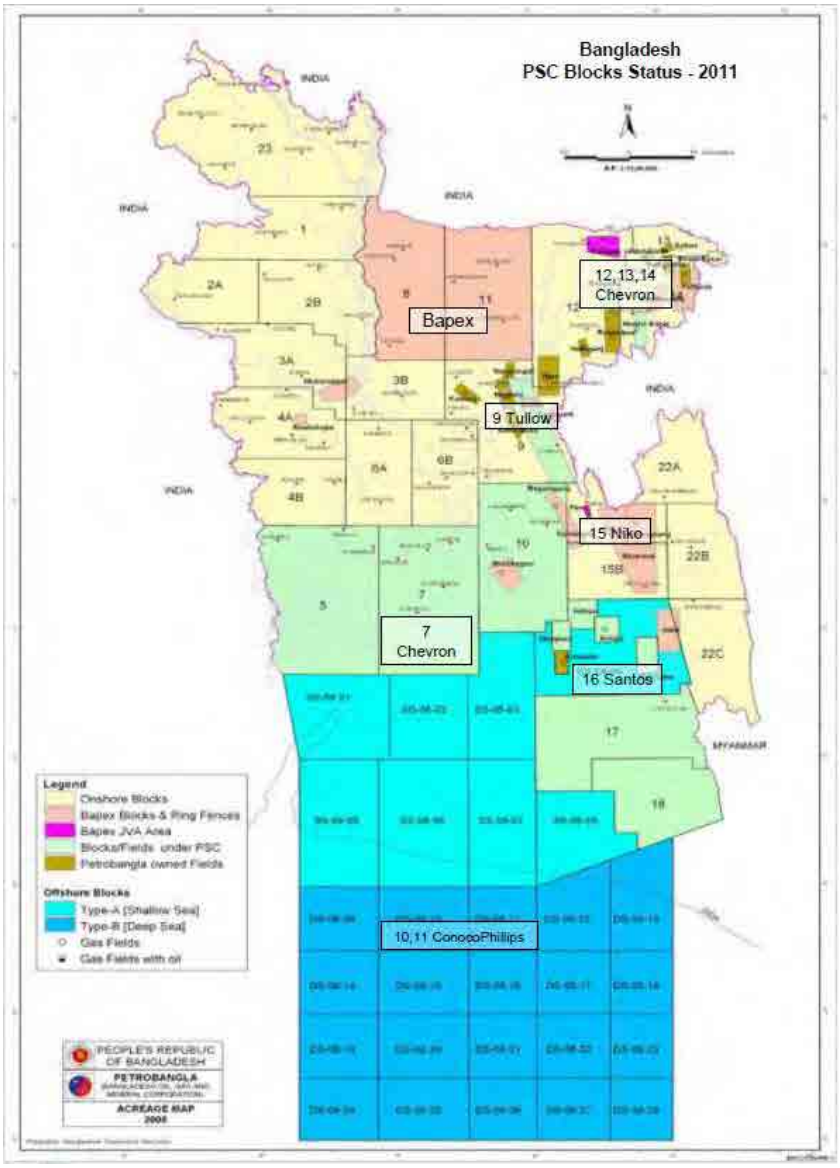



**Figure 3.1.37 Bangladesh PSC Blocks Status in 2011**

## 3.2 Gas Sector Development Progress & Challenge Analysis

### 3.2.1 Current Status of Gas Sector Development

#### 3.2.1.1 Organization and Gas Price

Organizational reform and gas price reform correlate with each other. As mentioned in section 3.1.3.2, the revenue from the gas sales are distributed to State-owned Gas Companies (SOGCs) at fixed rates as their margins, and their margins are insufficient for the proper investment and maintenance activities.

In order to get out of such situation, the gas price should be raised to provide greater autonomy and financial independence to SOGCs.

The Gas Sector Master Plan 2010 proposes the domestic gas selling price should be equalized to the replacement fuel price in five years (2006-2010), however, the price was raised only once at 8~15% in 2009 except for the price of CNG as shown in the table below.

**Table 3.2.1 Recent Natural Gas Tariff Increase**

TAKA/MCF

| | Effective | Power | Fertilizer | Industry | Commer-cial | Tea Estate | Cap. Power | CNG Feed Gas | Brick Field | Domestic | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | Metered | Single | Double |
| | 01/09/2002 | 70.00 | 60.00 | 140.00 | 220.00 | 140.00 | 100.00 | - | 220.00 | 120.00 | 325.00 | 375.00 |
| | 15/02/2003 | - | - | - | - | - | - | 70.00 | - | - | - | - |
| | 01/07/2004 | 72.45 | 62.15 | 145.20 | 228.50 | 145.20 | - | - | 228.50 | 126.10 | 340.00 | 390.00 |
| | 01/09/2004 | - | - | - | - | - | 103.50 | - | - | - | - | - |
| GSMP2006 → | 01/01/2005 | 73.91 | 63.41 | 148.13 | 233.12 | 148.13 | 105.59 | - | 233.00 | 130.00 | 350.00 | 400.00 |
| | 25/04/2008 | - | - | - | - | - | - | 282.30 | - | - | - | - |
| | 01/08/2009 | 79.82 | 72.92 | 165.91 | 268.09 | 165.91 | 118.26 | - | - | 146.25 | 400.00 | 450.00 |
| | 12/05/2011 | - | - | - | - | - | - | 509.70 | - | - | - | - |
| | 19/09/2011 | - | - | - | - | - | - | 651.29 | - | - | - | - |
| | Price Increase ratio since 2006 | 8.0% | 15.0% | 12.0% | 15.0% | 12.0% | 12.0% | 830.4% | 0.0% | 12.5% | 14.3% | 12.5% |

The price reform has not progressed well due to the strong resistance of the public. Domestic gas selling price on average as of April 2011 was US$1.31/mmbtu according to Petrobangla, while LNG spot import price (FOB) is US$17~18 and crude oil price is US$19/mmbtu (US$108.5/barrel) as of December 2011. Natural gas price in Bangladesh is still far below the international market price of replacement fuel.

### 3.2.1.2 Demand Side Management

(1) Introduction of Alternative Energy

As mentioned in section 3.1.1, the dependence on natural gas is quite high in Bangladesh, and the promotion of alternative energy has not progressed so far.

Also as mentioned in section 3.1.2.2, the current National Energy Policy is outdated, and it seems that there is no specific policy or plan that guides how to promote alternative energy in Bangladesh except for the import of LNG

As mentioned in section 3.1.4.2, the Renewable Energy Policy was published in 2008 and it shows the specific goals for the introduction of renewable energy, however the share of renewable energy is still very low and it may not contribute much to solve the energy crisis.

(2) Energy Saving Activities

As mentioned in section 3.1.4.4, there are some movements for energy saving such as introduction of gas meters and high efficiency appliances. However the energy saving awareness is still very low and it should be improved by an aggressive policy and enlightenment.

(3) Correlation with Gas Price

Gas price reform is indispensable to promote alternative energy. Alternative energy will not be promoted unless the low domestic gas price is equalized to the same level as the alternative energy price. Further, a proper gas price will encourage the efficient use of energy.

However, as mentioned in the previous section, the gas price reform has not progressed well so far.

### 3.2.1.3 Gas Reserves

In the near-term priorities (2006-2008) of the Gas Sector Master Plan, an additional 16 to 33 TCF of gas needs to be discovered over the next 10 years based on the 2P reserves planning case. This will require an investment of approximately US$ 8 billion, which will entail deciding which blocks will remain under BAPEX’s control, reviewing licensing terms, preparing a new open, transparent, competitive licensing round, and reviewing the exploration work approval process.

However, the target is far from being reached as follows.

New exploratory wells are few and exploration activities are not very active in Bangladesh, as mentioned in the section 3.1.5.1. Petrobangla disclosed that BAPEX recently (August 2011) discovered a new gas field at Sundalpur in Noakhali district south of Dakka. The gas reserve of this field is about 0.5 TCF (unofficial information from Petrobangla) and the size of the gas field is small.

Although transparency and speed-up are needed regarding procedures for tenders or contracts, the situation in which little progress is made still continues.

The survey team forecast on natural gas production up to 2030 is mentioned in the section 3.1.5.3. The amount of gas production is estimated 19.2 TCF from 2011 to 2030, approximately 2.2 TCF after 2031, and 21.4 TCF in total (Table 3.2.2). Meanwhile, the remaining recoverable reserves (1P + 2P) as of December 2010 by HCU / GA is 18.6 TCF. The difference between these estimates is about 2.8 TCF, therefore the gas production can be achieved sufficiently and additional reserves can be expected, compared to near-term priorities of Gas Sector Master Plan.

In order to add recoverable reserves certainly, field growth in and around the existing gas fields, and exploration for new area will be required. Although expected reserves in the field growth are not so large, the development cost and exploration risk are low since infrastructures such as a production facility and pipeline and gas fields are existing. In the exploration for new area, it may be able to add big reserves, although the cost is high because of no or few infrastructure and the exploration risk is high,

In order to perform exploration and development effectively in the future, it is required to conduct 2D and/or 3D seismic survey and to drill exploration, appraisal and development wells based on these interpretation results. Also, it is required to combine the field growth development and new exploration properly, and to strive for the addition of recoverable reserves.

**Table 3.2.2 Natural gas production forecast and remaining recoverable reserves**

| Year | Petrobangla (MMcfd) | IOC (MMcfd) | Total Production (MMcfd) | Annual Production (TCF) |
|---|---|---|---|---|
| 2011 | 1,140 | 1,128 | 2,268 | 0.83 |
| 2012 | 1,390 | 1,498 | 2,888 | 1.05 |
| 2013 | 1,520 | 1,798 | 3,318 | 1.21 |
| 2014 | 1,565 | 2,051 | 3,616 | 1.32 |
| 2015 | 1,615 | 2,248 | 3,863 | 1.41 |
| 2016 | 1,880 | 2,538 | 4,418 | 1.61 |
| 2017 | 1,922 | 2,362 | 4,284 | 1.56 |
| 2018 | 1,939 | 2,004 | 3,943 | 1.44 |
| 2019 | 1,884 | 1,688 | 3,572 | 1.30 |
| 2020 | 1,841 | 1,446 | 3,287 | 1.20 |
| 2021 | 1,768 | 1,177 | 2,945 | 1.07 |
| 2022 | 1,632 | 986 | 2,618 | 0.96 |
| 2023 | 1,514 | 833 | 2,347 | 0.86 |
| 2024 | 1,408 | 653 | 2,061 | 0.75 |
| 2025 | 1,227 | 557 | 1,784 | 0.65 |
| 2026 | 1,074 | 437 | 1,511 | 0.55 |
| 2027 | 957 | 281 | 1,238 | 0.45 |
| 2028 | 678 | 258 | 936 | 0.34 |
| 2029 | 609 | 254 | 863 | 0.31 |
| 2030 | 561 | 251 | 812 | 0.30 |
| Expected production from 2011 to 2030 (TCF) | | | | 19.2 |
| Expected production after 2031(TCF) | | | | 2.2 |
| Remaining reconerable reserves (P1+P2) by HCU/GA as of 12/2010 (TCF) | | | | 18.6 |

### 3.2.1.4 Natural Gas Exploration & Production

Major challenges in gas exploration and production are as follows:

- Effort to maintain gas production rate by state-owned gas production company
- Effort to increase gas reserves by seismic works, development and production well drilling
- Strengthen of BAPEX; BAPEX is the only company that can perform seismic surveys and processing, exploration drilling, development drilling, and workover jobs in Bangladesh. BAPEX performance will influence the success of the gas sector.
- Give more incentives to IOC's to increase production such as increasing PB's gas purchasing price to an internationally acceptable price level and providing the freedom in selling gas to customers.
- Expedite the next offshore and onshore bidding, especially for the shallow water blocks.

(1) In order to correctly comprehend the present status and past histories of the state-owned gas production companies, the biggest five gas fields, Titas, Bakhrabad, Habiganj, Kailashtila and Rashidpur are examined as below:
(All well data are collected from PB's Web Site : "Chronological list of exploration wells and appraisal/development wells" and "Introducing Petrobangla")

■ Titas gas field : History of the development drilling and workover;

| Titas Well No. | Completion Date | Present Status | Workover Record |
|---|---|---|---|
| 1 | 1st Nov.-1962 | Flowing | No major W/O |
| 2 | 6th Jan.-1963 | Flowing | No major W/O |
| 3 | 8th Sep.-1969 | Plugged & Abandoned due to gas leak | Abandoned |
| 4 | 30th Oct.-1969 | Flowing | No major W/O |
| 5 | 6th Jan.-1981 | Flowing | No major W/O |
| 6 | 11th Oct.-1983 | Flowing | No major W/O |
| 7 | 17th Mar.-1985 | Flowing | No major W/O |
| 8 | 28th Sep.-1985 | Flowing | No major W/O |
| 9 | 20th Jan.-1988 | Flowing | No major W/O |
| 10 | 29th May-1988 | Flowing | No major W/O |
| 11 | 27th April-1990 | Flowing | No major W/O |
| 12 | 22nd Aug.-1999 | Flowing | No major W/O |
| 13 | 2nd Dec.-1999 | Flowing | No major W/O |
| 14 | 11th mar.-2000<br>Re-completion date : 11th Sept.- 2000 | Flowing | Once major W/O |
| 15 | 14-May-06 | Flowing | No major W/O |
| 16 | 17-Dec-05 | Flowing | No major W/O |

Titas gas field is producing 438.3mmcfd from 15 production wells and Titas is the biggest PB's gas field. Only one workover job to abandon gas leak well no. 3 in 2008 and one workover job on well no. 14 were done in 49 year history of Titas gas field. Not enough workover jobs have been conducted to maintain production rate and collect reservoir data for the gas reserve maintenance. Some wells have never been worked over in more than 50 years. No well drilling has been done between 2000 and 2005. No new drilling work has been done since 2006.

■ Bakhrabad gas field : History of the development drilling and workover

| BKB Well No. | Completion Date | Present Status | Workover Record |
|---|---|---|---|
| 1 | 9th June-1969 | Flowing | No major W/O |
| 2 | 13th Oct.-1981 | Flowing | Once major W/O |
| 3 | 16th April-1982 | Flowing | No major W/O |
| 4 | 23rd June-1982 | Closed | No major W/O |
| 5 | 27th Sep.-1982 | Closed | No major W/O |
| 6 | 4th Mar.-1989 | Closed | No major W/O |
| 7 | 9th July-1989 | Flowing | No major W/O |
| 8 | 22nd Sep.-1989 | Flowing | No major W/O |

Bakhrabad gas field is producing 33.1 mmcfd from 5 production wells. Wells number 4, 5 and 6 are not producing due to high water cut, but workover jobs are not planned to avoid water production. Well no. 1 has been producing for over 40 years but no workover work has been done. No new development wells have been drilled since well no. 8 in 1989.

■ Habiganj gas field : History of the development drilling and workover on

| HBG Well No. | Completion Date | Present Status | Workover Record |
|---|---|---|---|
| 1 | 24th June-1963 | Flowing | No major W/O |
| 2 | 21st Nov.-1967 | Flowing | No major W/O |
| 3 | 23rd may-1985 | Flowing | No major W/O |
| 4 | 26th Jan.-1985 | Flowing | No major W/O |
| 5 | 31st Jan.-1989 | Flowing | No major W/O |
| 6 | 17th Jan.-1990 | Flowing | No major W/O |
| 7 | 23rd April-1999 | Flowing | No major W/O |
| 8 | 15th Jan.-1999 | Closed | No major W/O |
| 9 | 16th July-1998 | Closed | No major W/O |
| 10 | 15th Aug.-1999 | Flowing | No major W/O |
| 11 | 05th Jan-2008 | Flowing | No major W/O |

Habiganj gas field is producing 257.9 mmcfd from 9 wells and is the second biggest gas field in PB. Habiganj-8 and 9 are not producing due to the high water cut and no workover jobs are planned for these two wells. Well no. 1 was drilled 40 years ago but no major workover job has been conducted.

■ Kailashtila gas field : History of the development drilling and workover

| KTL Well No. | Completion Date | Present Status | Workover Record |
|---|---|---|---|
| 1 | Jun-83 | Flowing | No major W/O |
| 2 | 1988 | Flowing | No major W/O |
| 3 | 1988 | Flowing | No major W/O |
| 4 | 1996 | Flowing | No major W/O |
| 5 | 2007 | Closed due to water cut | No major W/O |
| 6 | 2007 | Flowing | No major W/O |

Kailashtila gas field is producing 77.5 mmcfd from 6 wells and is PB's third biggest gas field in the country. Well no. 5 is not producing due to excessive water and workover of this well is planned in 2012. Well no. 1 was drilled 28 years ago but no major workover job has been done. From 1996 till 2007 no development drilling has been done.

■ Rashidpur gas field : History of the development drilling and workover

| RP Well No. | Completion Date | Present Status | Workover Record |
|---|---|---|---|
| 1 | 1960 | Flowing | No major W/O |
| 2 | | Closed due to water cut | No major W/O |
| 3 | 1989 | Flowing | No major W/O |
| 4 | 1989 | Flowing | No major W/O |
| 5 | 1997<br>Workover Sept.- 2010 | Flowing | |
| 6 | 1997 | Flowing | No major W/O |
| 7 | 1997 | Closed due to water cut | No major W/O |

Rashidpur gas field is producing 48.1 mmcfd from 5 production well. Well no. 2 and 7 are not producing due to high water cut. Workover on well no. 7 is planned in 2012 but well no. 1 has not had any workover in over 50 years. No new development drilling has been done since 1997.

In these PB's 5 biggest gas fields in Bangladesh, proper maintenance and management have not been carried out for a long time, and very little new development work has been undertaken despite the acute gas shortage situation in Bangladesh. This is due to the fact that the exploration and development work have been done only by BAPEX with the limited quality and performance of their equipment and personnel.

The following is the list of drilling and workover rigs owned by BAPEX:

1) 32 years old - P-80 Workover Rig (Mechanical), Rumanian Made
2) 28 Years old - IDECO H-1700, USA made
3) 22 years old - Gardner Denver E-1100, USA made
4) 2000 HP AC-AC, Drilling rig, Chinese made (purchased in 2010)
5) Trailer mounted Workover Rig, Chinese made (purchased in 2010)

Out of the above 5 listed rigs, only one drilling rig is capable of directional drilling for the exploration and the development work and only one rig is suitable for efficient workover jobs.
Only four workover jobs were carried out in past eight years from 2001 to 2008, however, nine workover job were recently carried out in two years from 2009 to 2010. This significant improvement is due to the newly purchased rig performance.

The procurement of a new rig was approver by the GOB in 2003. However, the rig was finally purchased in 2010 after repeated biddings (6 times). Therefore the bidding process has to be open to avoid such non-productive time.

Another reason for the inefficient drilling is the Monsoon season. Most of the gas fields are submerged during this season and all drilling work or transportation must be halted in many gas producing fields in Bangladesh.

For the seismic survey work, only BAPEX has equipment and crew. Three dimensional (3D) survey equipment was purchased by BAPEX with ADB assistance, and 3D survey work is in progress at 5 fields, Rashidpur、Kailashtila、Sylhet、Bakhrabad and Titas.
BAPEX currently owns one set of 3D survey equipment, and they may need to purchase one more set for better survey work progress.

Seismic survey is also affected by the Monsoon season, and the work has to be halted and this will reduce the performance of the work.

(2) Incentive to IOCs

IOC's gas sales prices to PB is around US$2.7/Mcf, while the gas price in USA is around US$ 3.5～5/Mcf and the gas price in Europe is around US$ 15/Mcf. IOC's price is far below the world market price.

IOC’s gas sales price should be raised to encourage the participation of IOCs in gas exploration and production.

(3) Model Production Sharing Contract of the Offshore Bidding Round 2008

The Model Production Sharing Contract 2008 was the base model of the last Offshore Biding Round-2008. Model contracts are normally negotiated and modified, clause by clause, word by word by Petrobangla and IOC before the signing the contract. Therefore, the detail of the contract with ConocoPhillips was not made in public.

The following articles of gas purchasing price and bonuses in the Model Production Sharing Contract 2008 may be too strict for IOC to explore Bangladesh's deepwater offshore area which are still unexplored area and will require a high risk to IOC;

1) Article-15, Natural Gas, Clause-15.7, (i), (d) : gas purchasing price articles.
2) Article-20, Fees and Bonuses, Clause-20.1 : Discovery Bonus
   Within thirty (30) days after either the Date of Declaration of each Commercial Discovery of Oil or Gas in the Contract Area or approval of a Development Plan for Gas Field, Contractor shall pay Petrobangla Discovery Bonus of three (3) million Dollars.
3) Article-20, Clause 20.3 : Production Bonuses
   Contractor shall pay to Petrobangla the following Production Bonuses for Gas after a period of thirty (30) consecutive producing days, within thirty (30) days after the first date when the total average daily production of Gas each field separately from the Contract Area has been sustained at the rate of:
   a) 75 MMCF/day, the sum of amount 500,000 Dollars ($).
   b) 150 MMCF/day, the sum of amount 1,000,000 Dollars ($).
   c) 225 MMCF/day, the sum of amount 2,000,000 Dollars ($).
   d) 300 MMCF/day, the sum of amount 2,500,000 Dollars ($).
   e) 375 MMCF/day, the sum of amount 3,000,000 Dollars ($).
   f) 600 MMCF/day, the sum of amount 4,000,000 Dollars ($).

The offshore exploration and development in Bangladesh's deepwater will require the huge amount of investment with high risks to IOC. Therefore, the Model Production Sharing Contract 2008 shall be relaxed and give more incentives to IOC to the next offshore bidding.

(4) Expedite next offshore bidding round 2011;

The offshore bidding round 2008 was announced in February 2008 with 20 deep sea blocks and 8 shallow water blocks. Only six oil and gas companies submitted their bids for 16 out of 28 offshore blocks. In August 2009, GOB approved the award of two deepwater offshore gas blocks (Block no. 10 & 11) to ConocoPhillips and one shallow water block (Block no. 5) to Tullow for oil and gas exploration in the Bay of Bengal. Both firms needed to avoid exploring areas in maritime dispute, because of overlaps with those of neighboring countries India and Myanmar.

During and after the political turmoil in 2008, not much progress were made for PSC selection. In June 2011, GOB signed the PSC with ConocoPhillips on the two blocks without the disputed areas of the two blocks and ConocoPhillips agreed to conduct exploration work in 30 percent and 15 percent areas in block 10 and 11 respectively. But, PSC with Tullow was suspended due to the most of the block is in the disputed area with India.

It took almost 3 years to select and sign PSC with only one contract, and this is due to the maritime dispute and due to the political turmoil.

Offshore bidding round 2011 is prepared by Petrobangla and this is the fourth international bidding after 2008. Since the PSC section of Petrobangla is waiting GOB's approval for the bidding documents, no information is in public yet. It is expected that this bidding will proceed without much problem as 2008 because the bidding area will be selected in only undisputed Bangladesh waters.

#### 3.2.1.5 Natural Gas Transmission

Table 3.2.3 shows a comparison between the actual status of pipeline reinforcement projects and planned projects in the "Gas Sector Master Plan 2006".

## Table 3.2.3 Plan and Current Status of Pipeline Reinforcement Projects

| Items | | | GSMP | GEP * | Obseervation 2011 | | |
|---|---|---|---|---|---|---|---|
| No. | Planned project | Description | End | End | Project Status at Sep. 2011 | Fund | expected completion |
| 1 | Dhanua - Aminbazar | 50km, 20" | 2006 | | done | | |
| 2 | Ashuganj - Monohordi | 36km, 30" | 2006 | | done | | |
| 3 | Monohordi - Dhanua | 37km, 30" | 2008 | | ongoing | ADB | 2012 |
| 4 | Elenga - Jamuna Brdg. | 14km, 30" | 2008 | | ongoing | ADB | 2012 |
| 5 | Hatikumrul - Bheramara | 87km, 24/30" | 2009 | | ongoing | ADB | 2012 |
| 6 | Bonpara - Rajshahi | 53km, 12" | 2009 | | ongoing | ADB | 2012 |
| 7 | Bheramara - Khulna | 165km, 20" | 2010 | | ongoing | ADB | 2013 |
| 8 | Compressor at Ashganj west | 2 X 15000hp | 2008 | | ongoing | ADB | 2014 |
| 9 | Compressor at Ashganj south | 1 X 15000hp | 2008 | | ongoing | ADB | 2014 |
| 10 | Compressor at Muchai | 1 X 15000hp | 2008 | | ongoing | PCS | 2012 |
| 11 | Compressor at Elenga | 1 X 15000hp | 2009 | | ongoing | ADB | 2014 |
| 12 | Piggin program | | | | not implemented yet | | |
| 13 | Muchai to Ashuganj (2nd line) | 82km, 30" | 2011 | | done | | |
| 14 | Bakhrabad to S/SW | 224 km, 24" | 2013 | 2013 | partially ongoing as Bakhrabad - Siddhirganj (60 km, 30")<br>partially planned as Langalband - Maowa (40 km, 30")<br>partially planned as along Padma Bridge<br>partially planned as Zajira - Khulna (110 km, 30") | IDA<br>-<br>-<br>- | 2013<br>2014<br>2013<br>2017 |
| 15 | Bakhrabad to Chittagong | 178km, 30" | 2012 | | partially planned as Bakhrabad - Feni (91 km, 30")<br>no plan but estimated as Feni - Chittagong | -<br>- | 2017<br>2025 |
| 16 | Compressor at Muchai | 2 X 15000hp | 2014 | | not planned at Sep. 2011 | | |
| 17 | Ashagani - Elenga (2nd line) | 125km, 30" | 2015 | | not planned at Sep. 2011 | | |
| 18 | Elanga west (2nd line) | 91km, 30" | 2017 | | no plan but estimated as East bank of Jamuna brigde - Nalka | | 2025 |
| 19 | Compressor at Bakhrabad to S/SW | 2 X 15000hp | 2019 | | not planned at Sep. 2011 | | |
| 20 | Muchai to Ashganj (3rd line) | 82km, 30" | 2020 | | not planned at Sep. 2011 | | |
| 21 | Ashagani - Elenga (3rd line) | 125km, 30" | 2021 | | not planned at Sep. 2011 | | |
| 22 | Compressor at Bakhrabad to Chittagong | 2 X 15000hp | 2023 | | not planned at Sep. 2011 | | |
| 23 | Khatihata - Bhadugar | 12km, 24" | | 2012 | not planned at Sep. 2011 | | |
| 24 | Maheshkali - Anowara | 91km, 30" | | 2012 | project ongoing for LNG | GOB/ GTCL | 2013 |
| 25 | Dhanua - Elenga | 52km, 30" | | 2013 | planned but no fund. Estimated completion on 2025 | | 2025 |
| 26 | Bangarbandhu Bridge West - Nalka | 14km, 30" | | 2013 | planned but no fund. | | |
| 27 | Jalalabad Gas Field - Kailashtila | 18km, 14" | | 2014 | not planned at Sep. 2011 | | |
| 28 | Bibiyana - Dhanua | 150km, 30" | | 2013 | ongoing (size change to 30") | GOB/ GTCL | 2013 |
| 29 | Mubarakpur - Baghabari | 30km, 12" | | 2011 | not planned at Sep. 2011 | | |
| 30 | Kapasia - Amraid | 4km, 12" | | 2011 | not planned at Sep. 2011 | | |
| 31 | Sundarpur - Feni | 30km, 12" | | 2010 | not planned at Sep. 2011 | | |
| 32 | Monohordi - Joydevpur | 52km, 20" | | 2015 | not planned at Sep. 2011 | | |
| 33 | Moulvibazar - Muchai | 22km, 14" | | 2015 | not planned at Sep. 2011 | | |
| 34 | Ashganj - Bakrabad | 60 km, 30" | | | ongoing | GOB/ GTCL | 2013 |

*1: Gas Sector Master Plan (2006)

*2: Gas Evacuation Plan (2010)

*3: Planned as Langalband - Maowa - Jajira (60km, 30") instead of the plan in GSMP.

The table shows that all projects run behind schedule.

The "Gas Evacuation Plan 2010-15" which was issued after the "Gas Sector Master Plan 2006" points out the revised and additional pipeline reinforcement projects. Current status of those projects is reflected in the Gas Evacuation Plan.

### 3.2.1.6 Natural Gas Distribution

(1) System Loss

The "Third Natural Gas Development Plan" completed in 2003 confirmed that the natural gas system loss of BGSL and JGTDSL was less than 2 %. The system loss of TGTDCL ranged 6 to 9%. Thus the "System Loss Reduction Plan" for TGTDCL was started under ADB support as mentioned in the "Gas Sector Master Plan 2006".

The "Gas Transmission and Development Project" planned after the "Gas Sector Master Plan 2006" indicated that the system loss was reduced to 4% in 2007 and 2% in 2010.

Table 3.2.4 below shows the status of the "System Loss Reduction Plan"

**Table 3.2.4 Status of System Loss Reduction Plan**

| | Planned description | Status |
|---|---|---|
| Period: | July 2006 to June 2010 | Extended to June 2011 |
| Area: | Location 1 (Narayanganj, Fatulla, Munshiganj) and Location 2 (Sonargaon) | |
| Action: | · Procurement and installation of 604 nos. of Turbine and Rotary Meters equipped with Electronic Volume Corrector (EVC) | · Contract with M/S Actaris Singapore and meters are procured |
| | · Procurement of 5 nos. of Mobile Meter Calibration Units for onsite meter calibration | · - ditto - |
| | · Appointment of International and National Consultants for operational and management aspects of System Loss Reduction. | · Contract with Fichtner GmbH & Co. KG. German |

Table 3.2.5 below shows the annual system loss of distribution companies since 2004. Among others, the system loss of TGTDCL has been decreased remarkably by the implementation of the "System Loss Reduction Plan".

System gains which are indicated as minus figures are mainly due to the following reasons;

- Low pressure situation causes less supply than billing volume

- Less consumption than the minimum charge volume

**Table 3.2.5 Annual System Loss (%)**

| | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|---|---|
| TGTDCL *1 | N/A | N/A | 6.47 | 5.26 | 3.39 | 0.81 | -2.14 |
| BGSL | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| JGTDSL *1 | -0.29 | -0.6 | 1.15 | 0.52 | 1.08 | 0.41 | 1 |
| PGCL *1 | N/A | N/A | N/A | 0 | 0 | 0 | 0 |
| Total loss *2 | 5.58 | 5.97 | 5.2 | 4.79 | 2.73 | 1.47 | 1.00 |

*1: Data from Annual Report

*2: Calculated through Petrobangla Annual Report 2010

(2) System Efficiency

According to the TGTDCL annual report, “Domestic” customers use unmetered gas. They can use gas without reference to actual consumption. Some customers also use gas in unauthorized appliances. This kind of gas consumption is inefficient, and also liable to produce system losses.

Thus the project, “Supply Efficiency Improvement of TGTDCL” has been implemented supported by ADB and the GOB. A loan agreement was signed between ADB and the GOB on 30 June 2011.

The following activities will be undertaken;

| | |
|---|---|
| Duration: | To October 2012 |
| Activities: | ✓ Design, supply, installation, testing & commissioning of 8,600 nos. of Domestic/Commercial Pre-paid gas meters |
| | ✓ Design, supply, installation, testing & commissioning of 680 nos. of Remote metering system |
| | ✓ Employment of Consultant |

A proposal to undertake a pilot project for Installation of Pre-Paid Meter in order to examine the feasibility of introducing pre-paid metering arrangement for domestic customers was approved by the TGTDCL Board of Directors on 03 August 2009.

This project which has been undertaken by TGTDCL planned to purchase 5,000 meters and install 4,500 meters.

Successful results have been obtained from the trial meters 339 pre-paid meters that have been installed up to 30 June 2011.

The meter supplier failed to supply the meters as per the contract, therefore this project has been extended. Thus 4,500 numbers of meters were expected to be installed within November 2011.

## 3.2.2 Challenges in Natural Gas Sector Development

### 3.2.2.1 Challenges of Natural Gas Sector Identified

As a result of data collection and analysis, challenges of the natural gas sector and main causes of the challenges are identified as follows:

(1) Deficient gas supply from state-owned production companies due to the delay of new gas field development as well as the delay in the production increase from existing gas fields
- Shortage of funds for development (insufficient staff and equipment)
- Insufficient ability of development planning
- Outdated technologies for the development

(2) Delay of the commencement of gas exploration and production by IOCs due to the prolonged conclusion of PSC
- Maritime dispute with India and Myanmar is not settled yet
- Condition of PSC which does not encourage IOC's investment

(3) Regional gas supply gap due to the delay of the expansion of gas pipeline systems in the north-west of the country
- Shortage of fund
- Insufficient maintenance of pipeline network system

(4) Delayed gas price reform which will affect the national finance in future when the natural gas produced in Bangladesh is diminished while the natural gas and petroleum produced in foreign countries is imported at international price
- Strong resistance from the nation against the hike of gas price
- Unclear gas pricing mechanism especially for the upstream side
- Incomplete contract for sale between state-own gas companies

(5) Inefficient use of natural gas
- Low gas price

- Insufficient replacement of old and inefficient plants and appliances
- Awareness for energy saving is still low in Bangladesh.
- Insufficient management in the gas distribution system (e.g. lack of metering)

(6) Low effectiveness of development plans assisted by financing agencies as follows
  - Update of the National Energy Policy as well as Gas Sector Master Plan is still incomplete.
  - Gas price is still far below the international market price of replacement fuel, and there is no clear plan for this issue.
  - Delays are found even in the plans mentioned in the Gas Sector Reform Roadmap (2009-2012)
- Lack of institutional capacity such as;
  - Inadequate capacity to develop, implement and operate projects
  - Inadequate policy making and planning
  - Corporate governance and transparency issues
- Insufficient leadership of the government to realize the vision of the natural gas sector

#### 3.2.2.2 Measures to Overcome the Challenges of Natural Gas Sector

Bangladesh government needs to overcome these challenges of natural gas sector to escape from the recent energy crisis and to realize sustainable energy supply. Table 3.2.6 shows the measures to overcome the challenges with their priority order, effectiveness and expected schedule.

ADB Technical Assistance (TA 7758) named as "Tariff Reform and Inter-sectoral Allocation of Natural Gas", which relates to .Item D-2) and D-3) in Table 3.2.6, has not been activated yet.

## Table 3.2.6 Measures to Overcome the challenges that should be addressed by the Government of Bangladesh

| Measures to Overcome the Challenges | Priority | Effect | 2012 | | | | 2013 | | | | 2014 | | | | 2015 | | | | 2016 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | q1 | q2 | q3 | q4 | q1 | q2 | q3 | q4 | q1 | q2 | q3 | q4 | q1 | q2 | q3 | q4 | q1 | q2 | q3 | q4 |
| **A. Exploration and Production** | | | | | | | | | | | | | | | | | | | | | | |
| 1) Increase of gas reserve by exploration and drilling | 1 | Sup. increse | | | | | | | | | | | | | | | | | | | | |
| 2) Increase of gas supply from existing gas fields | 1 | Sup. increse | | | | | | | | | | | | | | | | | | | | |
| 3) New gas field development of SOGs | 1 | Sup. increse | | | | | | | | | | | | | | | | | | | | |
| 4) New gas field development of IOCs | 1 | Sup. increse | | | | | | | | | | | | | | | | | | | | |
| (aritime dispute settlement, Review of PSC conditions) | | | | | | | | | | | | | | | | | | | | | | |
| 5) Import of LNG | 1 | Sup. increse | | | | | | | | | | | | | | | | | | | | |
| 6) Import of natural gas from neighboring countries | 2 | Sup. increse | | | | | | | | | | | | | | | | | | | | |
| **B. Transmission** | | | | | | | | | | | | | | | | | | | | | | |
| 1) Reinforcement of pipeline network | 1 | Sup. increase | | | | | | | | | | | | | | | | | | | | |
| (Bypass Lines/Compressor stations/Pigging/etc.) | | | | | | | | | | | | | | | | | | | | | | |
| 2) Effective gas supply by SCADA system | 1 | Sup. control | | | | | | | | | | | | | | | | | | | | |
| (time or volume/region) | | | | | | | | | | | | | | | | | | | | | | |
| **C. Distribution** | | | | | | | | | | | | | | | | | | | | | | |
| 1) Introduction of metering system | 1 | Dem. control | | | | | | | | | | | | | | | | | | | | |
| (domestic consumers and industries) | | | | | | | | | | | | | | | | | | | | | | |
| 2) Introduction of high efficiency plants and appliances | 1 | Dem. control | | | | | | | | | | | | | | | | | | | | |
| (power plants/fertilizer factory/improved stove/etc.) | | | | | | | | | | | | | | | | | | | | | | |
| 3) Restriction of new gas connection | 1 | Sup. control | | | | | | | | | | | | | | | | | | | | |
| 2) Effective gas supply by SCADA system | 2 | Sup. control | | | | | | | | | | | | | | | | | | | | |
| (time or volume/region) | | | | | | | | | | | | | | | | | | | | | | |
| 5) Enlightenment of consumers for energy saving | 2 | Dem. control | | | | | | | | | | | | | | | | | | | | |
| **D. General** | | | | | | | | | | | | | | | | | | | | | | |
| 1) Institutional reform of gas sector | 1 | - | | | | | | | | | | | | | | | | | | | | |
| 2) Reform of policies, regulations and plans | 1 | - | | | | | | | | | | | | | | | | | | | | |
| 3) Gas price reform | 1 | Dem. control | | | | | | | | | | | | | | | | | | | | |
| 4) Introduction of alternative energy | 1 | Dem. control | | | | | | | | | | | | | | | | | | | | |
| (coal, fuel oil, renewable energy) | | | | | | | | | | | | | | | | | | | | | | |
| 5) Securing fund for the development & maintenance | 1 | - | | | | | | | | | | | | | | | | | | | | |
| 6) Promotion of private sector participation | 1 | - | | | | | | | | | | | | | | | | | | | | |
| 7) Human resource development | 1 | - | | | | | | | | | | | | | | | | | | | | |
| (planning/management/technology/O&M) | | | | | | | | | | | | | | | | | | | | | | |
| 8) Introduction of the state-art technology | 2 | - | | | | | | | | | | | | | | | | | | | | |

**Notes:** Implementation Stage  Preparation Stage

## 3.3 Assistance by Other Development Partners in Natural Gas Sector

(1) Assistance by Asian Development Bank (ADB)

According to the "Sector Assistance Program Evaluation for Bangladesh Energy Sector (Project Number SAP: BAN 2009-36)", ADB adopted a programmatic approach for its assistance in the energy sector during 1993-2008, grouping its operations under seven broad thematic areas as follows:

- promoting commercial orientation of power sector entities,
- promoting investments in power generation,
- removing transmission constraints,
- improving access to electricity,
- increasing gas production capacity and mobilizing investments in gas production,
- improving the gas transmission and distribution network, and
- improving the governance and regulatory framework of the energy sector.

During the same period, ADB approved $1,755.9 million of financial assistance to the energy sector. This amounted to approximately 30% of the total ADB lending to Bangladesh. The power subsector was given nine loans amounting to $1,291.3 million and the gas subsector was given five loans and one grant assistance amounting to $414.6 million. During that period, ADB also provided 19 advisory technical assistance (TA) grants amounting to $10.4 million.

Table 3.3.1 shows the outcomes achieved and the impacts realized in key thematic areas of ADB assistance relating especially to the gas sector.

**Table 3.3.1 Outcomes Achieved and Impacts Realized in Key Thematic Areas of ADB Assistance to Gas Sector.**

| ADB Input | Outcome Achieved | Impact Realized |
|---|---|---|
| **V. Increasing Gas Production Capacity and Mobilizing Investments in Gas Production** | | |
| A. Technical Assistance<br>TA 2024-BAN : Preparation of Gas Development Master Plan and Strengthening of the Organization and Regulatory Framework for the Oil and Gas Sector | The Government has implemented the development of new gas fields through the participation of IOCs, and the gas transmission network through Government and ADB financing.<br>Gas production in Titas and Habiganj gas fields increased by 251 MMCFD (13% of national gas output) as a result of the work over gas fields under Loan 1293. | Total gas production in Bangladesh increased from 223 BCF in 1994 to 596 BCF in 2008.<br>The increase helped the country maintain its energy security and economic growth as gas is the dominant form of commercial energy source contributing to over 80% of power generation. |
| B. Loans<br>Loan 1293-BAN: Third Natural Gas Development<br>Loans 2188/2189(SF)- BAN: Gas Transmission and Development | The field appraisal of existing gas fields undertaken under Loan 1293 has confirmed additional reserves of 4.6 TCF amounting to over 30% confirmed remaining gas reserves.<br>The gas field appraisal under Loan 2188 is still being implemented and the results are not yet known. | |

| | | |
|---|---|---|
| **VI. Improving the Gas Transmission and Distribution Network** | | |
| A. Technical Assistance<br>TA 2025-BAN: Safety and Efficiency Improvements in the Gas Sector<br>B. Loans<br><br>Loan 1293-BAN: Third Natural Gas Development<br><br>Loans 1942(SF)/1943-BAN: Dhaka Clean Fuel<br><br>Loans 2188/2189(SF)-BAN: Gas Transmission and Development | The gas transmission capacity to Dhaka city was expanded by connecting the Ashuganj–Elenga pipeline to Dhaka gas supply system under Loan 1293. This enabled TGTDCL to meet the increasing demand for gas in Dhaka. The gas supply to Dhaka city was further increased under Loan 1942 by about 150 MMCFD. The gas supply to Dhaka city would further improve after the completion of the Monohardi–Dhanua pipeline and the compressor station in Ashuganj under Loan 2188.<br><br>The gas distribution network in the greater Dhaka area, the Sylhet area and the Bakhrabad franchise area were expanded under Loan 1293. The operational performance of the gas transmission network was improved by installing measuring and regulating stations and tele-metering. Loan 1942 further improved the gas distribution network within Dhaka city to allow the supply of high pressure gas to CNG filling stations.<br>Loan 1293 and the associated TA helped especially TGTDCL to achieve efficiency improvement including the reduction of gas distribution loss from over 8% in 1994–2000 to below 3.5% by 2008.<br>Loan 1942 was instrumental in introducing CNG as a transport fuel.<br>Loan 2188 is under implementation and gas pipelines are being procured for gas transmission expansion to west of Jamuna bridge and the gas distribution network in Rajshahi. | The reach and the capacity of the gas transmission network were increased. This enabled the supply of an increasing volume of gas to the demand centers and to an increasing number of consumers (0.6 million in 1994 to 1.8 million in 2008).<br><br>The increased availability of gas and use of gas for new applications such as transport have resulted in foreign exchange savings, improved industrial competitiveness, better quality of life due to improved indoor air quality for households with gas supply, and improved outdoor air quality due to use of CNG for transport. |
| **VII. Improving the Governance and Regulatory Framework of the Energy Sector** | | |
| **A. Technical Assistance**<br>TA 2024-BAN: Preparation of a Gas System Development Plan and Strengthening of the Organizational and Regulatory Framework for the Oil and Gas Sector<br>TA 2800-BAN: Support a Gas Regulatory Authority Project<br>TA 3129-BAN: Support for the Energy Regulatory Project<br>TA 4379-BAN: Power Sector Development Program II<br>TA 4528-BAN: Promoting Private Sector Participation in the Energy Sector<br>**B. Loans**<br>Loan 2038-BAN: Power Sector Development Program<br>Loan 2334-BAN: Sustainable Power Sector Development Program | The Government decided to establish a combined regulatory agency for both gas and power sectors. Although TA 2800, and TA 3129 had undertaken the initial work required for setting up of BERC, most of capacity building assistance to BERC was provided by USAID. Both ADB and the World Bank maintained the policy dialogue through appropriate loan assurances and program loan conditions to ensure that the BERC is established as intended. The ADB program loan 2038 was instrumental in finally getting the BERC functional in 2008.<br>Since becoming fully operational in 2008, BERC has made only a single regulatory order for adjusting the bulk supply tariffs for the power sector. | Although BERC finally became fully operational in 2008, it is yet to make an impact on the energy sector governance as an independent regulatory agency. However, it has effectively taken over the responsibility for tariff setting from the Government. It is yet to be seen whether it would be able to maintain its independence and integrity. |

Data source: Sector Assistance Program Evaluation for Bangladesh Energy Sector (ADB Project Number. SAP: BAN 2009-36)

The following matters have been presented as lessons learned through the implementation of ADB assistance to the energy sector.

1) Programmed Lending Linked to a Road Map

Programmed lending for investments linked to an agreed-upon medium-term road map for sector reforms can achieve development impacts even in difficult environments. ADB assistance to Bangladesh during 1994–2008 was closely linked to the gradual and phased implementation of the PSRB. ADB has taken into account the reform implementation capacity and political economy issues at play

and provided TA grants to implement reforms and investment loans that were conditional upon achieving certain milestones in the PSRB.

2) Corporate Governance

   Improved corporate governance, managerial autonomy, and performance-based incentives can significantly change institutional performance even if there is no change in ownership or personnel. The improved operational and managerial performance due to the commercialization and corporatization of Power Grid Company of Bangladesh (PGCB) and DESCO has demonstrated that full privatization alone is not an essential requirement for improved performance; appropriate incentives must be provided to the management.

3) Investment of the Domestic Private Sector in New Industries

   The domestic private sector is capable of investing in relatively capital-incentive new industries like CNG supply, if appropriate incentives and policy regimes are established.

Table 3.3.2, which is based on the information in Annual Report 2009-2010 for Petrobangla, shows the ongoing projects consisted of 12 projects financed by ADB and other 2 projects financed by WB and JDCF. Many projects are intended to reinforce the GTCL natural gas transmission pipeline network.

**Table 3.3.2 Gas Sector Ongoing Projects Financed by ODA Agencies**

[Million Taka]

| No. | Name of Project | Project Period | Executing Agency | Development Partners | Estimated Cost (Project Aid) |
|---|---|---|---|---|---|
| 1 | Muchai-Ashuganj Compressor Station Installation Project | Jan'06-Dec'11 | GTCL | PSC | 3,041 (2,093) |
| 2 | Construction of Monohordi-Dhanua, Elenga-East Bank of Jamuna Bridge 30" diax120km Gas Transmission Pipeline and Installation of Compressor Stations at Ashuganj and Elenga | Jan'06-Jun'11 | GTCL | ADB | 8,346 (5,183) |
| 3 | Appraisal of Gas Field (3D Seismic) (Titas, Bakhrabad, Sylhet, Kailashtila and Rashidpur) Project (Revised) | Jan'06-Dec'12 | BGFCL | ADB | 785 (420) |
| | | | SGFL | | 860 (390) |
| 4 | Construction of West Bank of Jamuna Bridge-Nalka, Hatikumrul-Iswardi-Bheramata 30"diaX98.10km Gas Transmission Pipeline | Jul'06-Jun'11 | GTCL | ADB | 6,287 (3,422) |
| 5 | Construction of Bonpara-Rajshahi Gas Transmission Pipeline | Jul'06-Jun'11 | GTCL | ADB | 1,615 (763) |
| 6 | Gas Distribution Network in Rajshahi City and Adjoing Area | Jul'06-Jun'11 | PGCL | ADB | 1,056 (463) |
| 7 | System Loss Reduction of Titus Gas Transmission and Distribution Company Ltd. | Jul'06-Jun'11 | TGTDCL | ADB | 226 (140) |
| 8 | Upgradation of Data Center of BAPEX | Jul'06-Jun'11 | BAPEX | ADB | 189 (153) |
| 9 | Construction of Bheramara-Khulna 20"diax162.50km Gas Transmission Pipeline | Jul'07-Jun'12 | GTCL | ADB | 6,853 (3,259) |
| 10 | Gas Seepage Control and Appraisal & Development of Titus Gas Field | Jan'10-Jun'14 | BGFCL | ADB | 10,000 (8,100) |
| 11 | Supply Efficiency Improvement of Titus Gas Transmission and Distribution Company Ltd. | Jan'10-Oct'12 | TGTDCL | ADB | 555 (347) |
| 12 | Gas Distribution Network in South-West Zone | Jan'10-Dec'12 | SGCL | ADB | 5,305 (2,800) |
| 13 | Construction of Bakhrabad-Siddhirganj Gas Transmission Pipeline | Jul'07-Dec'12 | GTCL | WB | 6,855 (4,293) |
| 14 | Exploration and Production Company Building of BAPEX | Jul'08-Jun'11 | BAPEX | JDCF | 2,000 (0) |
| | | | BGSL | | 1,400 (0) |
| Total | | | | | 55,372 (31,826) |

**Source: Petrobangla Annual Report 2010**

The future ADB's assistance for the energy sector, which is planned in the ADB Country Partnership Strategy: Bangladesh, 2011–2015, is summarized in Table 3.3.3.

**Table 3.3.3 ADB Assistance Program (Energy 2011-2015)**

| Planned ADB Interventions | Main Outputs Expected from ADB Interventions |
|---|---|
| Continuation of energy sector reforms<br>Implementation of eastern border power transmission interconnection | Construction of 250 and 500 MW transmission links & substations |
| Efficiency improvement in thermal power plants | Conversion of two 120 MW peaking plants to combined-cycle power plants |
| Construction of key in-country gas and power transmission links | Construction of Dhanu–Elenga gas pipeline and 500 km of 400 kV power transmission lines |
| Establishment of solar and wind power pilot projects | |
| Safety and supply improvement in gas fields | Rectifying all problematic wells in Titas gas field |

(2) Assistance by Word Bank(WB)

Table 3.3.4, which is based on the information in the WB website, shows the ongoing projects financed by WB in the Bangladesh energy sector..

**Table 3.3.4 Ongoing Projects Financed by WB**

| No. | Project Name | ID | Commit Amount* | Status | Approval Date |
|---|---|---|---|---|---|
| 1 | Additional Financing II For Rural Electrification and Renewable Energy Development Project | P126724 | 172 | Active | 4-Oct-2010 |
| 2 | Efficient Lighting Initiative for Bangladesh | P118605 | 15 | Active | 28-Jun-2010 |
| 3 | GPOBA: Rural Electrification & Renewable Energy | P119547 | 1.1 | Active | 13-May-2010 |
| 4 | Investment Promotion and Financing Facility | P117542 | 257 | Active | 4-May-2010 |
| 5 | GPOBA: Bangladesh Solar Home Systems | P119549 | 7.2 | Active | 26-Mar-2010 |
| 6 | Additional Financing For Rural Electrification and Renewable Energy Development Project | P112963 | 130 | Active | 4-Aug-2009 |
| 7 | Siddhirganj Peaking Power Project | P095965 | 350 | Active | 30-Oct-2008 |
| 8 | Grameen Shakti Solar Homes Project | P106135 | 9 | Active | 17-Dec-2007 |
| 9 | Investment Promotion and Financing Facility | P089382 | 50 | Active | 2-May-2006 |
| 10 | Power Sector Development Technical Assistance Project | P078707 | 15.5 | Active | 3-Jun-2004 |
| 11 | Rural Electrification and Renewable Energy Development | P071794 | 190.98 | Active | 25-Jun-2002 |
| 12 | Haripur Power Project | P065131 | 60.9 | Active | 1-Jun-2000 |
| 13 | EGY SEC ADJ CREDIT SUPPLEMENT | P009551 | 2.3 | Active | 12-Oct-1989 |

Though No-7 and No-10 in Table 3.3.4 are categorized in the power sector, both contain a project relating to the natural gas sector as shown below.

1) Siddhirganj Peaking Power Plant Project (Credit No. 45080-BD; P095965): consists of the following;
   - 60km natural gas pipeline from Bakhrabad to Siddhirganj
   - 335MW gas fired power plant

- 11km, 230kV transmission line to grid substation
- O&M technical assistance

2) Power Sector Development Technical Assistance Project (Credit No. 3913-BD, Grant No. H092-BD, P078707): consists of the following;
   - Consulting Services on LNG Import (24months)
   - Consulting Services on Performance Improvement of Power Plants of BPDB

The following lessons learned from the previous experience are described in the WB Country Assistance Strategy (CAS) 2011-2014.

- Lessons from the CAS Completion Report
  - Define a manageable set of outcomes to which the CAS will contribute, with fewer and more clearly linked indicators which can be adequately monitored to assess progress towards results.
  - Continue during implementation to carry out regular monitoring of progress towards results.
  - Ensure adequate and appropriate staffing and skills mix on the ground—particularly for expected areas of greater emphasis such as infrastructure and climate change.
  - Governance and institutional reforms take significant time to achieve desired outcomes. Change is incremental, and it is important to stay engaged in key sectors, even if performance is weak and progress slow.
  - The relevance of tackling weak governance as a barrier to development was appropriate, but experience has provided lessons on how we might be more effective in addressing this seemingly intractable and pervasive problem in Bangladesh and other countries of South Asia.
- Lessons from the Country Assistance Evaluation
  - While macroeconomic governance improved to some extent, progress on public sector reform was disappointing. In particular, initiatives to reform the civil service suffered from insufficient political will. The full range of Bank instruments is required to support complex institutional reforms of this nature.
  - Monitoring and evaluation of the CAS should be strengthened.
  - Improved coordination and harmonization with DPs was effective in human development sectors. The Bank's coordination was strong in many sectors, but weaker in energy and water supply, contributing to unsatisfactory outcomes in these areas.

- Staying engaged over the long-run is deemed critical to getting results, even in sectors where dialogue has proven difficult, like energy and agriculture.
- The design and implementation of analytical and advisory work should involve all the relevant stakeholders including the government, civil society and DPs.

The result framework described in the WB CAS 2011-2014 consists of following four strategic objects. To achieve these four objectives, WB will seek to contribute to sixteen development outcomes with presenting the core indicators for assessing progress towards CAS outcomes.

**Strategic Objective 1:**
**Increase Transformative Investments and Enhance the Business Environment**

| | |
|---|---|
| Outcome 1.1: | Increased public investment and improved framework for revenue generation |
| Outcome 1.2: | Improved environment for private sector investment |
| Outcome 1.3: | Increased infrastructure provision, access and efficiency |
| Outcome 1.4: | Improved planning and management of urbanization |

**Strategic Objective 2:**
**Reduce Environmental Degradation and Vulnerability to Climate Change and Natural Disasters**

| | |
|---|---|
| Outcome 2.1: | Strengthened water resource management and coastal protection |
| Outcome 2.2: | Improved agriculture production and food security |
| Outcome 2.3: | Reduced environmental degradation |
| Outcome 2.4: | Enhanced disaster preparedness |

**Strategic Objective 3:**
**Improving social services delivery**

| | |
|---|---|
| Outcome 3.1: | Improved access to quality health, population and nutrition services |
| Outcome 3.2: | Expanded access to safe water and sanitation services |
| Outcome 3.3: | Enhanced and more systematic social protection |
| Outcome 3.4: | Improved student learning based on quality education services |

**Strategic Objective 4:**
**Enhance Accountability and Promote Inclusion**

| | |
|---|---|
| Outcome 4.1: | Increased effectiveness and efficiency of public resource use |
| Outcome 4.2: | Enhanced transparency and accessibility of public services through information technology |
| Outcome 4.3: | Increased effectiveness of public service delivery at the local level |
| Outcome 4.4: | Expanded participation in local development and women's economic empowerment |

Though WB intends to assist the power sector from now on, there is no specific future loan project in the gas sector now. It may assist a project such as capacity building in the gas sector.

(3) Assistance by Islamic Development Bank (IDB)

IDB is now assisting the energy sector in Bangladesh as follows.

■ Power Sector

1) Bola Power Plant Station 225MW

Finance Agreement has been signed already. Gas supply (72mmcfd) was confirmed by written letter from the GOB. Expected completion: Dec 2014

2) Ashganji C/C PS 400MW

Finance Agreement will be signed soon. Expected completion: Dec 2014

PS is located near the gas fields and gas is available.

3) Shikrababad (near Chittagong) PS 150MW

Under consideration.

4) PS for private sector 50 - 200MW

Under consideration.

■ Petroleum Sector（BPC）

5) Shinglemorng LPG Terminal (Fuel refinery)

Project cost: basically USD 140mil., maybe more than USD 200mil. Consultant was awarded 3 months ago.

■ Renewable Energy

6) IDB has supported the IDCOL (Infrastructure Development Company Limited) Solar Energy Program and will also support the renewable energy development project in the future.

(4) Assistance by USAID

USAID have mainly been assisting the energy sector in Technical Assistance and Capacity Building. They have no ongoing project in the energy sector now.

(5) Assistance by Gesellschaft für Internationale Zusammenarbeit (GIZ)

GIZ conducts grass roots cooperation projects such as electrification in rural regions, improvement of cooking fuel for households, etc., and works for the efficient utilization of energy and its widespread expansion in the region. GIZ introduces small size solar power generation systems for households which have no electricity, and intends to provide a better life for people by improving lighting for housework, working, and studying in the nighttime. GIZ is also going to conduct grass roots cooperation in the future.

## 3.4 Proposal for Assistance to Natural Gas Sector by Japanese ODA

### 3.4.1 Priority of the Challenges to be assisted by Japanese ODA

As a result of preceding surveys and analysis, the challenges of natural gas sector to be assisted by the Japanese government have been summarized as shown in Table 3.4.1.

The challenges to be dealt with by the Japanese government have been extracted from Table 3.2.1 in consideration of the following points;

- Sustainability and economic efficiency of the projects
- Applicability of energy-related technology and energy-saving systems in which Japan excels
- Possibility to further improve effectiveness of projects under implementation by Japanese assistance

**Table 3.4.1 Approaches of the future Japanese cooperation**

| Challenges | Priority Areas | Priority | Solutions |
|---|---|---|---|
| A. Exploration and production<br>· Extent of gas reserve to be confirmed by exploration and drilling | Throughout the country (BAPEX) | 1 | Technical assistance & equipment procurement for exploration |
| B. Transmission<br>· Expand and improve pipeline network | West/South of the country | 2 | Additional parallel pipeline installation |
| · Efficient gas transmission with new comprehensive SCADA system | Throughout the country | 1 | Rehabilitation and expansion of existing SCADA system |
| C. Distribution<br>· Efficient gas distribution with new comprehensive SCADA system | TGTDCL franchise area | 2 | Provision of new SCADA system |
| · Improve supply efficiency with introduction of gas metering system | TGTDCL/ KGDCL | 2 | Installation of gas meters to domestic and industrial consumers |
| D. Others<br>· Introduction of alternative energy (renewable energy) | Throughout the country | 2 | Introduction of Solar power, wind power, mini-hydro |
| · Preparation of policy/regulations/plans for proper operation of gas sector | Throughout the country | 2 | Preparation of codes and standards |
| · Improvement of policy making, organizational management, development technology and facility maintenance by human resources development | Throughout the country | 2 | Technical assistance in seismic survey, establishment of a laboratory |

### 3.4.2 Proposal for the ODA Loans

During the implementation of the Survey, the Survey team interviewed the related entities of the gas sector about the need for Japanese government assistance. Table 3.4.2 shows the list of proposals requesting the Japanese government assistance.

**Table 3.4.2 List of proposals requesting the Japanese government assistance**

| Proposal | Entry | Outline |
|---|---|---|
| A. Exploration and production<br>1. Training of BAPEX engineers | BAPEX | Training of engineers on 2D/3D seismic data acquisition, remote sensing by satellite with Japanese advanced technology. |
| 2. Procurement of hardware & software to develop 2nd 3D crew of BAPEX | BAPEX | In addition to the above training, BAPEX needs to procure hardware & software, such as shown in Appendix-9, to develop a 3D crew. |
| B. Transmission<br>3. Gas transmission pipeline Dhanua-Elenga (additional parallel) | GTCL | 30-inch, 52km, additional parallel pipeline to facilitate the enhanced flow from Bibyana gas field through the Bibyana-Dhanua pipeline. |
| 4. Gas transmission pipeline West bank - Nalka (additional parallel) | GTCL | 24-inch, 17km, additional parallel pipeline to facilitate the enhanced flow to the west region. |
| 5. Rehabilitation and expansion of SCADA System for Natural Gas Transmission Pipeline Network | GTCL | Since the existing SCADA system has been malfunctioning, an integrated system shall be built up urgently to realize the effective and sustainable gas supply for the whole country. |
| C. Distribution<br>6. Pre-paid gas meter installation (Other requests were delivered at the late stage of the Survey as shown in the Appendix 9 also.) | TGTDCL | Following the pilot project named the "Installation of Prototype Pre-paid Gas Meters Project" undertaken by the company's own funds, TGTDCL plans to install over 600,000 more pre-paid meters. TGTDCL itself will arrange funds for a half while the fund source for the remaining half is not confirmed yet. |
| 7. Pre-paid gas meter installation | KGDCL | In view of the effectiveness of TGTDCL's pilot project, KGDCL also proposes a project for pre-paid gas meter installation in Chittagong area on a grant basis. |
| D. Others<br>8. Preparation of codes & standards for natural gas sector | BERC | Preparation of necessary codes & standards for natural gas transmission and distribution, operation & maintenance manual for natural gas networks etc. |
| 9. Testing and quality control laboratory | BERC | Establishment of a well designed standard testing and quality control lab to mitigate risks associated with petroleum products. |

| | | |
|---|---|---|
| 10. Establishment of a centralized energy monitoring system | BERC | Establishment of a centralized energy monitoring system so that the Commission is in possession of real time data regarding electricity and energy (natural gas and petroleum). |

In keeping with the priority of challenges mentioned in Table 3.4.1, and also considering the proposals from the Bangladesh side shown in Table 3.4.2, the following four projects are recommended in order of highest priority as prospective projects for a Japanese ODA loan in the natural gas sector.

(1) Rehabilitation and expansion of the SCADA System for Natural Gas Transmission Pipeline Network

Executing Agency: GTCL

The existing SCADA system has been malfunctioning, and an integrated system shall be built urgently to realize the effective and sustainable gas supply for the whole country.

The proposed SCADA system shall be interfaced with the western zone SCADA system which is one component of the "Gas Transmission and Development Project (called GTDP)" supported by ADB funds and is under the tender evaluation stage.

Project Cost: Approximately US$ 37.400,000 (JPY 2,600,000,000)

(2) Gas transmission pipeline, Dhanua-Elenga (D-E), 30-inch, 52km (Additional and parallel pipeline to the existing pipeline)

Executing Agency: GTCL

Although the D-E pipeline was originally a part of the Monohordi-Jamuna Project supported by ADB funds, it was cancelled due to the shortage of funds and no action has been taken till now.

The upcoming Bibiyana-Dhanua pipeline project, which ensures full capacity evacuation of additional gas production from the Bibyana gas field, was planned after the cancellation of the D-E pipeline and the completion of Bibiyana-Dhanua pipeline as well as compressor stations will increase the necessity of the D-E pipeline to facilitate the enhanced gas flow to the western region.

ADB and WB have no plan to support this transmission pipeline project so far.

Project Cost: Approximately US$ 62.400,000 (JPY 4,800,000,000)

(3) Pre-paid gas meter installation for the domestic consumers (300,000 pieces)

Executing Agency: TGTDCL

TGTDCL intends to improve supply efficiency in the distribution system and is implementing the following projects.

- A pilot project, named the “Installation of Prototype Pre-paid Gas Meters Project” undertaken by the company’s own funds, is under implementation and 4,500 meters have been installed by the end of November 2011.
- A project titled the “Supply Efficiency Improvement of TGTDCL” with the financial assistance from ADB and GOB, is under preparation of tender documents for Contract.

  8,600 Domestic/Commercial Pre-paid gas meters,

  680 Remote metering system

Also, TGTDCL plans to install over 600,000 pre-paid meters and intends to arrange its own funds for installing 300,000 meters while the funding for the remaining half is not confirmed yet. It is told that in some cases remarkable gas savings have been achieved (approximately 30~40%) as a result of the pilot project (TGTDCL's own fund). Accordingly, from a point of view of efficient energy consumption and demand suppression, the assistance for this project is meaningful.

Project Cost: Approximately Taka 3,600,000,000 (JPY 3,800,000,000)

(4) Pre-paid gas meter installation for domestic consumers (326,000 pieces)

Executing Agency: KGDCL

KGDCL, in which the franchise area KAFCO lies, proposes a project on a grant basis for pre-paid gas meter installation for domestic consumers in Chittagong area. (Total required numbers: 326,000 pieces)

By the same reason mentioned in (3) above, the assistance for this project is meaningful

Project Cost: Approximately Taka 3,900,000,000 (JPY 4,100,000,000)

As for the “Gas transmission pipeline (additional parallel) between the West bank and Nalka” which has been requested by GTCL, the Survey team has judged that its necessity is not so urgent in consideration of the gas volume transferred in it and the effect of the compressor station to be installed at Elenga in the near future. Therefore it has not been recommended as a prospective project for Japanese ODA loan.

### 3.4.3 Proposal for the Technical Cooperation Projects

In keeping with prior challenges, priority areas and resources mentioned in Table 3.4.1, and also considering the proposals from the Bangladesh side shown in Table 3.4.2, the

following two projects are recommended as prospective projects for Japanese technical cooperation in the natural gas sector.

(1) Seismic exploration training for BAPEX engineers

Executing Agency: BAPEX

In Japan, seismic exploration has been carried out actively for many purposes including oil/gas exploration, mitigating earthquake disaster and others. And the most advanced systems have been developed and utilized.

Accordingly, geophysical training courses in Japan are proposed for BAPEX technologists in order to enhance their capacity and accelerate the exploration activities. During the training period, it is planned to organize the data acquisition and processing workshops utilizing the real instrument and the data acquired in the field. The workshops will be carried out by hand-on training style managed by experienced instructors.

After the training in Japan, an OJT (On the Job Training) in Bangladesh will be organized with actual BAPEX field seismic crews and Japanese instructors using the state-of-the-art equipment and/or technology employed in the training in Japan.

Though the detailed requirements are provided by BAPEX as shown in Appendix-9, those shall be reviewed and finalized later by both parties.

Project Cost: Approximately US$ 970,000 (JPY 75,000,000)

(2) Procurement of hardware & software to develop a 3D crew of BAPEX

Executing Agency: BAPEX

In relation with the above training, BAPEX requires hardware & software, such as shown in Appendix-9, to develop the 2nd 3D crew. This requirement shall also be reviewed and finalized later by both parties.

Project Cost: Approximately US$ 4,000,000 (JPY 3,100,000,000)

With respect to the above, the following comment was given by the JICA Bangladesh office.

In addition to the above (1) Seismic exploration training and (2) Procurement of hardware & software, the possibility of the technical assistance for BAPEX exploration activities such as 2D/3D seismic surveys and exploratory drilling shall be examined so that JICA assistance will directly contribute to the future natural gas production.

Accordingly, only for reference, the 2D/3D seismic survey and exploratory drilling program in the Madarganj area of Jamalpur district has been proposed as follows. (Details shall be referred to in Appendix-10.)

| | |
|---|---|
| 2D seismic survey (approximately 250 linear kilometers): | US$ 750,000 |
| 3D seismic survey (approximately 300 square kilometers): | US$ 4,500,000 |
| 2 exploratory well drillings (each approximately 3,200 meters deep) | US$ 16,000,000 |
| Assignment of specialist for technical assistance (approximately 12MM) | US$ 480,000 |
| Total (approximately): | US$ 21,730,000 |
| | (JPY 1,700,000,000) |

This program shall be reviewed and finalized later by both parties.

As for the three projects requested by BERC as shown in Appendix-9, the Survey team does not recommend them as prospective Technical Cooperation Projects because the necessity of those requests cannot be confirmed.

(1) Preparation of codes & standards for the natural gas sector

Since the document submitted by BERC was relating to the power sector, the resubmission of the document properly revised has been requested and not received yet.

(2) Testing and quality control laboratory

Though BERC intends to install and operate a dedicated laboratory, a well equipped existing laboratory, such as Bangladesh Council of Scientific and Industrial Research (BCSIR), is available in Dhaka city. So, utilizing such existing facilities is more economical and practicable than the BERC plan.

(3) Establishment of a centralized energy monitoring system

The centralized SCADA system for natural gas transmission pipeline networks will be established by GTCL soon. So, the BERC request for a relevant (similar) system can not be explained properly.

# Appendices

Appendix-1

# Minutes of Meetings with Related Entities

**Minutes of Meeting**

| | | |
|---|---|---|
| Date: | 04 September 2011 | |
| Time: | 11:40~ | |
| Venue: | EMRD office | |
| Participants: | EMRD | : Mr. Md. Sefaul Alam - Joint Secretary |
| | JICA Survey Team (JST) | : Mr. Iwamoto/Kono/Sasano/Mizushima/Matsuda |
| | | : Mr. KM Ahmed - Project coordinator |
| | | : Mr. Md. Noor Alam - Local support service |

**Subjects: Data Collection Survey on Bangladesh Natural Gas Sector**

1. JST explained the outline and objective of the survey.

2. JST requested the strong support of EMRD for the data collection from related entities. EMRD assured the cooperation to JST, and stated that they will write a letter to Petrobangla so that JST can collect necessary information from Petrobangla as well as other state own gas companies.

3. JST mentioned that Chevron is not in a position to provide the answers to JST's inquiries without EMRD's consent, and requested EMRD the cooperation on this issue. EMRD assured their cooperation on this issue except for the information protected by PSC.

4. EMRD mentioned that the Gas Demand Projection up to 2030 is not available in their hand, and only 5 years projection can be provided.

5. Both parties agreed to meet again in the middle of survey period in order to check the necessity of further support from EMRD for JST's data collection.

Prepared by JST

**Minutes of Meeting**

| | | |
|---|---|---|
| Date: | 04 September 2011 | |
| Time: | 14:45~ | |
| Venue: | HCU office | |
| Participants: | HCU | : Mr. Anwar H Khan - Director General |
| | JICA Survey Team (JST) | : Mr. Iwamoto/Kono/Sasano/Mizushima/Matsuda |
| | | : Mr. KM Ahmed - Project coordinator |
| | | : Mr. Md. Noor Alam - Local support service |

**Subjects: Data Collection Survey on Bangladesh Natural Gas Sector**

1. JST explained the outline and objective of the survey.

2. HCU explained the outline and activities of HCU, and provided JST with the following documents:
   1) Papers explaining HCU's outline and their activities

3. HCU mentioned that latest gas reserve estimation prepared by Gustavson is yet to be approved by the government and therefore this estimation cannot be disclosed without consent of EMRD.
   JST explained the importance of the information provided in this latest estimation.
   Both parties will discuss this issue with EMRD, and meet again on 15/Sep to confirm the information can be provided to JST.

Prepared by JST

**Minutes of Meeting**

| | | |
|---|---|---|
| Date: | 04 September 2011 | |
| Time: | 16:00~ | |
| Venue: | GTCL office | |
| Participants: | GTCL | : Mr. Md. Aminur Rahman - Managing Director |
| | | : Mr. S. Faheem - Director (Operation) |
| | JICA Survey Team (JST) | : Mr. Iwamoto/Kono/Sasano/Mizushima/Matsuda |
| | | : Mr. Md. Noor Alam - Local support service |

**Subjects: Data Collection Survey on Bangladesh Natural Gas Sector**

1. JST explained the outline and objective of the survey.

2. GTCL stated that letter and inquiries regarding this survey sent by JICA are yet to be received by them, and JST presented JICA's letter to GTCL and handed the copy of inquiries to GTCL.

3. GTCL suggested to JST obtaining "Gas Sector Strategic Business Plan (Year 2010 to 2015)" from Petrobangla, because this document replaces "Gas Evacuation Plan 2010-2015".

4. GTCL suggested to JST contacting Production & Marketing Division of Petrobangla for the gas sales data of non-bulk categories such as industrial, commercial and domestic.

5. Both parties agreed that Mr. Mizushima from JST and GTCL's staff in charge will sit together as soon as possible for the clarification of data required for the gas pipeline network simulation.

6. Both parties agreed to meet again on 12/Sep to provide answers to the inquiries as many as possible.

Prepared by JST

**Minutes of Meeting**

| | | |
|---|---|---|
| Date: | 05 September 2011 | |
| Time: | 15:30~ | |
| Venue: | ADB office | |
| Participants: | ADB | : Mr. Rahman Murshed - Head, Energy |
| | JICA Survey Team (JST) | : Mr. Iwamoto/Kono/Matsuda |
| | | : Mr. KM Ahmed - Project coordinator |
| | | : Mr. Md. Noor Alam - Local support service |

**Subjects: Data Collection Survey on Bangladesh Natural Gas Sector**

JST explained the outline and objective of the survey, and ADB answered to JST's inquiries (see attached) as below:

Inquiry No. 7-1

ADB will collect and provide JST with the requested documents if those documents are available with ADB and permitted to be disclosed.

Inquiry No. 7-2

Risk analysis reports are not available with ADB, because GOB should take responsibility for such risks. However, ADB evaluates the GOB sovereign.

Inquiry No. 7-3

This inquiry should be answered by Petrobangla as an implementation agency of GSRR..

Inquiry No. 7-4

Both figures do not much with the latest scenario including the import of LNG. Correct figure should be collected from Petrobangla.

Inquiry No. 7-5

There is no updated report. The evaluation study report of "Sector Assistance Program Evaluation for Bangladesh Energy Sector" (Project Number SAP: BAN 2009-36, Oct. 2009) is the latest.

Inquiry No. 7-6

The following two projects are ongoing under ADB loan in the gas sector.

1) Gas Sector Development Program

2) Natural Gas Access Improvement Project

There is no specific future project right now, however it does not mean ADB is going to quit assistance to the gas sector.

On the other hand, there are three upcoming ADB loans to the power sector. One is for combined cycle power plant in Ashuganji which was already approved and other two loans will be for the next year or the year after.

Prepared by JST

# Inquiries: ADB

| No. | Inquiry | Answer |
|---|---|---|

## 1. Organaization/Institution

Not Applicable

## 2. Natural Gas Demand

Not Applicable

## 3. Natural Gas Exploration, Production and Import

Not Applicable

## 4. Natural Gas Transmission

Not Applicable

## 5. Natural Gas Sales

Not Applicable

## 6. Natural Gas Pricing and Subsidies

Not Applicable

## 7. Others (General)

| | | |
|---|---|---|
| 7-1 | Please provide us with the supplementary appendixes of ADB RRP (Project Number 38164, Feb. 2010). | |
| 7-2 | Please provide the company risk analysis report for each agencies/companies by ADB. If you do not have report, please explain the risk analysis by ADB.<br>(1) Petrobangla<br>(2) BAPEX<br>(3) BGFCL<br>(4) SGFL<br>(5) Niko<br>(6) Chevron<br>(7) Tullow<br>(8) Santos<br>(9) GTCL<br>(10) JGTDCL<br>(11) TGTDCL<br>(12) BGSL<br>(13) SGDCL<br>(14) PGCL<br>(15) KGDCL | |
| 7-3 | Please fill the current implementation status of GSRR into relevant cells of *"the attached file"*. | |
| 7-4 | Please provide the further detailed information with respect to the investment plans for the gas sector mentioned as follows at the sentence number 8 in the page 2 of ADB RRP (Project Number 38164, Feb. 2010).<br>“The gas sector master plan for 2005–2025 envisages investments of $2.5 billion in exploration, field development, transmission, and distribution.”<br><br>Though we found the related description in Chapter 6.6 of the Gas Sector Strategy, the amount appears to be slightly different. | |

# Inquiries: ADB

| No. | Inquiry | Answer |
|---|---|---|
| 7-5 | As a material to study your Bank's assistance to the Bangladesh energy sector, we found the evaluation study report of "Sector Assistance Program Evaluation for Bangladesh Energy Sector" (Project Number SAP: BAN 2009-36, Oct. 2009) in your website. Are there any updated similar reports other than it? If so, please provide us with such information. | |
| 7-6 | Please provide us with your Bank's current and future assistance plan to the Bangladesh energy sector, if possible. | |

**Minutes of Meeting**

Date: 06 September 2011
Time: 09:00~
Venue: BAPEX office
Participants: BAPEX : Mr. Mortuza Ahmad Faruque - Managing Director
JICA survey team (JST) : Mr. Iwamoto/Kono/Matsuda
: Mr. Md. Noor Alam - Local support service

**Subjects: Data Collection Survey on Bangladesh Natural Gas Sector**

1. JST explained the outline and objective of the survey.

2. BAPEX went through the inquiries and found that they are able to answer to the following inquiries:
   - Inquiry No. 3-1
   - Inquiry No. 4-1
   - Inquiry No. 4-2 (supply projection only for several years)

   Answers will be prepared within the next week.

3. BAPEX provided JST with annual reports for the following fiscal years.
   - 2001-2002, 2006-2007, 2007-2008, 2008-2009 and 2009-2010

4. JST expert for gas development will meet BAPEX again on 11/Sep for further clarifications.

5. JST asked financial resources for their projects, and BAPEX stated that financial resources are always from the central government or their own fund, and basically no fund from multilateral financial institutions except for the one recent project under ADB.

Prepared by JST

**Minutes of Meeting**

| | | |
|---|---|---|
| Date: | 06 September 2011 | |
| Time: | 14:00~ | |
| Venue: | Hotel The Westin Dhaka | |
| Participants: | WB | : Mr. Mohammad Anis - Energy Specialist<br>South Asia Sutainable Development Unit |
| | JICA Survey Team (JST) | : Mr. Iwamoto/Kono |
| | | : Mr. KM Ahmed - Project coordinator |
| | | : Mr. Md. Noor Alam - Local support service |

**Subjects: Data Collection Survey on Bangladesh Natural Gas Sector**

1. JST explained the outline and objective of the survey.

2. WB explained their present activities in the gas sector. They are now assisting to the consultant service for the LNG receiving terminal. (they are not assisting to the construction of the terminal.) The consultant service includes Feasibility Study (?), Procurement (tendering) and Construction supervision (16 months). Its contract period is 2 years. The contract may be signed between Petrobangla and the selected consultant within this week.

3. WB also explained their present activities in the power sector. They are now assisting to the construction of Siddhirganji 335MW power plant and the gas pipeline (Bakhrabad - Siddhirganji) to this power plant.

4. WB will provide the written answers to the inquiries as soon as possible.

Prepared by JST

**Minutes of Meeting**

| | | |
|---|---|---|
| Date: | 06 September 2011 | |
| Time: | 15:30~ | |
| Venue: | BERC office | |
| Participants: | BERC | : Mr. Syed Yusuf Hossain - Chairman |
| | | : Mr. Zaved Choudhury - Director (Gas) |
| | | : Mr. Mohammad Bazlur Rahman - Director (Power) |
| | | : Mr. Md. Emdadul Haque - Member |
| | | : Dr. Salim Mahmud - Member |
| | JICA Survey Team (JST) | : Mr. Iwamoto/Matsuda/Kono |
| | | : Mr. KM Ahmed - Project coordinator |
| | | : Mr. Md. Noor Alam - Local support service |

**Subjects: Data Collection Survey on Bangladesh Natural Gas Sector**

1. JST explained the outline and objective of the survey.

2. BERC explained their position and present activities in the energy sector as well as in the government.

3. BERC also explained the problems against the gas sector's reform plan such as liberalization and increase of domestic gas price.

4. BERC will prepare the written answer to the inquiries by 12/Sep.

P.S. JST received BERC's answers to the inquiries (see attached) on 14th September 2011 by e-mail.

This minutes prepared by JST

Bangladesh Energy Regulatory Commission

(JICA Inquiries vis-à-vis information, data, explanations are provided below in seriatim)

***Inquiries: BERC***

## *1.* ***Organization / Institution***

*1-1 Are there any organizational problems in the energy sector that are obstructing the reform of Gas Sector?*

Bangladesh Energy Regulatory Commission, BERC, is mandated to regulate the downstream part of the natural gas sector. The sphere of BERC in the gas sector is limited in the purview of gas transmission and distribution till the end user.

Reviewing the present gas crisis it appears that the Reserve to Production ratio (R/P) had not been changed over a long period of time. This requires substantial investment to replenish the reserve status and thereby increase the gas production to address the present gas production/supply deficit. Insignificant investment for long time has added to such deficit scenario. Looking into such scenario it appears that the expansion of the downstream segment will not add any comfort to the gas hungry market until and unless situation is favorable for enhanced gas production at the upstream field ends.

In this backdrop, during taking decision on the proposal from Petrobangla in the year 2008 for tariff increase, BERC adjudged it prudent to increase weighted average price of gas to the tune of 11.22% to create a fund—Gas Development Fund, the GDF, to facilitate exploration and production augmentation at local level subject to the agreement of the government since fixation of commodity price of gas is beyond BERC's purview. The government has agreed to creation of GDF and the fund has been aimed to be utilized by the public sector companies under Petrobangla responsible for exploration and production. The creation of the GDF is a positive specific decision to increase capacity of local companies under Petrobangla. It is a milestone achievement in the energy sector, and will augment the gas production and reduce the present demand-supply situation to create confidence among the users.

First phase of Gas Sector Reform has already been taken place and gas management chain has been unbundled to exploration, production, transmission and distribution utilities. All these utilities are under the umbrella of Petrobangla. Transmission and distribution utilities including Petrobangla are licensees of BERC. Moreover, Hydrocarbon Unit is also functioning as the technical wing of the Energy and Mineral Division of the Ministry of Power, Energy and Mineral Resources. However, gas sector still needs further reform to function effectively for better managing the gas management chain to make available user and environmental friendly natural gas.

At this moment, BERC also needs organizational restructuring with adequate trained manpower so that it can effectively regulate and monitor the energy sector utilities as well as perform the functions as laid down in the BERC Act 2003. When the proposed restructuring is in place and the position firmly consolidated, then BERC will be in a sound footing to look into energy efficiency, energy audit, consumer care, dispute resolution, energy statistics, inventory management, maintenance & BMR, subsidy needs, cost rationalization, revenue requirement, transparency & accountability towards reaching cost reflective affordable energy to take the economy towards achieving a middle income county status minimizing investment risk.

*1-2. Please explain the present state of your activities and the challenges to be solved in future.*

Independent Regulatory idea in a developing country like Bangladesh is a new concept, new development and a challenge itself. As such the dissemination of the concept requires time. The functions of BERC are four dimensional in the energy sector:

(1) To create conducive environment for attracting investment including foreign direct investment.

(2) To establish level playing field by providing equal opportunities for public and private investments.

(3) To protect consumers' interest/rights by determining just and reasonable costs & rates.

(4) To allow utilities to get necessary revenue ensuring quality services.

It is a very difficult task to bring in all the interested parties to a win-win situation and as such challenges are as follows:

- Balancing all stakeholders' interests for attaining a better public good.
- Ensuring cost reflective affordable tariff.
- Bring changes in the Energy Sector Management so as to attain international standard.
- Lower the System Loss to bare minimum level.
- Information Flow—Energy Statistics and Databank.
- Energy Audit—To achieve Technical Efficiency to international standard.
- Renewable Energy Regulations and Feed-in-Tariffs.
- Establishment of a Laboratory for Monitoring Quality and Standard.
- To turn the Energy Sector into a dynamic, transparent, accountable and peoples' service oriented organization.
- To contribute as a supportive element towards Government's Vision—"Converting Bangladesh into a Middle income Earning State by 2021" maintaining its position and identity.

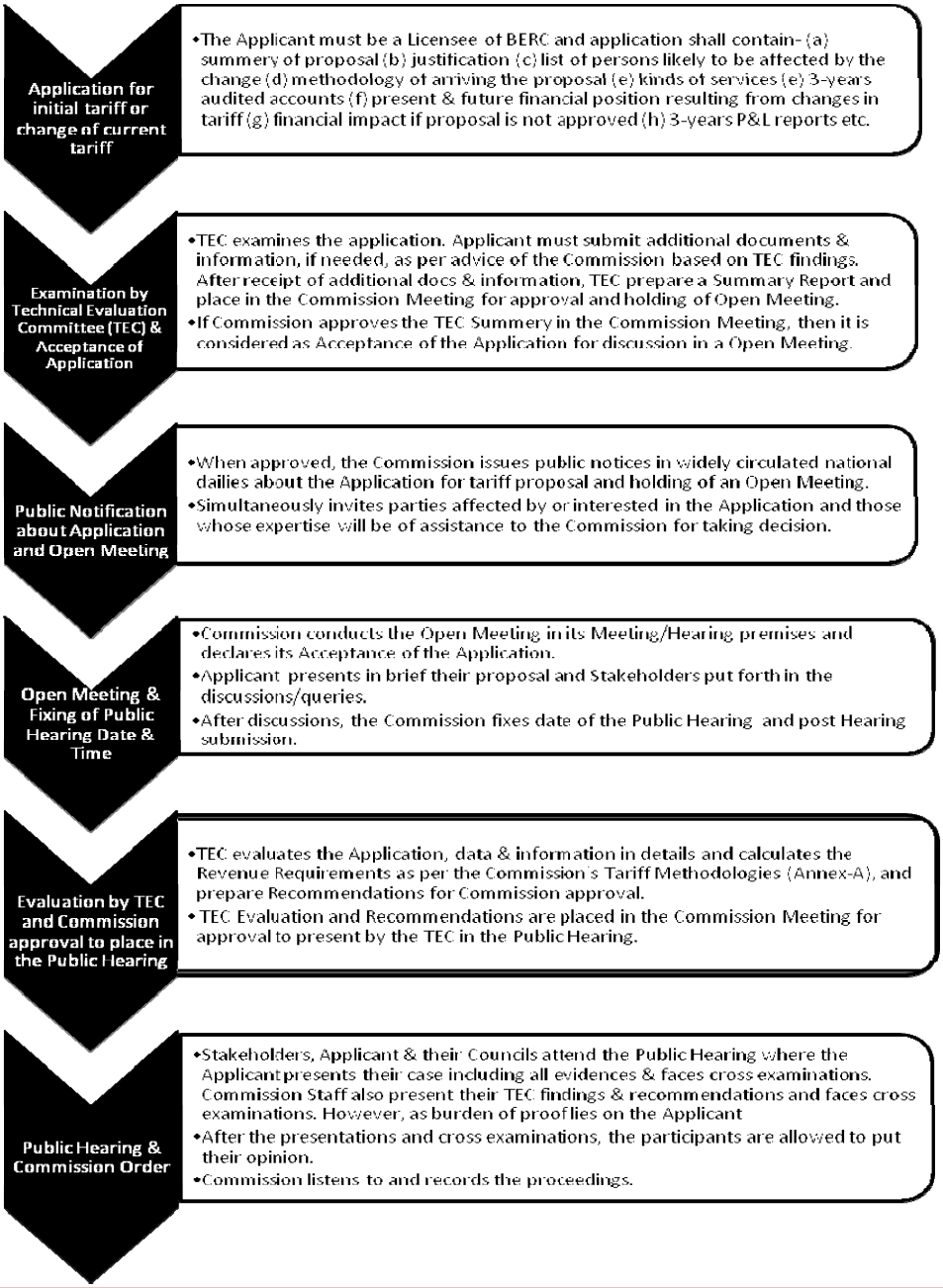
BERC's activities are:

- Formulation of Tariff Regulations
- Formulation of Organizational Regulations
- Codes and Standards
- Uniform System of Accounts to bring the utility entities under one platform to help evaluate their performance rating
- Benchmarking of Electricity Generation Costs
- Consumer’s Outreach Program
- Demand Side Management
- Maintenance and Development Funds
- Performance Indicators : Set and Monitor
- Rate Cases - Resolution
- License - Issue, Renewal and Waiver.
- Dispute settlement/resolution in the energy sector.

## *6. **Natural Gas Pricing and Subsidies:***

### *6.1 Please Explain the following items:*

(1) *Gas tariff decision process with flow chart:*
*(how to calculate, how to keep benefit)*
*Basic charge system, volume charge system & others)*




The Commission takes decision reviewing staff evaluation report, hearing deliberation, post hearing submission, socio-economic and political situation and government subsidy provisions. The Commission decision order containing rate(s) and directives for compliance is signed by all members of the Commission.

*(2) Gas tariff approval process with flowchart*:

The Commission Order is final and does not require approval of any other authority.

*(3) Gas tariff levy and collection system*:

End-user price of gas is composed of SD & VAT, price deficit fund, BAPEX margin, producers' margin (for gas produced by national companies under Petrobangla), transmission margin and distribution margin. The SD & VAT which is 55% of the end users' price is the government portion. The distributions of the remaining 45% are for price deficit fund, BAPEX margin, production companies, transmission company, and distribution companies.

Gas bills are collected on monthly basis by the gas distribution utilities from different classes of consumers, which includes all elements of the end-user price as stated above. After collection, it is the responsibility of the utilities to pay the relevant portions of the end-user price including the SD &VAT.

*(4) Gas tariff reform strategy*:

At present BERC practices the gas tariff methodology, which is Cost Plus basis on the application from Licensee. However, in course of time BERC may go for multi-year tariff and benchmarking of investment and O&M cost.

Annex-A

## SUMMARY OF THE METHODOLOGY FOR DETERMINING GAS DISTRIBUTION SERVICE RATE

- The methodology of determining gas distribution service charges for each class of consumers is based on the annual revenue requirement, which is the sum of a return on rate base, plus the sum of the total annualized costs of operating the distribution utility (*Total Annual Revenue Requirement = Return on Rate Base + Total Costs*).

- The rate base for a distribution licensee shall consist of the depreciated used and useful assets; plus the regulatory working capital (*Rate Base = Depreciated Used & Useful Assets + Regulatory Working Capital*).

- "Regulatory Working Capital" is the sum of the cash working capital, materials and supplies inventory, and any prepayments made (*Regulatory Working Capital = Cash Working Capital + Materials and Supplies Inventory + Prepayments*).

- Cash working capital represents the licensee provided cash required for payment of operation expenses, to maintain compensating cash balances, and similar needs, between the time the expenditures are necessary to provide the services and the time collections are received for the services. For a licensee, the formula calculates 1/4th (approximately 90 days) of operation and maintenance expenses for one year (*Cash Working Capital = 1/4 x (Annual Operation & Maintenance Expenses*).

- Materials and supplies are the licensee's inventory value for material and supplies necessary to meet daily requirements of providing services. 12-month average for the test year is used (*Materials and Supplies Inventory = (Total of 12 Months Value Materials and Supplies)/4*).

- Prepayments are made in advance of the period to which they apply and include items such as prepaid rents, insurance, and taxes. The amounts normally allowed are based on the same standards outlined above for materials & supplies inventories.

- Distribution licensees may utilize consumer security deposits in meeting of working capital requirements. Thus for purposes of calculating return on working capital, since these funds are not funds provided by the licensee, any amount so used are be subtracted from the working capital. If the distribution licensee pays interest on the funds deposited by consumers, these interest costs are treated as an expense.

- Working capital is allocated to the respective distribution classes on the same percentage basis as the total allocation of assets.

- The distribution rate of return on qualifying assets are calculated as the weighted average cost of capital in accordance with the following formula:

$$\text{Average Cost of Capital} = \frac{[(\text{Equity Capital} \times E\%) + (\text{Debt Capital} \times D\%)]}{[(\text{Equity Capital} + \text{Debt Capital})]}$$

Where:
"E%" is a rate of return on the equity capital of the company.
"D%" is a calculated weighted value of interest rate for debt capital.

- Rate of Return on Equity capital are calculated as the weighted average of equity in accordance with the following formula:

$$E\% = \frac{[(\text{Common Stock Amount} \times \text{Dividend Rate}) + (\text{Remaining Equity Amount} \times \text{Non-Stock Rate})]}{[(\text{Common Stock Amount} + \text{Remaining Equity Amount})]}$$

- In the case of common stock, the amount of common stock outstanding during the test year is multiplied by the last dividend rate paid during the test year.

- In terms of the remaining equity existing within the licensee, if government owned, then the government's borrowing rate is utilized.

- In the case of licensees, which are wholly or partially owned by the government, the cost of capital for remaining equity would equal the government's cost of capital. For purposes of rate development, the most recent Treasury bill auction rate, pursuant to Bangladesh Bank (central bank) auction, for the two-year treasury bills shall be utilized.

- If the licensee is a privately held distribution company (which in fact does not exist in Bangladesh at present) that falls under the regulation of the Commission, then the remaining equity rate can be computed on the basis the Commission's preference of the capital asset pricing model.

- The rate of return on the weighted value of interest rate for debt capital is calculated using the following formula:

$$D\% = \frac{[(\text{Long Term Debt} \times \text{Debt Rate}) + (\text{Preferred Stock Amount} \times \text{Dividend Rate})]}{[(\text{Long Term Debt} + \text{Preferred Stock Amount})]}$$

- If there is multiple long term debt instruments at different interest rate or multiple issuance of preferred stock at different dividend rates exist, then a similar weighted cost calculation would be performed for each category.

- In terms of long term debt rate, the utilities that are wholly owned government entities shall use the loan rate applied by the government, even if the loan funds derive from donor loans at a lower rate. The loan amounts used in this calculation should represent the outstanding balance (or unpaid balance) of the loan – not the original loan amount.

- Total Costs are the sum of costs associated with the operation and maintenance (O & M) of the licensee's system, the straight-line depreciation costs of used and useful assets used for distribution for the year, taxes, and any other necessary costs related to the operation of the licensee's system (*Total Costs = O & M Costs + Depreciation + Income & Other Taxes*).

- The amount of the current depreciation will be added as an expense in total costs at the current book value of the assets, and is not subject to re-evaluation based upon any subsequent revision of the asset valuation.

- O & M expenses are broken into the major categories viz. distribution, consumer accounts, sales, and administrative and general expenses. These costs are allocated to the respective consumer classes on the basis of the consumer allocation ratios.

- Repayments of long-term foreign loans received from international financial institutions are accounted for in local currency, utility may incurs revenue loss as a result of the fluctuation of exchange rates of the local currency with that of foreign currencies to the extent that revenues

used to repay the such loans in foreign currencies when repaid during the fiscal year will be included as an administrative and general expense.

- The amount of income tax to be included as a cost expense for rate design during the test year is the actual amount of income tax paid to the government as booked for the test year. The taxes are to be included for rate design purposes within a test year (*Taxes = Land Tax + Income Taxes Paid*).

- The recommended operating revenues for each distribution class would be the sum of the proposed return on rate base plus the total operating expenses which include the current year depreciation, and taxes (*Recommended Operating Revenue = Proposed Return on Rate Base + Operating Expenses*), which shall be compared to the current operating revenues to determine the amount of the increase required that the licensee will have the opportunity to earn to achieve the revenue requirement.

- The total current operating revenues for each class would be the sum of distribution service revenues, income from other services rendered, any interest income, and any miscellaneous income (*Total Current Operating Revenues = Distribution + Other Service + Interest + Miscellaneous income*).

- Miscellaneous income would include revenue from customer charges, reconnection charges, etc.

- The proposed revenue increase is the difference by class between the current revenues and the recommended operating revenues. This difference is the amount of revenue that rates would need to be increased to provide the licensee with the opportunity to achieve the recommended rate of return and receive sufficient funds to cover operating expenses (*Proposed Revenue Increase = Recommended Operating Revenues - Current Revenues*)

- The revenue increases are subject to income tax. If these proposed increases are directly added to current revenues, then the licensee after implementing the increase would not receive the recommended operating revenues. Future revenues would be reduced by the amount of the increased taxes. To insure the licensee has the opportunity to earn the revenues recommended, the amount of the increase is “grossed up”. Essentially, the increase is enlarged to allow for the increased taxation for which a revenue conversion factor is to be calculated [*Revenue Conversion Factor = 1/(1- Income Tax Rate*)] which is multiplied with the revenue increase (*Recommended Revenue Increase = Proposed Revenue Increase x Revenue Conversion Factor*).

- The total recommended revenue requirement is the sum of the current class revenues plus the recommended class revenue increase (*Recommended Revenue Requirement = Total Current Revenues + Recommended Revenue Increase*).

- The distribution rate for each class is simply computed by dividing the recommended revenue requirement by the annual distribution throughput in MCM (1000 cubic meter) for each class (*Distribution Rate = Recommended Revenue Requirement/Annual Distribution Throughput*).

***************

**Minutes of Meeting**

| | | |
|---|---|---|
| Date: | 07 September 2011 | |
| Time: | 12:20~ | |
| Venue: | BPDB office | |
| Participants: | BPDB | : Mr. A.S.M. Alamgir Kabir - Chairman |
| | | : Mr. Tamal Chakraborty - Member |
| | JICA Survey Team (JST) | : Mr. Iwamoto/Kono |
| | | : Mr. Md. Noor Alam - Local support service |

**Subjects: Data Collection Survey on Bangladesh Natural Gas Sector**

1. JST explained the outline and objective of the survey.

2. BPDB went through the inquiries and assured that they will shortly prepare the answers and send to JST by email.

Prepared by JST

**Minutes of Meeting**

| | | |
|---|---|---|
| Date: | 07 September 2011 | |
| Time: | 13:10~ | |
| Venue: | NWPGCL office | |
| Participants: | NWPGCL | : Mr. A.M. Khurshedul Alam - Managing Director |
| | JICA Survey Team (JST) | : Mr. Iwamoto/Kono |
| | | : Mr. Md. Noor Alam - Local support service |

**Subjects: Data Collection Survey on Bangladesh Natural Gas Sector**

1. JST explained the outline and objective of the survey.

2. NWPGCL provided JST with copies of the documents related to the gas supply to Bheramara CCPP.

Prepared by JST

**Minutes of Meeting**

| | | |
|---|---|---|
| Date: | 08 September 2011 | |
| Time: | 11:00~ | |
| Venue: | Petrobangla office | |
| Participants: | Petrobangla | : Dr. Md. Hussain Monsur - Chairman |
| | | : Mr. Md. Shafiqur Rahman - General Manager |
| | | : Mr. M. S. Alam Chowdhury - Director (Planning) |
| | JICA Survey Team (JST) | : Mr. Iwamoto/Kono/Sasano/Mizushima/Matsuda |
| | | : Mr. KM Ahmed - Project coordinator |
| | | : Mr. Md. Noor Alam - Local support service |

**Subjects: Data Collection Survey on Bangladesh Natural Gas Sector**

1. JST explained the outline and objective of the survey.

2. Mr. Shafiqur Rahman of Petrobangla was appointed to the person who will be working with JST.

3. JST will visit Mr. Shafiqur Rahman on 11/Sep to clarify the contents of inquiries and discuss the best way to complete the data collection survey.

Prepared by JST

**Minutes of Meeting**

| | | |
|---|---|---|
| Date: | 08 September 2011 | |
| Time: | 15:00~ | |
| Venue: | JGTDSL office | |
| Participants: | JGTDSL | : Mr. S. H. Z. Rahman - Managing Director |
| | | : Mr. A. B. M. Sharif - Deputy General Manager |
| | JICA Survey Team (JST) | : Mr. Iwamoto/Kono/Mizushima/Matsuda |
| | | : Mr. Md. Noor Alam - Local support service |

**Subjects: Data Collection Survey on Bangladesh Natural Gas Sector**

1. JST explained the outline and objective of the survey.

2. JGTDSL provided JST with the answers to the inquiries which was sent to JGTDSL through JICA beforehand.

3. JST will review the answers and will request further clarification from JGTDSL if necessary.

4. JGTDSL provided JST with the following documents:
   - Present gas tariff structure
   - Report on daily gas consumption
   - Daily gas supply to power stations (Allocation vs Actural)
   - Annual Report (2005/06, 2006/07, 2007/08, 2008/09 & 2009/10)

Prepared by JST

**Minutes of Meeting**

| | | |
|---|---|---|
| Date: | 11 September 2011 | |
| Time: | 10:00~11:00 | |
| Venue: | Tullow office | |
| Participants: | Tullow Bangladesh Ltd. : | Mr. James Baber - Country Manager |
| | | Mr. A.H. All Ashraf – Manager, PSC Operation |
| | JICA survey team (JST) : | Mr. Matsuda/Sasano |
| | : | Mr. Md. Noor Alam - Local support service |

**Subjects: Data Collection Survey on Bangladesh Natural Gas Sector**

1. JST explained the outline and objective of the survey.

2. JST handed over a copy of the inquiries and Tullow replied to send the inquiries to their technical office in Dublin. They will e-mail us in a few days.

3. Tullow has 4 producing wells and is producing gas of 121 mmcf/d. They are facing sand production problem, if production rate goes up.

4. Tullow is willing to continue to work in Bangladesh and will bit next round of PSC Lease.

5. The meeting was very friendly mood and Mr. Noor Alam discussed geological matters in Bangladesh with Tullow personnel.

Prepared by JST

**Minutes of Meeting**

Date: 11 September 2011
Time: 12:20~13:00
Venue: RPGCL (Rupantarita Prakritik Gas Company - CNG) office
Participants: RPGCL Ltd. : Mr. Shafiul Azam – Managing Director

JICA survey team (JST) : Mr. Matsuda/Sasano
: Mr. Md. Noor Alam - Local support service

**Subjects: Data Collection Survey on Bangladesh Natural Gas Sector**

1. JST visited RPGC office without appointment due to Mr. Alam tried to contacted by tel, e-mail or fax, but he could not get any replay. RPGC's MD welcomed us and meeting was held Friendly mood.

2. JST explained the outline and objective of the survey.

3. JST's inquiries to RPGCL are only two – gas purchase & sale volume and gas purchase & CNG sale price past ten years. They replied all our inquiries.
(Due to the black out during meeting, copies of their report was not available)

4. Annual report 2009/10 was received.

5. RPGCL's stuff showed JST for CNG compression process and CNG filling station.

Prepared by JST

**Minutes of Meeting**

| | | |
|---|---|---|
| Date: | 11 September 2011 | |
| Time: | 15:00~16:10 | |
| Venue: | Santos Sangu Field Ltd. | |
| Participants: | Santos | : Mr. John Chambers, President |
| | | : Mr. Ajay Nambiar, Vice President of Planning |
| | JICA Survey Team (JST) | : Mr. Sasano/Matsuda |
| | | : Mr. Md. Noor Alam - Local support service |

**Subjects: Data Collection Survey on Bangladesh Natural Gas Sector**

1. JST explained the background of the study and requested the several data.

2. Santos explained the outline of the Santos company and the natural gas sector condition in Bangladesh using the presentation materials.

3. Santos explained their opinion of PSC Contract of the ConocoPhillips's deepwater exploration blocks DS-08-10 and DS-08-11.

4. They will send the requested data by e-mail including presentation material within several days.

Received Material

(1) Annual report of Santos
(2) Several pages of presentation material

Prepared by JST

**Minutes of Meeting**

| | | |
|---|---|---|
| Date: | 12 September 2011 | |
| Time: | 10:00~ | |
| Venue: | Petrobangla Mr. Shafiqur Rahman's office | |
| Participants: | Petrobangla | : Mr. Shafiqur Rahman<br>General Manager<br>Strategic Planning and Resources Mobilization Division |
| | JICA Survey Team (JST) | : Mr. Iwamoto/Kono/Sasano/Mizushima/Matsuda |
| | | : Mr. Md. Noor Alam - Local support service |

**Subjects: Data Collection Survey on Bangladesh Natural Gas Sector**

1. Petrobangla answered to inquiries No.1~3 as per attached sheets.

2. Petrobangla provided JST with latest Annual Report 2010. JST will review the contents and will request supporting data if necessary.

3. Both party will meet again within this week or early next week to clarify the rest of inquiries. Petrobangla will confirm the date & time.

Prepared by JST

# Inquiries: Petrobangla

## 1. Organaization/Institution

| No. | Inquiry | Answer |
|---|---|---|
| 1-1 | Is the National Energy Policy 2004 availabe on Petrobangla's website latest? | Yes |
| 1-2 | Please provide the English version of GAS ACT 2010 | No English version is available |
| 1-3 | Please provide the Gas Sector Reform Roadmap | Petrobangla to collect and provide. |
| 1-4 | Please explain the interrelationship between following policies and plans those are related to the gas sector?<br>- Outline Perspective Plan of Bangladesh 2010-2021<br>- National Strategy for Accerelated Poverty Reduction (revised) FY 2009-11<br>- National Energy Policy (NEP)<br>- Gas Act 2010<br>- Gas Sector Reform Roadmap (GSRR)<br>- Gas Evacuation Plan 2010-2015 (GEP)<br>- Gas Sector Master Plan 2006 (GSRR) | NEP is the state policy.<br>Gas Act shows the ways for distributers and consumers.<br>GSRR is the policy roadmap approved by the government.<br>GEP shows implementation plans.<br>GSMP is now under review by Petrobangla.<br><br>Petrobangla is not in a position to provide the latest GEP which is now renamed as "Gas Sector Stategic Business Plan (year 2010 to 2015)" because it is not approved yet. |
| 1-5 | What are the changes in the Gas Sector Master Plan 2006 at this stage? | See the answer in item No.1-4. |
| 1-6 | Are there any organizational problems in the state gas companies that are obstructing the reform of Gas Sector? | No. |
| 1-7 | Please explain the basic policy of gas supply at off-grid region. (Expanding pipelines? or introducing LPG?) | For off-grid area LPG will be introduced rather than expanding pipelines. |
| 1-8 | Please explain the basic policy of gas supply to different sectors such as power, fertilizer, domestic, etc. (e.g. any restrictions to particular sectors?) | New connection is presently restricted except for the power and fertilizer sectors untill the gas production reaches to 2200mmcfd. |

## 2. Natural Gas Demand

| | | |
|---|---|---|
| 2-1 | Please provide the Annual Report of 2010 if it is already prepared.<br><br>If it is not prepared, please provide the updated version of following tables shown in the Annual Report 2009.<br><br>- GROWTH OF CUSTOMER BASE<br>- CATEGORY-WISE ANNUAL GAS SALES | Petrobangla provided JST with Annual Report 2010. |
| 2-2 | Please provide the latest GAS DEMAND PROJECTION of each distribution company preferably up to 2030. | Petrobangla stated that latest gas demand projection is mentioned in the annual report 2010 but up to 2015 only.<br>JST will review the report and request supporting data if necessary. |
| 2-3 | Please provide the latest GAS DEMAND PROJECTION of each category (power/captive.power/fertilizer/industry/ commercial/domestic/CNG/tea/brickfield) preferably up to 2030. | Ditto |
| 2-4 | Does the latest GAS DEMAND PROJECTION reflects the following issues?<br><br>- Rise of gas price<br>- Gas supply deficiency<br>- Import of LNG<br>- Demand decrease due to restrictions<br>(e.g. restrictions for new connections, introduction of metering system, etc.) | Yes, but the demand will not be decreased by the restrictions, because there are many hidden demands around upcoming pipelines. |

# Inquiries: Petrobangla

| No. | Inquiry | Answer |
|---|---|---|
| 2-5 | What is the GDP growth ratio considered in the latest GAS DEMAND PROJECTION? | 7% |
| 2-6 | Are there any energy-saving activities such as day light saving time, holiday steggering and introduction of solar power among gas consumers? | Day light saving time was introduced in the last year, but not introduced in this year.<br>Holiday steggering is also being carried out in some field but not widely spread.<br>Setting up solar panel is now mandatory for those who have demand over two kilowatts. |
| 2-7 | Please provide the monthly demand & supply data of natural gas to the power sector for last 10 years. | Petrobangla to collect and provide. |
| 2-8 | Please provide the monthly demand & supply data of natural gas to fertilizer factories for last 10 years with the list of fertilizer factories. | Petrobangla to collect and provide. |

## 3. Natural Gas Exploration, Production and Import

| | | |
|---|---|---|
| 3-1 | Please provide us information of LNG import program ;<br>1) Progress of LNG import plan (e.g. the construction of receiving terminal & necessary pipelines)<br>2) Information of LNG regasification terminal and associated infrastructure<br>3) When LNG gas available to flow to gas grid | Consultant service contract was just signed with USA consulting company.<br>This consultant will finalize the type of regasification terminal.<br>LNG supply will start from December 2013. |
| 3-2 | Do you plan to import the natural gas from neighboring countries ?<br>If yes, please inform the followings;<br>a. Importing country,<br>b. When starts to import,<br>c. Importing gas volume,<br>d. Importing price,<br>e. Associated infrastructure provision plan | Bilateral discussions are progressing very slowly, and therefore natural gas import from neighboring countries is not considered in the future gas supply plan. |
| 3-3 | Please provide us following document ;<br>1) Bangladesh Gas Reserve Estimation by Gustavson Associates - Hydro Carbon Unit (HCU)、MPERMR<br>2) Gas Evacuation Plan (2010-15) | Both documents cannot be provided because they are yet to be approved. |
| 3-4 | Please provide following information ;<br>1) Exploratory or development plans with CNPC<br>2) Exploratory or development plans with Gazprom<br>3) Exploratory or development plans with Sinopec<br><br>For example:<br>- Field name, duration of agreement<br>- Terms of contract<br>- Number of exploration or development wells drilled<br>- Expecting production rate<br>- Drill by their own rig or by BAPEX rig ? | No plans yet with CNPC and Sinopec.<br>Gazprom proposed 10 wells drilling by turn key project, and most likely this project will start in very near future. |
| 3-5 | Please provide us with the following information of PSC agreement with ConocoPhillips ;<br>1) Detail of exploratory plan (Seismic work) of ConocoPhillips (DS-08-10 and DS-08-11 PSC Fields)<br>2) Number of exploratory wells (if any agreed) | These details are not available in the strategic planning division yet, because no field activity is commenced.<br>Petrobangla will try to find out the local contact of ConocoPhillips. |

**Minutes of Meeting**

| | | |
|---|---|---|
| Date: | 12 September 2011 | |
| Time: | 11:10~ | |
| Venue: | BGFCL Dhaka office | |
| Participants: | BGFCL | : Mr. Md. Nurul Islam - Managing Director |
| | JICA Survey Team (JST) | : Mr. Iwamoto/Kono/Sasano/Mizushima/Matsuda |
| | | : Mr. Md. Noor Alam - Local support service |

**Subjects: Data Collection Survey on Bangladesh Natural Gas Sector**

1. BGFCL stated that they are now preparing the answers to inquiries, and it will be ready by early next week for JST's collection.

2. BGFCL provided JST with the latest Annual Report (2009-2010).

Prepared by JST

**Minutes of Meeting**

| | | |
|---|---|---|
| Date: | 12 September 2011 | |
| Time: | 11:50~ | |
| Venue: | SGCL Dhaka office | |
| Participants: | SGCL | : Mr. A. B. M. Nazmul Hasan - Managing Director |
| | JICA Survey Team (JST) | : Mr. Iwamoto/Kono/Sasano/Mizushima/Matsuda |
| | | : Mr. Md. Noor Alam - Local support service |

**Subjects: Data Collection Survey on Bangladesh Natural Gas Sector**

1. SGCL briefed the outline of SGCL.

2. SGCL provided JST with the answers to JST's inquiries. JST will review the answers and will contact SGCL again if further clarification is required.

3. SGCL provided JST with the latest Annual Report (2009-2010) in Bengali.

Prepared by JST

**Minutes of Meeting**

| | | |
|---|---|---|
| Date: | 12 September 2011 | |
| Time: | 14:30~ | |
| Venue: | GTCL Dhaka office | |
| Participants: | GTCL | : Mr. Harun |
| | JICA Survey Team (JST) | : Mr. Iwamoto/Kono/Mizushima |

**Subjects: Data Collection Survey on Bangladesh Natural Gas Sector**

1. GTCL provided JST with the tables showing the state of ongoing and future pipeline projects, and stated that the construction of some part of pipelines are cancelled due to the shortage of funds.

2. GTCL provided JST with the following annual reports. JST will make copies and return these reports to GTCL at next meeting.
   2005-2006/2006-2007/2007-2008/2008-2009/2009-2010

3. Both party will meet again at 14:30 of 14/Sep, and GTCL will provide the following documents in this meeting.
   - Complete node name list
   - Node number of the each intake & offtake points mentioned in the daily gas production and supply report
   - Iuput/output data and network model of the previous GTCL's gas pipeline network simulation.

Prepared by JST

**Minutes of Meeting**

| | | |
|---|---|---|
| Date: | 13 September 2011 | |
| Time: | 11:00~11:20 | |
| Venue: | Economic Relations Division of Ministry of Finance | |
| Participants: | MOF | : Mr. Md. Mostafizur Rahman, Deputy Secretary |
| | JICA Survey Team (JST) | : Mr. Sasano/Matsuda |
| | | : Mr. Md. Noor Alam - Local support service |

**Subjects: Data Collection Survey on Bangladesh Natural Gas Sector**

1. Since there is no answer from MOF, JST directly visited to MOF.

2. JST explained study background and requested data related with natural gas sector.

3. However DS of MOF suggested us to visit the other division, namely General Electric Division and General Economics Division.

4. Min. of Finance gave up a copy of ”Sixth five year Plan”

Prepared by JST

**Minutes of Meeting**

| | | |
|---|---|---|
| Date: | 13 September 2011 | |
| Time: | 11:25~12:10 | |
| Venue: | General Economics Division, Bangladesh Planning Commission | |
| Participants: | GED/BPC | : Mr. Md. Monirul Islam, Senior Assistant Chief |
| | JICA Survey Team (JST) | : Mr. Sasano/Matsuda |
| | | : Mr. Md. Noor Alam - Local support service |

**Subjects: Data Collection Survey on Bangladesh Natural Gas Sector**

1. Since there is no answer from GEC/BPC, JST directly visited to GEC/BPC.

2. JST explained study background and requested economic data and last Five Year Plan.

3. SAC hand over the "6th Five Year Plan" including economic data and explained the background of the Prospect Plan 2021 and the Five Year Plan.

Received Material

(1) 6th Five Year Plan 2011-2015

Prepared by JST

**Minutes of Meeting**

| | | |
|---|---|---|
| Date: | 13 September 2011 | |
| Time: | 12:45~13:40 | |
| Venue: | Sylhet Gas Fields Limited | |
| Participants: | SGFL: | Mr. Engr. Tofazzal Hossain, Managing Director |
| | JICA Survey Team (JST): | Mr. Sasano/Matsuda |
| | | Mr. Md. Noor Alam - Local support service |

**Subjects: Data Collection Survey on Bangladesh Natural Gas Sector**

1. JST explained the study background and requested the data.

2. The MD explained their activity. Technical discussion was made for past and on-coming well program.

3. JST handed over a copy of the inquiries and SGFL will inform to SGFL's Shylet main office and will e-mail us before 19th next week.

4. SGFL's 2009-2010 Annual Report was received.

Prepared by JST

**Minutes of Meeting**

| | | | |
|---|---|---|---|
| Date: | 14 September 2011 (2nd Meeting) | | |
| Time: | 12:00~ | | |
| Venue: | Bangladesh Petroleum Exploration & Production Co., Ltd. | | |
| Participants: | BAPEX : | (Drilling) | Mr. Amzad Hossain GM Drilling Div. |
| | | (Planning) | Mr. Engr. M. Yusuf Haroon, GM of Planning |
| | JICA Survey Team (JST) : | | Mr. Iwamoto/Sasano/Matsuda |
| | | | Mr. Md. Noor Alam - Local support service |

**Subjects: Data Collection Survey on Bangladesh Natural Gas Sector**

(Drilling)

1. Since JST handed-over the inquiries on the 1st meeting day on 06 Sept, to BAPEX's MD Faruque. Mr. Haroon didn't know such inquiries. JST requested to answer in the inquiries on Monday (20th) morning.

2. Confirmed wells status of "Gas Evacuation" report – new wells, work over, etc,

(Planning)

3. Since JST requested the data, JST could not have any data from BAPEX.

4. GMP does not have any information about the JST requirement, so after checking the background of the JST Study, GMP will decide whether hand over or not.

Prepared by JST

**Minutes of Meeting**

Date: 14 September 2011
Time: 13:30~
Venue: Tital Gas Transmission and Distribution Co., Ltd.
Participants: TGTDCL : not available
JICA Survey Team (JST) : Mr. Sasano/Matsuda
: Mr. Md. Noor Alam - Local support service

**Subjects: Data Collection Survey on Bangladesh Natural Gas Sector**

1. Since it was difficult contact with TGTDCL, JST directly visited TGTDCL.

2. However managing director of TGTDCL is out of the country, JST could not make interview to TGTDCL.

3. The managing director will be back end of next week after JST will leave Bangladesh.

4. TGTDCL stuff explained that all JST's required data are on the Annual Report on TGTDCL's website.

Prepared by JST

**Minutes of Meeting**

Date: 14 September 2011
Time: 14:30~
Venue: GTCL office
Participants: GTCL : Mr. Shariful/Nasir/Harun
JICA Survey Team (JST) : Mr. Kono/Mizushima

**Subjects: Data Collection Survey on Bangladesh Natural Gas Sector**

1. JST returned annual reports (given to JST for making photo copies) to GTCL.

2. GTCL provided JST with the following information.
   - Complete node name list
   - Node number of the each intake & offtake points mentioned in the daily gas production and supply report
   - Iuput/output data and network model of the previous GTCL's gas pipeline network simulation.

3. JST presented the additional inquiries (see attached), and GTCL will email the answers to JST by 15/Sep evening.

4. GTCL explained the peak time of gas consumption as follows:
   - Daily consumption
     Lowest consumption from midnight to 7 am, then increase up to 12 am and constant up to 5 pm, then increase again up to 7 pm. This is the peak time of daily consumption continues up to 10 pm, and drop down to the lowest consumption by 12 pm. Difference between off-peak and peak is 200~300mmcfd.
   - Yearly consumption
     More demand in summer season due to irrigation and more gas is allocated to power sector. Consequently gas supply to other sectors in this season is reduced.

Prepared by JST

**Minutes of Meeting**

| | | |
|---|---|---|
| Date: | 15 September 2011 | |
| Time: | 10:00~ | |
| Venue: | KAFCO Office | |
| Participants: | KAFCO | : Mr. Mohammad Kamal Uddin<br>Manager, Corporate Planning |
| | JICA Survey Team (JST) | : Mr. Iwamoto/Kono |

**Subjects: Data Collection Survey on Bangladesh Natural Gas Sector**

1. JST explained the outline and objective of the survey.

2. KAFCO explained their prospect to the gas consumption of fertilizer factories up to 2030, and provided the following documents for JST's reference.
   - Production and Gas Consumption Data of Fertilizer Factories
   - Copy of "Power and Energy Sector Road Map" issued by MOF.

Prepared by JST

**Minutes of Meeting**

| | | |
|---|---|---|
| Date: | 15 September 2011 | |
| Time: | 10:15~ | |
| Venue: | Pashchimanchal Gas Company Ltd. (PGCL) | |
| Participants: | PGCL | : Mr. Md. Ali Hossain, Managing Director |
| | JICA Survey Team (JST) | : Mr. Sasano/Matsuda |
| | | : Mr. Md. Noor Alam - Local support service |

**Subjects: Data Collection Survey on Bangladesh Natural Gas Sector**

1. JST explained JICA study background and request the data related to the Natural Gas Sector.

2. PGCL explained the natural gas supply condition in Rajshahi Division.

3. PGCL provide JST their annual reports and MD explain the data which JST required are all described in the annual reports.

Received Material:

(1) Annual Report 2010, 2009, 2008 and 2007.

Prepared by JST

**Minutes of Meeting**

| | | |
|---|---|---|
| Date: | 15 September 2011 | |
| Time: | 15:00~ | |
| Venue: | BPC Office | |
| Participants: | BPC | : Mr. Md. Muqtadir Ali - Chairman |
| | JICA Survey Team (JST) | : Mr. Iwamoto/Kono |

**Subjects: Data Collection Survey on Bangladesh Natural Gas Sector**

1. JST explained the outline and objective of the survey.

2. BPC explained the outline and present activities of BPC, and stated that:
   - Demand of gas oil (diesel) and furnace oil is currently increasing for domestic energy security.
   - Import and process of LPG will be increased to fulfill the demand at off-grid area.

3. BPC provided JST with the following documents:
   - Actual sales of petroleum products since FY2007-2008
   - Demand projection of petroleum product up to FY2013-2014

Prepared by JST

**Minutes of Meeting**

| | | |
|---|---|---|
| Date: | 15 September 2011 | |
| Time: | 15:00~ | |
| Venue: | Hydrocarbon Unit, EMRD | |
| Participants: | HCU | : Mr. Engr Anwar H Khan, Director General |
| | | : Mr. A S M Manzurul Quader |
| | JICA Survey Team (JST) | : Mr. Sasano/Matsuda |
| | | : Mr. Md. Noor Alam - Local support service |

**Subjects: Data Collection Survey on Bangladesh Natural Gas Sector**

1. JST visited HCU office for expecting the requested data, however due to the other project under the HCU, DG Khan could not get in touch with our required data.

2. DG Khan promised when the Minister endorse the new revised prospect data, he will provide the data and will send JST by e-mail.

3. At this time, DG Khan provides JST “the Bangladesh Gas Reserve Estimation 2003”.

Received Material:

(1) Bangladesh Gas Reserve Estimation 2003

Prepared by JST

**Minutes of Meeting**

Date: 18 September 2011
Time: 10:10~10:40
Venue: IDB Office
Participants: IDB : Mr. Mohammad Iqbal Karim (Representative)
JICA Survey Team (JST) : Mr. Iwamoto/ Mr. Alam

**Subjects: Data Collection Survey on Bangladesh Natural Gas Sector**

1. JST explained the outline and objective of the survey.

2. IDB explained the outline and present activities of IDB, and stated that:
   - Power Sector
     ① Bola PS 225MW
     Finance Agreement has been signed already. Gas supply (72mmscfd) was confirmed by the written letter by the GOB. Expected completion: Dec 2014
     ② Ashganji C/C PS 400MW
     Finance Agreement will been signed soon. Expected completion: Dec 2014
     Since the PS is located near to gas fields, gas is available.
     ③ Shikrababad (near Chittagong) PS 150MW
     Under consideration
     ④ PS for private sector 50 - 200MW
     Under consideration
   - Gas Sector
     ① Shinglemorng LPG Terminal (Fuel refinery) under BPC
     Project cost: basically USD 140mil., maybe more than USD 200mil. Consultant was awarded 3 months ago.
   - Renewable Energy
     ① IDB has supported the IDCOL (Infrastructure Development Company Limited) Solar Energy Program and will support the renewable energy development project.

Prepared by JST

**Minutes of Meeting**

Date: 18 September 2011
Time: 11:25~12:10
Venue: General Economics Division, Bangladesh Planning Commission
Participants: GED/BPC : Mr. Md. Monirul Islam, Senior Assistant Chief
JICA Survey Team (JST) : Mr. Matsuda

**Subjects: Data Collection Survey on Bangladesh Natural Gas Sector**

1. GDP growth rate was steady increasing last few years with 0.3 to 0.4 % per year.

2. GDP projections between 2010 and 2015 in 6th Five Year Plan are 6.1, 6.7, 7.0, 7.2, 7.6 and 8.0, respectively.

3. GDP projection of Petrobangla which carried out by WB (Bangladesh Gas Sector Master Plan) shows a little bit low. The GDP growth ratio should be higher than the figure in previous year.

4. Case-B figure of WB between 2015/16 could reduce from 8.0% to 7.5%, however suggested GDP increase ratio between 2015/16-2019/20, 2020/21-2024/25 and 2025/26-2029/30 shall be 8.0%, 8.5% and 9.0%, respectively.

Prepared by JST

**Minutes of Meeting**

| | | |
|---|---|---|
| Date: | 18 September 2011 | |
| Time: | 14:00~15:00 | |
| Venue: | Deutsche Gesellschaft Fur Internationale Zusammenarbeit (giz) GmbH | |
| Participants: | giz | : Mr. Erich Otto Gomm, Programme Coordinator Sustainable Energy for Development |
| | | : Dr. Engr. Khursheed-Ul-Islam, Senior Advisor |
| | JICA Survey Team (JST) | : Mr. Matsuda |
| | | : Mr. Md. Noor Alam - Local support service |

**Subjects: Data Collection Survey on Bangladesh Natural Gas Sector**

1. JST explained background of the Data Collection on the Natural Gas Sector Project.

2. Giz explained German assistance scheme, that giz supports technical corporations and Kfw supports finance projects. Kfw supported the power and energy sector, however nowadays they do not support huge power and energy projects.

3. Giz supports rural areas that people could not have access to the electricity and gas. They promote renewable energy and energy efficiency, and rural electrification.

4. If there are access to the power and energy, rural people wish to connect. However rural people could have a priority or not, that is the big issue for them. The most important point is the fuel for foods, so Giz supports rural household for fuel of cooking and solar power light system for their work and study.

5. People who use the firewood or other energy in the house without chimney, they got a lot of smog and they got the lung illness and/or die according to the WHO.

Received material:

(1) Promotion Renewable Energy and Energy Efficiency by giz

Prepared by JST

**Minutes of Meeting**

| | | |
|---|---|---|
| Date: | 19 September 2011 | |
| Time: | 10:30~ | |
| Venue: | EMRD office | |
| Participants: | EMRD | : Mr. Md. Sefaul Alam - Joint Secretary |
| | JICA Survey Team (JST) | : Mr. Iwamoto/Kono |
| | | : Mr. KM Ahmed - Project coordinator |
| | | : Mr. Md. Noor Alam - Local support service |

**Subjects: Data Collection Survey on Bangladesh Natural Gas Sector**

1. JST explained the progress of meetings with related entities, and requested EMRD's support to obtain the following documents:
   - Gas Strategic Business Plan (2010-2015)
   - Update report of gas reservation by Gustavson

   EMRD mentioned these documents cannot be officially provided because they are yet to be approved by GOB.

2. Instead EMRD provided JST with the following documents:
   - Gas production augmentation plan (in Bangali)
   - Extracted copy of Gustavson's report showing the summary of latest gas reservation.

3. EMRD stated that Bibiyana-Dhanua pipeline project will be completed by March 2013, and other two essential pipeline projects (Ashuganj-Bakhlabad pipeline & pipeline for LNG terminal) will also quickly progress because these projects are under Petrobanla's own fund.

Prepared by JST

**Minutes of Meeting**

| | | |
|---|---|---|
| Date: | 19 September 2011 | |
| Time: | 14:00~ | |
| Venue: | USAID office | |
| Participants: | USAID | : Mr. Sher Khan & his staff |
| | JICA Survey Team (JST) | : Mr. Iwamoto/Kono |
| | | : Mr. Md. Noor Alam - Local support service |

**Subjects: Data Collection Survey on Bangladesh Natural Gas Sector**

1. JST explained the outline and objective of the survey.

2. USAID explained their present activities and future plan in the energy sector of Bangladesh. They are mainly assisting the sector in Technical Assistance and Capacity Building.

Prepared by JST

**Minutes of Meeting**

| | | |
|---|---|---|
| Date: | 20 September 2011 | |
| Time: | 10:20~ | |
| Venue: | BPDB office | |
| Participants: | BPDB | : Mr. Md. Ahsan Habib - Member |
| | JICA Survey Team (JST) | : Mr. Kono |
| | | : Mr. N. C. Ghosal - Local support service |

**Subjects: Data Collection Survey on Bangladesh Natural Gas Sector**

1. JST stated that the list of power plants with natural gas requirement provided from BPDB by email as an answer to JST's inquiries includes some additional upcoming power plants that were not considered in the gas demand projection of PSMP2010.

2. BPDB clarified the actual gas requirement of each of such power plants, and provided JST with following documents:
    - Revised list of power plants with natural gas requirement (2011-2018)
    - Power Generation Project up to 2016

Prepared by JST

**Minutes of Meeting**

| | | |
|---|---|---|
| Date: | 15 November 2011 | |
| Time: | 14:10~ | |
| Venue: | EMRD office | |
| Participants: | EMRD | : Mr. Sohel Ahmed - Deputy Secretary |
| | | : Mr. A. K. Mohiuddin Ahmed - Deputy Secretary |
| | JICA Survey Team (JST) | : Mr. Iwamoto/Kono/Sasano/Mizushima/Matsuda |
| | | : Mr. Md. Noor Alam - Local support service |

**Subjects: Data Collection Survey on Bangladesh Natural Gas Sector**

1. EMRD informed JST of the absence of their Joint Secretary Mr. Md. Sefaul Alam, however, stated that Mr. Sohel Ahmed is designated as a coordinator to maintain the cooperation from related entities.

2. JST provided EMRD with the tentative schedule of meeting with related entities and questionnaires, and requested EMRD to ensure the cooperation especially from Petrobangla who holds important information required for the survey team.

3. JST informed that the meeting with Petrobangla is not arranged yet, and requested EMRD to:
   - Assist JST to meet Petrobangla
   - Attend the meeting with Petrobangla

   in order to ensure their cooperation to JST. EMRD will discuss this issue with their Joint Secretary and take necessary actions.

4. JST presented the questionnaire (see attached) to EMRD, and explained the content of each question. EMRD will prepare the written answers and both parties will meet again to confirm the contents of answers.

5. The meeting with the Joint Secretary Mr. Md. Sefaul Alam will be held from 12:00 o'clock on 16/Nov at his office.

This minutes prepared by JST

# Questionnaire to EMRD for the 2nd Survey in Bangladesh

| No. | Question | Answer |
|---|---|---|
| 1 | Organization<br>Please explain:<br>- MoPEMR organization and the position of EMRD<br>- EMRD's organization | |
| 2 | Organization<br>Why does EMRD has several different name of organization, namely Unit, Bureau, Institute, etc. without department? | |
| 3 | Energy Balance Sheet<br>Please provide us the data of Simplified Energy Balance Sheet of Bangladesh for past five years.<br>We attached a blank table which introduced in Key World Energy Statistics by International Energy Agency. | |

**Minutes of Meeting**

| | | |
|---|---|---|
| Date: | 15 November 2011 | |
| Time: | 16:00~ | |
| Venue: | HCU office | |
| Participants: | HCU | : Mr. Anwar H Khan - Director General |
| | | : Mr. A. S. M. Monzurul Quader |
| | | : Mr. Abu Syed Md. Faisal |
| | | : Mr. Md. Hasan Shaharier |
| | JICA Survey Team (JST) | : Mr. Iwamoto/Kono/Sasano/Mizushima/Matsuda |
| | | : Mr. Md. Noor Alam - Local support service |

**Subjects: Data Collection Survey on Bangladesh Natural Gas Sector**

1. JST requested HCU to provide the detailed data of the following wells mentioned in the "Gas reserve estimation 2010":
   - Bibiyana
   - Titas
   - Habiganj
   - Kailashtilla
   - Rashidpur

   HCU stated that the "Gas reserve estimation 2010" is not approved by the government yet, and therefore the contents of this report cannot be disclosed. However HCU will try to extract the information which can be released from the report for JST as possible as they can.

2. JST presented the questionnaire to HCU, and explained the content of each question.

3. HCU will internally study above issues further and inform JST of the date of next meeting.

This minutes prepared by JST.

**Minutes of Meeting**

| | | |
|---|---|---|
| Date: | 16 November 2011 | |
| Time: | 11:30~ | |
| Venue: | EMRD office | |
| Participants: | EMRD | : Mr. Md Sefaul Alam - Joint Secretary |
| | JICA Dhaka Office (JDO) | : Mr. T. Sunouchi - Representative |
| | JICA Survey Team (JST) | : Mr. Iwamoto/Kono |
| | | : Mr. Md. Noor Alam - Local support service |

**Subjects: Data Collection Survey on Bangladesh Natural Gas Sector**

1. JDO explained the objective of the Survey is not only to examine the gas supply to Bheramara power plant but also to find out the potential projects to support natural gas sector by Japanese ODA loan.

2. JDO and JST requested EMRD to ensure the cooperation from related entities especially from Petrobangla who holds important information.

3. EMRD arranged the meeting with Mr. Md. Shafiqur Rahman, General Manager of Stategic Planning and Resources Mobilization Division of Petrobangla, for JST at 3:00 pm of 16/Nov.

4. JST provided EMRD with the questionnaires to related entities (see attached).
   EMRD quickly checked some of them and found that:
   - Some of the requested information are included in the documents which are not approved yet by the government and cannot be disclosed
   - Some questions to Petrobangla cannot be answered by Petrobangla and should be answered by EMRD.

   JST will meet Mr. Sohel Ahmed , Deputy Secretary of EMRD, to discuss above issues in detail.

This minutes prepared by JST

## Questionnaire for the 2nd Survey in Bangladesh

| Answerer | Question | Answer |
|---|---|---|
| Petrobangla | National Energy Policy (NEP)<br>NEP2004 seems to be outdated and does not reflect the recent energy crisis. And NSAPR II states that the existing National Energy Policy is being updated.<br>Please provide us with the latest draft of the National Energy Policy.<br>If the draft is not available please let us know the contents and the progress of updates in detail. | |
| Petrobangla | Gas Sector Master Plan 2006 (GSMP)<br>During the last interview it was mentioned that GSMP is under review.<br>Please provide us with the latest draft. If the draft is not available please let us know the contents and the progress of the review in detail. | |
| Petrobangla | Gas Sector Reform Roadmap (GSRR)<br>During the last interview we, the Survey team, requested the copy of GSRR, however we have not received it yet.<br>Please provide us with the copy of GSRR and also please let us know the actual progress of each action plans mentioned in GSRR. | |
| Petrobangla | Gas Demand<br>In recent years Bangladesh has been facing the gas supply shortage.<br>1) When did this shortage start?<br>2) How did this shortage increase?<br>3) How was each sector affected by this gas supply shortage?<br>4) What was done to restrain the demand increase so far? | |
| Petrobangla | Energy Saving<br>1) Why is the daylight saving time not adopted after 2009?<br>2) How are the actual states of the following energy saving activities mentioned in NSAPR II?<br>- Adjusting shopping hours<br>- Staggering holiday for industries<br>- Creating awareness of CFL bulbs<br>3) Are ther any other energy saving activities presently planned or already implemented? | |
| Petrobangla | Demand & Supply Records<br>Please provide us with the past records of monthly average of gas demand and supply for last 10 years. | |
| Petrobangla | Alternative Energy<br>1) Coal<br>Please provide us with the English version of Draft Coal Policy which is presently available in Petrobangla's web site.<br>When will the Coal Policy be finalized? | |
| Petrobangla | LNG import<br>Please explain the current plan in detail.<br>Who is responsible for LNG import in the energy sector? | |
| Petrobangla | Coal import<br>Who will be responsible for Coal import?<br>(not for brick field, as alternative fuel to natural gas) | |
| Petrobangla | Development Plan<br>Please let us know the development plans with CNPC, Gazprom and Sinopec. | |
| Petrobangla | Offshore Bidding Round 2011<br>Please let us know the progress and timing. | |
| Petrobangla | Organization<br>In general, governmental organization shows hierarchy of division, department and/or section of governmental offices except state own enterprises. However the position of Petrobangla seems to be same as department of EMRD. Please explain the exact position of Petrobangla. | |
| Petrobangla | Management plan for the profit and loss<br>Please explain the management plan for the profit and loss during past period and future. | |
| Petrobangla | Gas Meter<br>Installation of gas meters are very important for fair charge of gas consumption and minimize the contract consumption loss. On the other hand, Petrobangla has a benefit and distribute the dividend. Why does not Petrobangla (distribution companies) install gas meters for all customers? | |
| Petrobangla | Privatization<br>Please explain about the privatization plan of Petrobangla and group enterprises. | |
| Petrobangla | Bureau of Mineral Development<br>Why does not Bureau of Mineral Development (BMD) take responsibility of two mining enterprises? | |
| Petrobangla | Subsidy<br>Please provide the governmental subsidy on natural gas sector by item for past five years in Table. | |
| Petrobangla | "TA to review the approach for increasing the efficiency of gas utilization in certain major users" with financial assistance from Japan Debt Cancellation Fund (JDCF)<br>Please explain the progress of the above TA and provide us with the related data if possible. | |

| | | |
|---|---|---|
| ADB | Gas Meter<br>Please let us know the present state of gas meter installation project. | |
| BPC | Alternative Energy<br>1) Petroleum Products<br>Please let us know the concrete plans and actual progress of:<br>- Increase of fuel oil import as an alternative to natural gas<br>- Strengthening storage & distribution capacity of fuel oil<br><br>2) LPG<br>Please let us know:<br>- The present state of LPG import by BPC as well as private companies.<br>- The concrete plan for the promotion of LPG usage and its progress. | |
| Power Div. | Alternative Energy<br>1) Renewable Energy<br>Renewable Energy Policy 2008 states that achieve the targets for developing renewable energy resources to meet five percent of the total power demand by 2015 and ten percent by 2020. Will it be achieved? Please let us know the present state of renewable energy usage. | |
| BPDB | Gas Supply to Siddhirganj Power Plant<br>What is the gas requirement and actual gas supply to Siddhirganj 2x120MW Power Plant? | |
| BPDB | Power Generation Long Term Plan<br>Please let us know the long term plan for the construction of new high efficiency gas fired power plants and retirement of old low efficiency gas fired power plants. | |
| BPDB | Nuclear Power Plant<br>Please brief the plan for nuclear power plants by Russia at Rooppur. | |
| BAPEX | GDF<br>How much GDF does BAPEX need for the development of natural gas meet with demand? | |
| BERC | Organization<br>Please explain the exact position of BERC in the energy sector, such as the relationship with EMRD and Power Division. | |
| BERC | Gas Tariff<br>How do you set the gas tariff for considering the governmental subsidy? | |
| EMRD | Organization<br>Please explain:<br>- MoPEMR organization and the position of EMRD<br>- EMRD's organization | |
| EMRD | Organization<br>Why does EMRD has several different name of organization, namely Unit, Bureau, Institute, etc. without department? | |
| EMRD | Energy Balance Sheet<br>Please provide us the data of Simplified Energy Balance Sheet of Bangladesh for past five years.<br>We attached a blank table which introduced in Key World Energy Statistics by International Energy Agency. | |
| HCu | Reserve Estimation<br>In the latest reserve estimate by GA, Bibiyana, Kailash Tila, Rashidpur, and Titas significantly increased. On the other hand, Habiganj decreased significantly. We would appreciate it greatly if you could provide us the detailed data, such as descriptons and figures, tables on material balance analysis and production simulation of the above fields.<br>Even if data of the above all fields is not available, we would like to see at least data of Bibiyana, Titas and Habiganj. | |
| HCU | Energy Balance Sheet<br>Please provide us the data of Simplified Energy Balance Sheet of Bangladesh for past five years.<br>We attached a blank table which introduced in Key World Energy Statistics by International Energy Agency. | |
| JETRO | Please let us know about:<br>- Industrial condition in Bangladesh<br>- Trend of local and foreign investment in Bangladesh<br>- Trend of local and foreign investment especially in the gas sector | |
| BOI | Please let us know about:<br>- Industrial condition in Bangladesh<br>- Trend of local and foreign investment in Bangladesh<br>- Trend of local and foreign investment especially in the gas sector<br>- Companies who shows the interest in the natural gas transport and distribution projects, if any.<br>- Companies who shows the interest in the LNG receiving terminal and regasification project, if any. | |
| BEPZA | Please let us know about:<br>- Industrial condition in Bangladesh<br>- Trend of local and foreign investment in Bangladesh<br>- Trend of local and foreign investment especially in the gas sector | |

**Minutes of Meeting**

| | | |
|---|---|---|
| Date: | 16 November 2011 | |
| Time: | 12:30~ | |
| Venue: | BPDB office | |
| Participants: | BPDB | : Mr. Tamal Chakraborty - Member |
| | | : Mr. Md. Mizanur Rahman |
| | | : Mr. Md. Ahsan Habib |
| | JICA Survey Team (JST) | : Mr. Iwamoto/Kono |
| | | : Mr. Md. Noor Alam - Local support service |

**Subjects: Data Collection Survey on Bangladesh Natural Gas Sector**

1. JST presented the new questionnaire to BPDB prepared for this survey (see attached).

2. BPDB went through the questions and verbally answered to JST. BPDB stated that the plan for the retirement of old power plants is not changed from the plan shown in the Power Sector Master Plan 2010 prepared by JICA.

3. BPDB will provide the written answers to JST as soon as possible.

This minutes prepared by JST

# Questionnaire to BPDB for the 2nd Survey in Bangladesh

| No. | Question | Answer |
|---|---|---|
| 1 | Gas Supply to Siddhirganj Power Plant<br>What is the gas requirement and actual gas supply to Siddhirganj 2x120MW Power Plant? | |
| 2 | Power Generation Long Term Plan<br>Please let us know the long term plan for the construction of new high efficiency gas fired power plants and retirement of old low efficiency gas fired power plants. | |
| 3 | Nuclear Power Plant<br>Please brief the plan for nuclear power plants by Russia at Rooppur. | |

**Minutes of Meeting**

Date: 16 November 2011
Time: 15:00~15:45
Venue: Petrobangla office
Participants: Petrobangla : Mr. Shafiqur Rahman – GM of Strategic Planning and Resources Mobilization Division
JICA Survey Team (JST) : Mr. Iwamoto/Sasano/Mizushima

**Subjects: Data Collection Survey on Bangladesh Natural Gas Sector**

1. JST presented the questionnaire for the 2nd Survey to Petrobangla, and requested the response to it.

2. Mr. Shafiqur stated that he would leave Bangladesh for India on 18 November 2011 for around 6 weeks and would ask his Director to cope with the JST's questionnaire.

3. JST requested Mr. Shafiqur to introduce JST to the Director before his business trip for India. And Mr. Shafiqur agreed to do so tomorrow (17 November 2011).

4. Mr. Shafiqur noted that some items in the questionnaire should be presented to the other entities instead of Petrobangla as follows;
   - Item No. 1, 7 and 16 to be presented to EMRD
   - Item No. 5 and 9 to be presented to Power Division
   - Item No. 14 to be presented to the distribution companies such as TGTDCL, JGTDSL, etc.

This minutes prepared by JST.

**Minutes of Meeting**

| | | |
|---|---|---|
| Date: | 16 November 2011 | |
| Time: | 15:30~ | |
| Venue: | BPC office | |
| Participants: | BPC | : Mr. Abubakar Siddique - Chairman |
| | | : Mr. Saraf Uddin Ahmed - Director |
| | JICA Survey Team (JST) | : Mr. Kono/Matsuda |
| | | : Mr. Md. Noor Alam - Local support service |

**Subjects: Data Collection Survey on Bangladesh Natural Gas Sector**

1. JST presented the new questionnaire to BPC prepared for this survey (see attached).

2. BPC went through the questions and answered verbally, and also will prepare the written answers by next week for JST's collection.

3. JST requested the latest Annual Report of BPC. BPC will prepare it for JST's collection by next week.

4. JST asked how subsidies are used in petroleum products and BPC stated that BPC is not getting any profits, but affiliated three SOEs keeps their profits. So, the balance of imported cost and retailed price is the petroleum subsidy by central government. JST requested the data for the amount of subsidy for past five years, and BPC replied that they will ask to BPC head office in Chittagong.

This minutes prepared by JST

# Questionnaire to BPC for the 2nd Survey in Bangladesh

| No. | Question | Answer |
|---|---|---|
| 1 | Alternative Energy<br>1) Petroleum Products<br>Please let us know the concrete plans and actual progress of:<br>- Increase of fuel oil import as an alternative to natural gas<br>- Strengthening storage & distribution capacity of fuel oil<br><br>2) LPG<br>Please let us know:<br>- The present state of LPG import by BPC as well as private companies.<br>- The concrete plan for the promotion of LPG usage and its progress. | |

**Minutes of Meeting**

| | | |
|---|---|---|
| Date: | 17 November 2011 | |
| Time: | 09:30~11:00 | |
| Venue: | Planning Commission | |
| Participants: | Planning Commission: | Mr. Md. Monirul Islam |
| | | - Senior Assistant Chief, General Economic Div. |
| | | Ms. Shamima Akhter - Joint Chief (Power) |
| | | Mr. Sheikh Nazrul Islam |
| | | - Joint Chief (Director, ex-oficio, Petrobangla) |
| | JICA Survey Team (JST): | Mr. Kono/ Matsuda |
| : | | Mr. Md. Noor Alam - Local support service |

**Subjects: Data Collection Survey on Bangladesh Natural Gas Sector**

**With: S. A. Chief**

1. JST made a courtesy call for second field survey to Mr. Islam and Mr. Islam provided us the report on the SARRC Development Goals (Bangladesh Country Report 2011) which compiled by him.
2. JST explained our GDP projection of ITR and he is basically agreed the GDP projection.
3. And JST requested the data correction of the GDP break down and the national budget. When he will collect the data, he will contact us and will send the data.

**With: Joint Chief (Power)**

4. JST visited Ms. Shamima Akhter for courtesy call, because JST could not meet with Joint Chief of Power last first field survey. However she is new in this position only 15 days.
5. She explained the function of Planning Commission and leave for her important meeting. She kindly introduced Mr. S. N. Islam for JST.

**With: Joint Chief (Director, ex-ofico, Petrobangla)**

6. Mr. Islam explained about the direct and indirect subsidies of GOB.

Received Document:

(1) SAARC Development Goals (Bangladesh Country Report 2011), Planning Commission

This minutes prepared by JST.

**Minutes of Meeting**

Date: 17 November 2011
Time: 11:30~12:15
Venue: Petrobangla office
Participants: Petrobangla : Mr. Shiful Alam Chowdhury – Director of Planning
Mr. Shafiqur Rahman – GM of Strategic Planning
JICA Survey Team (JST) : Mr. Iwamoto/Sasano/Mizushima

**Subjects: Data Collection Survey on Bangladesh Natural Gas Sector**

1. Mr. Shafiqur introduced JST to the Director of planning. JST presented the questionnaire for the 2nd Survey to the Director and requested the response to it by the end of next week.

2. JST requested to provide the monthly data of gas demand and supply record. (Q-No.6)

3. "Gas Sector Reform Roadmap 2009–2012" was provided to JST. (Q-No.3)
(This is the updated information of the 2008 Report).

4. LNG Consultant "Poten and Partners" are working with Petrobangla but, they are not in Bangladesh. They are mainly working at their home office in Australia.

5. JST will meet again next week to the Director for more discussion.

6. Director has arranged the meeting with Chevron at 13:30 this afternoon.

This minutes prepared by JST.

**Minutes of Meeting**

| | | |
|---|---|---|
| Date: | 17 November 2011 | |
| Time: | 13:30~ | |
| Venue: | Chevron office | |
| Participants: | Chevron | : Mr. Shahid Shamsu |
| | | - Direcor, Planning & Commercial |
| | | : Mr. Md. Tanveer Yasser - Senior Planning Analyst |
| | JICA Survey Team (JST) | : Mr. Iwamoto/Kono/Matsuda/Sasano/Mizushima |
| | | : Mr. Md. Noor Alam - Local support service |

**Subjects: Data Collection Survey on Bangladesh Natural Gas Sector**

1. JST explained the outline and objective of the Survey, and presented the questionnaire to Chevron (see attached) which was sent to Chevron before the 1st survey in Bangladesh.

2. Chevron went through the questions and answered that Chevron is not able to answer these questions because they are bound to confidentiality by PSC. JST requested Chevron to provide their such comment in written. Chevron agreed to do that and JST will send a soft copy of questionnaire for Chevron's written comment.

This minutes prepared by JST

# Inquiries: Chevron

| No. | Inquiry | Answer |
|---|---|---|

## 1. Organaization/Institution

Not Applicable

## 2. Natural Gas Demand

Not Applicable

## 3. Natural Gas Exploration, Production and Import

| | | |
|---|---|---|
| 3-1 | A. Please provide us with the total number of wells, number of producing wells, production capacity and average production rate of each field, cumulative production, Remaining reserves (P1 and P2)and future development well drilling plan of following gas fields ;<br>1) Moulavi Bazar<br>2) Jalalabad<br>3) Bibiyana<br>4) Anyother prospects<br><br>A1. Please let us know the reason for changing the reserve from 2.4 to 5.5 Tcf in Bibiyana field. We would like to know how you estimated.<br><br>A2. To increase production of Bibiyana to more than 1,000 mmcfd, Do you have any more bottlenecks even after install pipelines and compression station ?<br><br>B. Please provide information for the gas augumentation plan for Short term (Up to 2013) and Mid Term (Up to 2015) as descrived on "GAS EVACUATION PLAN (2010-15)" - number of wells for new development, work-over, expected production rate, completion date, etc.<br><br>C. Please provide information on PSC Block-7 for any exploratory or development plans for "Char Kajol" and "Patuakhali" gas field or any other prospects. | |

## 4. Natural Gas Transmission

| | | |
|---|---|---|
| 4-1 | Please provide the latest GAS SUPPLY PROJECTION at each gas input points preferably up to 2030. | |

## 5. Natural Gas Sales

Not Applicable

## 6. Natural Gas Pricing and Subsidies

Not Applicable

## 7. Others (General)

| | | |
|---|---|---|
| 7-1 | Please let us know the present state and the prospect of your company's activities in Bangladesh? | |
| 7-2 | Your web site provides the outline of your activities in Bangladesh. If you have any other report or document that shows your activities further in detail, please provide us with such document. | |
| 7-3 | Do you intend to expand your business in Bangladesh? If not, what is the bottleneck? | |
| 7-4 | Please provide "Annual Reports" including "Financial Statements" for past five years. | |
| 7-5 | Please provide the rating appraisal report by Standard & Poor's, Moody's and others, if you have. | |
| 7-6 | Please explain the following items for your agency/company management in Bangladesh:<br>(1) Profit/income & expenditure long term plan<br>(2) Operation & maintenance long term plan<br>(3) Investment & financial long term plan | |

**Minutes of Meeting**

| | | |
|---|---|---|
| Date: | 17 November 2011 | |
| Time: | 16:00~ | |
| Venue: | GTCL office | |
| Participants: | GTCL | : Mr. S. Faheem - Director (Operation) |
| | JICA Survey Team (JST) | : Mr. Iwamoto/Kono/Mizushima |

**Subjects: Data Collection Survey on Bangladesh Natural Gas Sector**

1. GTCL aspires after the JICA support for Dhanua – Elenga pipeline as missing link which is not supported by ADB and other organizations.

2. JST requested the report of pipeline network analysis previously done by GTCL. GTCL provided the extract copy of the report.

3. GTCL stated that the contract of the installation of compressor units at Ashuganj and Elenga was signed with Hyundai on 21/Oct/2011. The construction period will be 24 months from the withdrawal of advance payment which is not yet made.

4. JST asked the present state of the gas supply to Siddirganj 2x120MW power plant. GTCL checked the recent daily reports and found that the supply is less than the requirement. However GTCL stated that the supply will be sufficient after the pipeline between Bakhrabad and Siddirganj is completed. The contract of this pipeline project was singed on 21/Oct/2011 and the construction period will be 21 months.

5. GTCL suggested to JST contacting the director of Operation & Marketing Mines and Finance Managing Division, Petrobangla for the detailed information of subsidies to gas sector.

6. Both parties agreed to meet again in next week.

This minutes prepared by JST.

**Minutes of Meeting**

| | | |
|---|---|---|
| Date: | 20 November 2011 | |
| Time: | 09:20~10:20 | |
| Venue: | BOI Meeting Room | |
| Participants: | BOI | : Mr. Nabhash Chandra Mandal (Joint Secretary) |
| | | : Mr. Ahmad Nasiruddin Mahmood (Executive member) |
| | | : Mr. Md. Khairul Anam (Joint Secretary) |
| | JICA Survey Team | : Mr. Iwamoto/Kono/Matsuda |
| | | : Mr. Md. Noor Alam - Local support Service |

**Subjects: Data Collection Survey on Bangladesh Natural Gas Sector**

1. JST explained the study background and requested the data upon requested in advance.

2. BOI explained general outlook of investment circumstance in Bangladesh and condition of natural gas sector.

3. BOI is the direct board attached to Prime Minister Office; however BOI does not involved in the investment of gas sector including PSC.

4. Singapore is the top investor in 2010 with USD 317 million, the second is U.K. with USD 105 million and Japanese investment is USD 21 million.

5. The sector wise investments are ICT (USD 360 million, 40%), manufacturing (USD 238 million, 27%), trade & commerce (USD 186 million, 21%) and power/Gas/petroleum (USD 92 million, 10%), respectively.

6. Japanese investments are quite few, namely garments, pharmaceutical, etc.

Collected Data:

(1) The Cost of Doing Business in Bangladesh
(2) Bangladesh Investment Review
(3) Investment in Bangladesh
(4) Application Forms

This minutes prepared by JST.

**Minutes of Meeting**

| | | |
|---|---|---|
| Date: | 20 November 2011 | |
| Time: | 11:30~ | |
| Venue: | WB office | |
| Participants: | WB | : Mr. Md. Iqbal<br>Senior Energy Specialist<br>South Asia Sustainable Development |
| | | : Mr. Zahid Hussain<br>Senior Economist |
| | JICA Survey Team (JST) | : Mr. Iwamoto/Kono/Matsuda |
| | | : Mr. Md. Noor Alam - Local support service |

**Subjects: Data Collection Survey on Bangladesh Natural Gas Sector**

**With Mr. Md. Iqbal**

1. JST requested WB to explain the current and future activities of WB in the energy sector in Bangladesh.
   WB's answers were as follows:

   Current
   WB is mainly assisting the power sector by the following active projects in the energy sector:

   ① Siddhirganj Peaking Power Project, composed of:
   - 60km natural gas pipeline from Bakhrabad to Siddhirganj
   - 335MW gas fired power plant
   - 11km, 230kV transmission line to grid substation
   - Technical assistance for O&M

   ② Power Sector Development TA Project, designed to create the institutional, and policy environment needed to scale up the development of the power sector.]

   Future
   WB will continue the assistance to the power sector, and there will be no major lending project to the natural gas sector. However, WB may assist the natural gas sector by capacity building projects, and so on.

2. JST asked the present state of LNG terminal project. WB answered that WB is assisting to the consultant service only, and the contract for the consultant service was recently signed. The project may be carried out with BOOT or BOT basis, and is expected to

**Minutes of Meeting**

Date: 20 November 2011
Time: 16:35~17:30
Venue: Marubeni Corporation (Dhaka Office)
Participants: Marubeni : Mr. Sano Toshiya, Deputy General Manager
JICA Survey Team : Mr. Iwamoto/Kono/Matsuda

**Subjects: Data Collection Survey on Bangladesh Natural Gas Sector**

1. JST explained the study background and asked the economic circumstance and natural gas sector. He explained general outlook of economic circumstance in Bangladesh and condition of power and natural gas supply.

2. He explained the JDCF outline, and their two projects, namely Haripur Power Station and Hydropower power plant. Even though, they made a contract under the name of JDCF, they could not receive the contract fee easily.

3. PSC is no incentives for IOC, cause of IOC should sell the natural gas in Bangladesh with low price.

4. A subsidy for A-heavy oil will be increase for the agricultural purpose, on the other hand, a subsidy of C-heavy oil will be decrease or minus incentives.

5. Petroleum import is prohibited under the law of BPC except who do not sell the petroleum products like IPP.

6. The deficit of BPC will be reach at USD 1.1 billion.

7. LNG project, coal mining project and nuclear project are the dream and difficult.

minutes prepared by JST.

complete within 24 months from now.

Further JST asked who will pay for import LNG. WB answered that Petrobangla on behalf of the Bangladesh government will pay for it, and the Contractor will receive LNG free on the re-gasification plant.

**With Mr. Zahid Hussain**

1. JST asked about subsidy in the natural gas sector. WB answered that Petrobangla is profitable company and does not receive any direct subsidies from the central government. The difference between the economic price (international market price) and the local selling price is defined as subsidy in the various reports.

This minutes prepared by JST

**Minutes of Meeting**

| | | |
|---|---|---|
| Date: | 21 November 2011 | |
| Time: | 11:00~11:45 | |
| Venue: | Tullow office | |
| Participants: | Tullow Bangladesh Ltd. : | Mr. James Baber - Country Manager |
| | | Mr. A.H. All Ashraf – Manager, PSC Operation |
| | JICA survey team (JST) : | Mr. Matsuda/Sasano |
| | : | Mr. Md. Noor Alam |

**Subjects: Data Collection Survey on Bangladesh Natural Gas Sector**

1. JST requested Tullow to answer the inquiries which was presented during the last JST survey. Mr. Barber replied that he requested their Dublin office to answer the inquiries and he will remind Dublin office again.

2. Production from Bangula hasn't changed much from last JST visit. But production of well no. B-1 has declined to 15 MMcfd due to sand production. Total production from Bangula is now 100 MMcfd.

3. Seismic interpretation on Bangula-South prospect is still going on in Dublin.

4. About offshore block no. 5 (Offshore bidding round 2008) – no progress due to maritime dispute with India.

5. Mr. Noor Alam handed over geological study reports made by his survey team.

This minutes prepared by JST

**Minutes of Meeting**

Date: 21 November 2011
Time: 13:45~14:30
Venue: JETRO Meeting Room
Participants: JETRO : Mr. Suzuki Takashi, Representative
JICA Survey Team : Mr. Matsuda
: Mr. Md. Noor Alam - Local support Service

**Subjects: Data Collection Survey on Bangladesh Natural Gas Sector**

1. JST explained the study background and requested the data for economic circumstance. JETRO explained general outlook of investment circumstance in Bangladesh and condition of power and natural gas supply to the industrial zone.

2. JETRO explained the shortage of power and gas supply in EPZs, and insatiable the power voltage in EPZ.

3. JETRO is the coordination body for Japanese investors, and negotiation as a representative of Japanese investors. Even JETRO negotiates with GOB during past two decades, there is nothing happened, so they did not ask anything to GOB, anymore. In case of Japanese locator in Dhaka EPZ, they set up three captive power generator for their factory due to the shortage and unstable power supply in SEZ, however BEPZA ask to Japanese investor that this is illegal power plants and request the penalty. Of course the locator refused to pay the penalty.

4. Investment circumstance is very bad and resultingly there is a few investors invest in Bangladesh from Japan.

5. Bangladesh has several conglomerate enterprise groups, and they are establishing their hard and tight industrial groups, so it is very difficult to find the good partner in Bangladesh for Foreigners.

Collected Data:
(1) under scanning

minutes prepared by JST.

**Minutes of Meeting**

| | | |
|---|---|---|
| Date: | 21 November 2011 | |
| Time: | 16:30~17:00 | |
| Venue: | Petrobangla office | |
| Participants: | Petrobangla: | Mr. Md. Hussain Monsur - Chairman |
| | | Mr. Md. Shaiful A. Chowdhury - Director (Planning) |
| | | Mr. Molla Md. M. Hossain - Director (Op.&Mines) |
| | JICA Survey Team (JST): | Mr. Iwamoto/Kono |
| | | Mr. Md. Noor Alam - Local support service |

**Subjects: Data Collection Survey on Bangladesh Natural Gas Sector**

1. JST explained the following issues to the Chairman:
   1) Objective of the 2nd survey in Bangladesh
   2) Progress of the meetings with Petrobangla so far
   3) Questionnaire to Petrobangla that Mr. Shaiful is currently preparing the answers

2. JST asked what area of the gas sector needs the assistance from JICA. Petrobangla stated that they may need the assistance for the gas pipeline between Dhanua and Elenga and also the gas pipeline between the west bank and Hatikumurul. Both parties will discuss this issue further in detail later.

3. JST requested the meeting to clarify the subsidy in the gas sector, and the meeting was arranged at 10:00 am of 23/Nov at Petrobangla office.

This minutes prepared by JST.

**Minutes of Meeting**

Date: 22 November 2011
Time: 11:00~11:50
Venue: ADB office
Participants: Asian Development Bank: Mr. Rahman Murshed – Energy Specialist

JICA Survey Team (JST) : Mr. Iwamoto

**Subjects: Data Collection Survey on Bangladesh Natural Gas Sector**

1. JST presented the questionnaire for the 2nd Survey to ADB, and requested the response to it. The ADB's response to the questionnaire is shown on the attached sheet.

2. Installation of 600,000 pre-paid meters
   ADB stated that TGTDCL is planning to install 600,000 pre-paid meters following to the ADB pilot project for gas meter and is looking for donors for the plan. However, no commitment to assist it has been made by ADB yet.

3. Muchai compressor station project
   Muchai compressor station project will be operatable in the 1st quarter of 2012.
   For this project, ADB's assistance was cancelled and it was funded by BOG.

4. Phased gas price increase
   In consideration of the election expected in a near future, the phased price increase to meet international price which was recommended in the GSMP 2006 will be impossible to realize.

5. LNG receiving facilities
   1) Infrastructure
      Terminal: Consultant was selected. A tender for BOT based contract will be called.
      Pipeline to Grid: GTCL is processing 11 contracts and land acquisition etc.
   2) Secure supply source: MOU was made with Qatar, but no firm agreement
   3) Secure supply Line: No shipping plan has been prepared yet.
   4) Coping with cost: Price adjustment is required.

This minutes prepared by JST.

# Questionnaire to ADB for the 2nd Survey in Bangladesh

| No. | Question | Answer |
|---|---|---|
| 1 | Gas Meter<br>Please let us know the present state of the following pilot projects for gas metering system included in the "Natural Gas Access Improvement Project" proposed by ADB.<br>- Remote sensing metering system for industrial consumers<br>- Prepaid metering system for domestic consumers | The contract for consultancy service was signed on 14 Jun 2011. Bid documents for Turn-key contract is under preparation.<br>Though there is no change for the scope of Project, the details/progress of Project must be confirmed to TGTDCL.<br>(Iwamoto wrote: This Project is explained as "Supply Efficiency Improvement project" in Page 39 of TGTDCL annual report.) |
| 2 | Gas Pipeline<br>Is there a plan to assist the construction of the following gas transmission pipelines?<br>- Dhanua to Elenga, 30-inch, approximately 52km<br>- West Bank of Jamna Bridge to Naika, -inch, approximately km | So far, ADB has no plan to assist those gas pipelines.<br>Once the Muchai-Dunua transmission pipeline project and two compressor station projects are completed, the Dhanua-Elenga loop transmission pipeline will be required. But the necessity of West Bank of Jamna Bridge to Naika pipeline may not be so high. |
| | | |

**Minutes of Meeting**

| | | |
|---|---|---|
| Date: | 22 November 2011 | |
| Time: | 11:20~ | |
| Venue: | Power Division Office | |
| Participants: | Power Division (PD): | Mr. Tapos Kumar Roy - Additional Secretary |
| | | Mr. Al Mudabbir Bin Anam - Deputy Director (Sustainable energy) |
| | | Mr. A. H. M. Kamal - Director, BPDB |
| | | Mr. Siddique Zobair - Senior Advisor, GIZ |
| | JICA: | Mr. Kazushige YASHIRO - Long term power sector advisor |
| | JICA Survey Team (JST): | Mr. Kono/Ahmed |

**Subjects: Data Collection Survey on Bangladesh Natural Gas Sector**

1. Power Division provided the presentation for the "Implementation of 500MW solar power development programme" as per the attached sheets. This presentation provided JST with not only the outline of this solar power development programme but also the information JST needed such as the outline of the renewable energy policy and current achievement on renewable energy development.

2. JST asked why the daylight saving time is not adopted after 2009. PD replied that public consent was not obtained.

3. JST asked the present state of energy saving activities mentioned in NSAPR II such as CFL bulbs promotion. PD stated that CFL bulbs promotion is under way. 10 millions CFL bulbs were already distributed and another 15 millions bulbs are going to be be distributed.

4. JST asked other energy saving activities in Bangladesh. PD provided "Bangladesh Roadmap for Energy Efficiency Improvements & Demand Side Management" prepared by WB and GIZ. PD stated that this report was already approved by the government and some plans are already under implementation.

5. JST asked the latest plan for coal import. PD replied that it is described in the Power Sector Master Plan 2010, and no change is made so far.

This minutes prepared by JST.

**Minutes of Meeting**

| | | |
|---|---|---|
| Date: | 22ND November 2011 | |
| Time: | 11:30~12:10 | |
| Venue: | BEPZA GM Room | |
| Participants: | BEPZA | : Mr. A.Z.M. Azizur Rahman, General Manager |
| | JICA Survey Team | : Mr. Matsuda |
| | | : Mr. Md. Noor Alam - Local support Service |

**Subjects: Data Collection Survey on Bangladesh Natural Gas Sector**

1. JST explained the study background and requested the data in inquiry. BEPZA agreed to send the data when they completed.

2. JST asked the economic circumstance and EPZ system. BEPZA explained general outlook of investment circumstance in EPZ and condition of infrastructure, namely power, natural gas and water supply to the locators.

3. BEPZA is the independent public body, directly connect to Board of Governors that chaired by Prime Minister. There are seven board members in Executive Board. There are eight EPZs in Bangladesh under controlled by BEPZA. The 9th EPZ is Korean EPZ by private company, but this EPZ directly coordinate by PM Office. Due to the shortage of EPZ land, Korean EPZ could not proceed for development of EPZ.

4. There are huge investments/demands in Chittagong-Dhaka Industrial Corridor area. A lot of investors come and ask the available industrial land but already sold out. And also it is very difficult to have a new industrial land in this area.

5. BEPZA explained that the new locator could not get the natural gas supply till enough natural gas supply will be proven.

Collected Data:

(1) Investment Guide
(2) Presentation CD of BEPZA
(3) Pamphlet

minutes prepared by JST.

**Minutes of Meeting**

| | | |
|---|---|---|
| Date: | 23rd November 2011 | |
| Time: | 10:45~11:30 | |
| Venue: | Petrobangla Directors' offices | |
| Participants: | PB Op. & Mines | : Mr. Molla Md. M. Hossain - Director |
| | PB Finance | : Mr. Md. Rafiqul Islam khan, Director |
| | | : Mr. Md. Abdul Khaleque, Sr. General Manager |
| | | : Mr. Mr. Nazrul Islam, Dy General Manager |
| | PB Planning | : Mr. Md. Shaiful A. Chowdhury, Director |
| | JICA Survey Team | : Mr. Iwamoto/ Mr. Kono/ Matsuda |
| | | : Mr. Md. Noor Alam - Local support Service |

**Subjects: Data Collection Survey on Bangladesh Natural Gas Sector**

1. With Mr. Molla, Director (Operation & Mines)

   JST visited Mr. Molla's office and explained that JST would like to clarify the subsidy in the gas sector. Then the Director Mr. Molla introduced the Director (Finance) Mr. Rafiqul to JST. JST moved to Mr Rafiqul's office.

2. With Mr. Rafiqul, Director (Finance)
   Mr. Abdul, Senior General Manager (Accounts)
   Mr. Md. Nazrul Islam, Deputy General Manager (FMD)

   1) JST asked to confirm the followings;
      (1) Income in IS of the Petrobangla and its affiliated SOEs calculates 45% of the total sales. (Yes)
      (2) Total payment to the IOCs is calculated in the cost item in IS. (Yes)
      (3) Petrobangla and its affiliated SOEs do not received of subsidy. (Yes)
      (4) Petrobangla group earns benefit and pays income tax and dividend after tax. (Yes)
      (5) Distribution companies deliver the collected natural gas sales benefit to GOB and PB group affiliated companies up on the rate of gas price distribution table. (Yes)

   2) The subsidy of the natural gas explained in the WB and ADB reports are discussed about indirect subsidy and/or opportunity cost.

   3) The natural gas purchase cost from IOCs is 2.66 USD/mcf in average and natural gas sales under PSCs including Petrobangla portion is 1.31 USD/mcf. However, the total

sale by PSCs is USD 46.03 million and total purchase cost from IOCs is USD 39.97 million, so the balance of sales versus purchase keeps plus figure.

3. With Mr. Shaiful, Director (Planning)

JST moved to Mr. Shaiful's office and asked him when the answers to JST's questionnaire will be ready for JST's collection. Mr. Shaiful replied that it would be ready within the day and he would phone to JST when it is ready.

Collected Data:

(1) Average Purchase price from IOC's

Minutes prepared by JST.

**Minutes of Meeting**

| | | |
|---|---|---|
| Date: | 23 November 2011 | |
| Time: | 11:30~12:30 | |
| Venue: | BAPEX office | |
| Participants: | BAPEX | : Mr. Mortuza Ahmad Faruque - Managing Director |
| | JICA Survey Team (JST) | : Mr. Sasano/Mizushima |
| | | : Mr. Md. Noor Alam - Local support service |

**Subjects: Data Collection Survey on Bangladesh Natural Gas Sector**

1. JST presented the questionnaire (see attached) to BAPEX. BAPEX will prepare the answer.

2. JST asked any request to JICA 's assistance to gas evacuation plan by Bapex in near future, and Bapex replied for the training of their engineers on 2D/ 3D seismic data acquisition, remote sensing by satellite or geochemical studies including gas leaking solutions in Titas gas field with Japanese advanced technology.
   Both parties agreed to discuss this issue further in detail (no. of trainees, duration of training, name of the field, etc.) on 30/Nov (Wed.) at Petrobangla office.

This minutes prepared by JST

**Minutes of Meeting**

| | | |
|---|---|---|
| Date: | 23 November 2011 | |
| Time: | 16:00~ | |
| Venue: | BERC office | |
| Participants: | BERC: | Mr. Syed Yusuf Hossain - Chairman |
| | | Mr. Salim Mahmud - Member |
| | | Mr. Md. Emdadul Haque - Member |
| | | Mr. Zaved Choudhury - Director (Gas) |
| | | Mr. Md. Bazlur Rahman - Director (Power) |
| | | Mr. Manjur Morshed Talukder - Consultant (Gas) |
| | JICA Survey Team (JST): | Mr. Iwamoto/Kono/Matsuda |
| | | Mr. KM Ahmed - Project coordinator |
| | | Mr. Md. Noor Alam - Local support service |

**Subjects: Data Collection Survey on Bangladesh Natural Gas Sector**

1. JST presented the questionnaire to BERC prepared for the 2nd survey in Bangladesh (see attached).

2. BERC's answers were as follows:
   - Question No.1:
     BERC is the independent organization, and they are performing their duties as per legislative Act. The relationship between BERC and EMRD and Power Division is consultative, BERC act as a regulating council to the EMRD and Power Division. Any proposal related to the services provided by the EMRD and Power Division have to have concordance from BERC before fixing any price or rate.
   - Question No.2:
     BERC stated that there is no direct subsidy in cash to the gas sector from the central government, but there is indirect subsidy to the gas sector for buying gas from international gas companies and composite the lower cost of purchases from local exploration companies thus give an indication of indirect subsidy to bring average in price fixing.

3. JST requested the detail of the following projects which BERC needs the assistance from JICA.
   - Preparing necessary codes & standards for natural gas transmission and distribution, operation & maintenance manual for natural gas networks, etc.

· Establishing a well standard testing and quality control lab
· Establishing a centralized energy monitoring system

BERC will provide the Project Concept Papers for the above to JST.

This minutes prepared by JST.

# Questionnaire to BERC for the 2nd Survey in Bangladesh

| No. | Question | Answer |
|---|---|---|
| 1 | Organization<br>Please explain the exact position of BERC in the energy sector, such as the relationship with EMRD and Power Division. | |
| 2 | Gas Tariff<br>How do you set the gas tariff for considering the governmental subsidy? | |

Titas Gas Field Gas Seepage Site Trip

Date : Nov. 28 2011
Time : Left Dhaka @ 07:00, arrived Titas gas field office @ 10:30
Participants : BGFCL Project Director : Mr. Md. A. Moktazer
(Gas Seepage Control and Drilling Project)
: JICA JST Team : Mr. Iwamoto, Kono, Mizushima , Sasano
: Local support : N.Alam
Current status of Titas Gas Field: Titas Gas was found in 1962, First gas in 1968
Total well number : 16, production well number : 14
Gas leaked well no. 3 was abandoned
Production rate in 2010 : 404 MMcfd, This field is the second biggest field after Chevron's Bibiyana.
Gas seepage is found surrounding marshy area of Titas river.

At Titas Gas Field Office in a village of Brahmanbaria approx., 100 Km from Dhaka, We met Gas Seepage Control and Drilling Project, Project Director Mr. Md. Ali Moktazer. He explained the history of this trouble. Seepage was noticed in 2006 but pressure and flow rate decrease had been noticed in 2003. The cause of the seepage was detected by temperature logs and location of leak was from 7" casing (on this well, 9-5/8" intermediate casing was not installed) on well no. 3 and poor cement bonding around the gas sand zones caused the problem. Gas started migrated gradually to the upper anticlines or formations and then leaked to the surface. Actual seepage is around 2 Km away from the well no. 3 wellhead. Bapex drilling rig was mobilized to kill this well first but, no success. An American well control expert "Boots and Coots" was brought in with Hydraulic Snubbing Unit and the well was cemented and abandoned permanently in January 2008. However, gas seepage continued till now but the seepage area and volume are decreasing gradually and naturally.

JST team visited the seepage site by crossing the Titas river by boat and seepage gas with flow of water or gas chimney bubbles were seen many places in the marshy area of Titas river. (See photo below)

| | |
|---|---|
|  |  |
| Crossing Titas river | One of the gas seepage site |

JST team returned to Titas office and discussed about on-going 3D seismic survey in Titas . 3D survey just started by Bapex without gas seepage area.

JST team left Titas @ 12:30 and returned Dhaka @ 18:30.

**Minutes of Meeting**

| | | |
|---|---|---|
| Date: | 29 November 2011 | |
| Time: | 10:00~ | |
| Venue: | GTCL office | |
| Participants: | GTCL | : Mr. S. Faheem - Director (Operation) |
| | | : Mr. Nazrul - DGM (Planning) |
| | JICA Survey Team (JST) | : Mr. Iwamoto/Kono/Mizushima |

**Subjects: Data Collection Survey on Bangladesh Natural Gas Sector**

JST presented the list of items to be confirmed with GTCL (see Appendix 1), and the discussion was as follows:

1. Detail of the pipelines GTCL needs JICA's assistance.
   1) GTCL will provide the detail by 01/Dec.
   2) JST will send a letter to GTCL requesting the copy of DPP for pipeline projects which include the pipelines GTCL needs JICA's assistance, and GTCL will prepare it by 01/Dec.

2. Gas Flow
   JST presented the gas flow for GTCL's confirmation (see Appendix 2), and GTCL made some corrections (see Appendix 3).

3. Financial Flow
   JST presented the financial flow for GTCL's confirmation (see Appendix 2), and GTCL added Gas Development Fund or GDF (see Appendix 3).

4. Upcoming pipelines (under construction & planned)
   JST presented the list of upcoming pipelines for GTCL's confirmation (see Appendix 4) prepared according to the information collected during the 1st survey in Bangladesh, and GTCL made some corrections (see Appendix 5).

This minutes prepared by JST.

# To be confirmed with GTCL

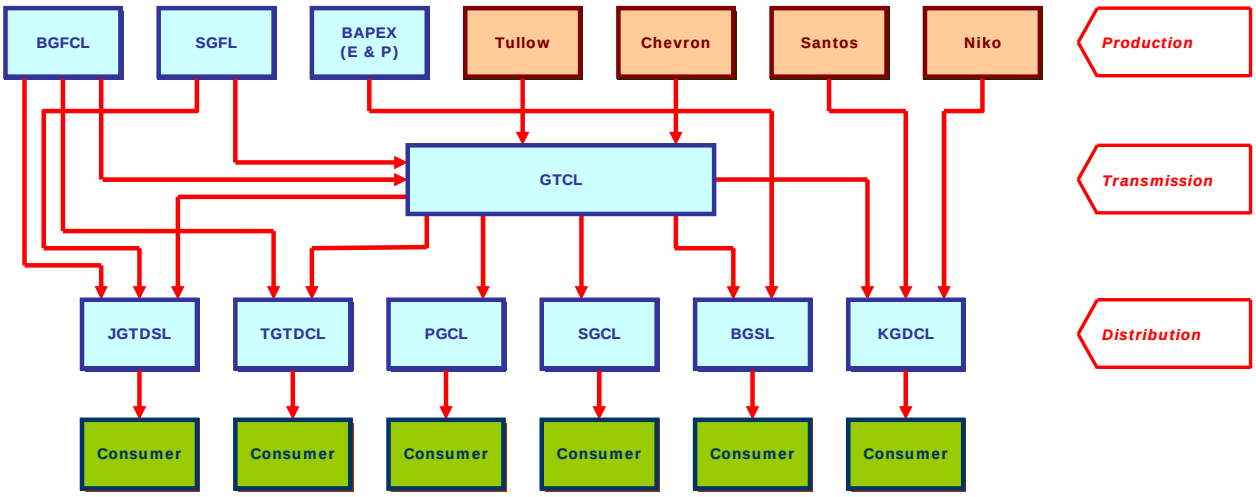
1. Detail of the pipeline between Dhanua and Elenga & the pipeline between West bank of Jamuna Bridge and Nalka, other than diameter and length
   - Capacity
   - Necessity of these pipelines
   - Reason why these parts are left out of bypass line construction scheme
   - Feasibility study report of these pipelines, if available

2. Confirmation of gas flow (see attached chart)

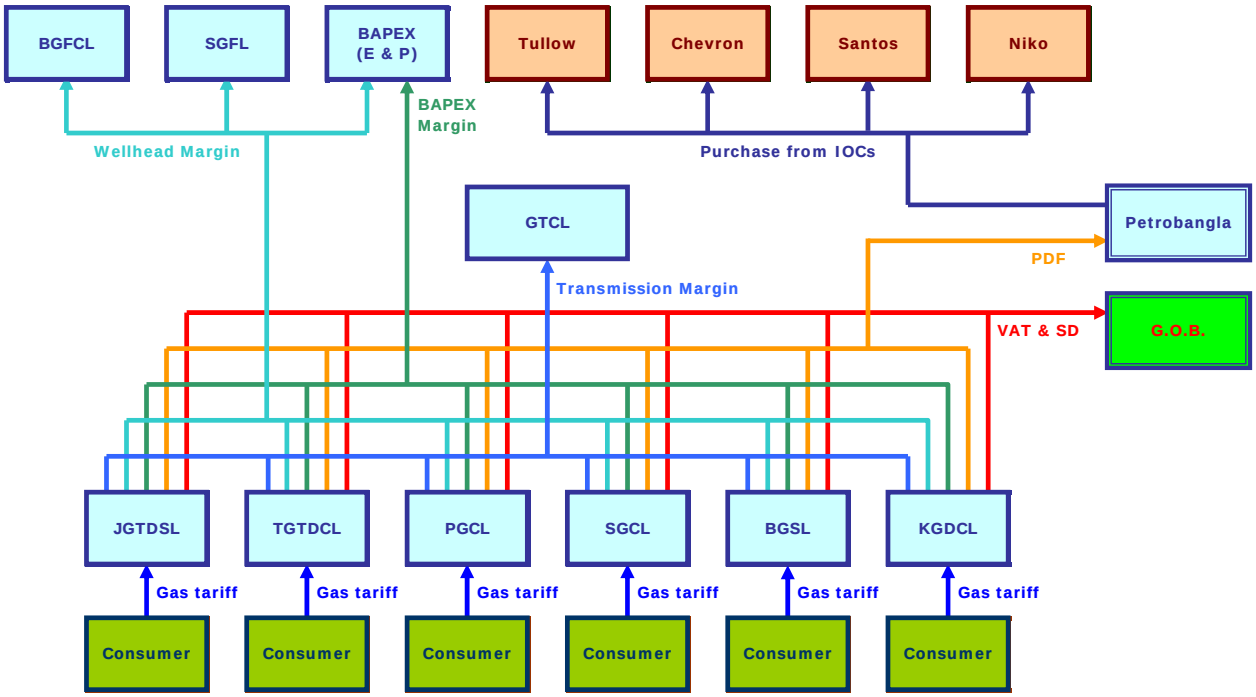
3. Confirmation of financial flow (see attached chart)
   - GTCL does not actually buy the gas from production companies and does not actually sell the gas to distribution companies. GTCL receives transmission margin from distribution companies and somehow manages GTCL's operation with this margin. Is this correct?
   - Who collect gas tariff from bulk consumer who obtain the gas directly from GTCL transmission network?

4. Confirmation of projects currently under construction and planned in future (see attached)

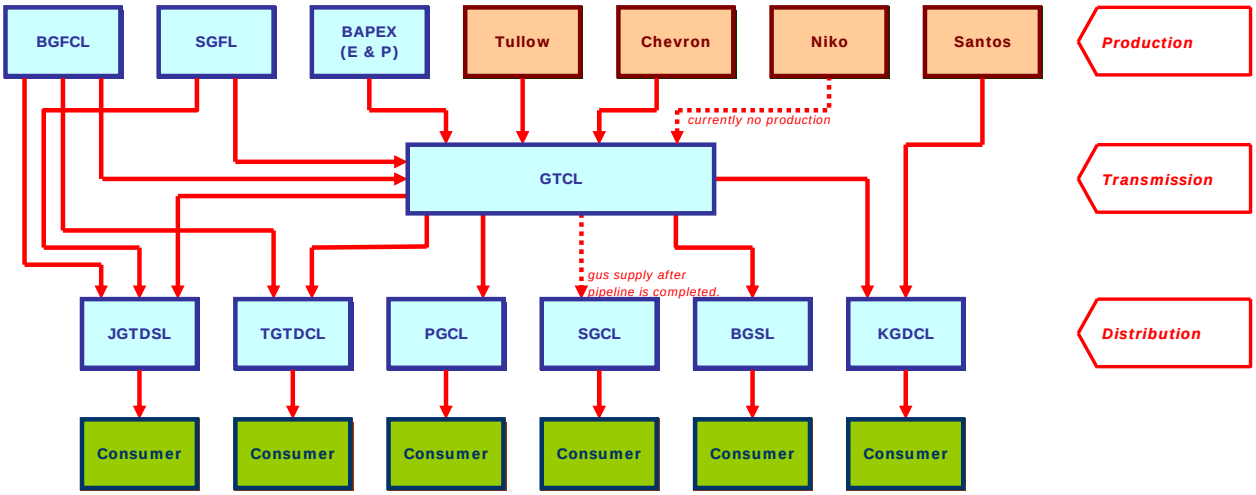
## Gas Flow



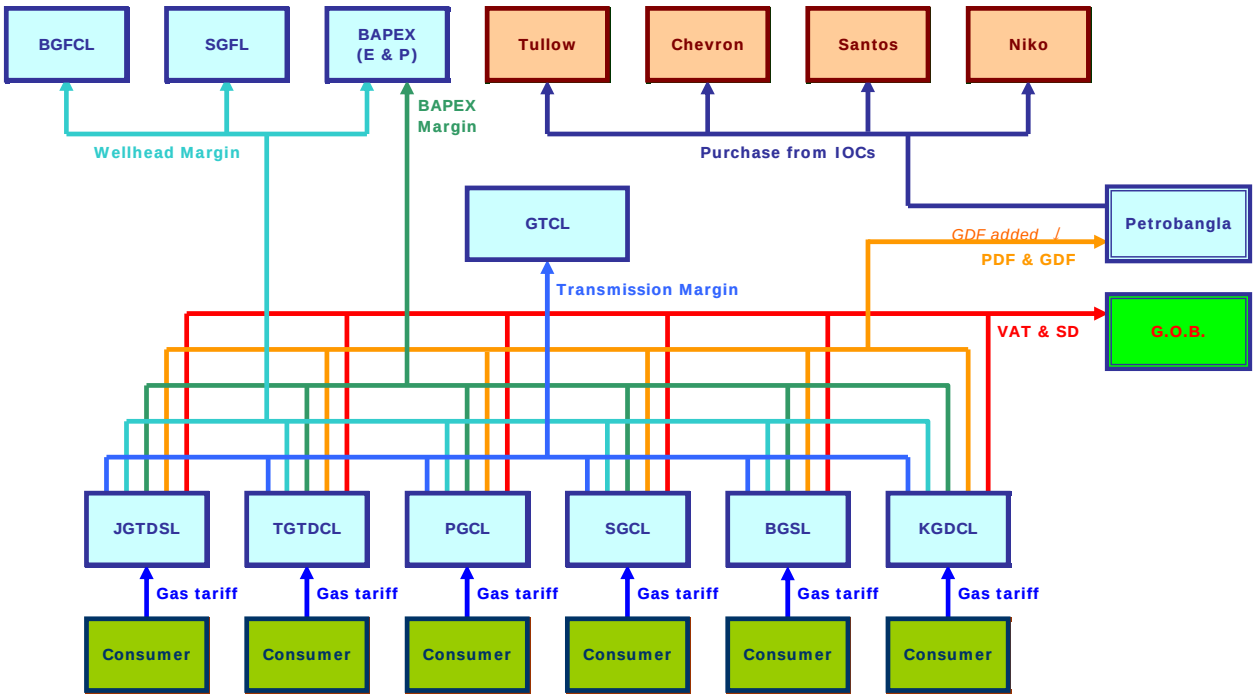

## Financial Flow



## Gas Flow (Revised)




## Financial Flow (Revised)



Under Construction

| | List of Projects | Description | Start | End | Fund |
|---|---|---|---|---|---|
| U1 | Monohordi - Dhanua Pipeline, Elenga - East Bank of Jamuna Bridge Pipeline | 37 km (Monohordi - Dhanua), 14 km (Elenga - East Bank of Jamuna Bridge), 30 inch. | 2006 | 2012 | ADB |
| U2 | Compressor at Ashuganj and Elanga | | 2011 | 2012 | ADB |
| U3 | Compressor Stations at Muchai | | 2006 | 2012 | ADB |
| U4 | Hatikumrul-Ishwardi-Bheramara Pipeline | 87 km, 30 inch | 2006 | 2012 | ADB |
| U5 | Bonpara-Rajshahi Pipeline | 53 km, 12 inch | 2006 | 2012 | ADB |
| U6 | Bheremara-Khulna Pipeline | 165 km, 20 inch | 2007 | 2013 | ADB |
| U7 | Bakhrabad-Siddhirganj Pipeline | 60 km, 30 inch | 2007 | 2012 | IDA |
| U8 | Ashuganj - Bakrabad Pipeline | 60 km, 30 inch | 2009 | 2014 | GoB/ GTCL |
| U9 | Titas Gas Field to A-B Pipeline | 8 km, 24 inch | | 2012 | GTCL |
| U10 | Bibiyana - Dhanua Pipeline | 135 km, 36 inch | | | GoB/ GTCL |
| U11 | Maheshkali - Anowara Pipeline | 91 km, 30 inch | 2010 | 2013 | GoB/ GTCL |

Planned Project

| | List of Projects | Description | Start | End | Fund |
|---|---|---|---|---|---|
| P1 | Langalband (Naratanganj) - Mawa pipeline. | 40 km, 30 inch | 2011 | 2014 | - |
| P2 | Pipeline along Padma Bridge | 20km, 30 inch | 2010 | 2013 | - |
| P3 | Bakhrabad - Feni pipeline. | 91 km, 30 inch | 2013 | 2017 | - |
| P4 | Zajira - Khulna pipeline. | 110km, 30 inch | 2013 | 2017 | - |
| P5 | Bogra - Rangpur pipeline. | 100 km, 20 inch | 2012 | 2016 | - |
| P6 | Feni- Chittagong | Planned in Gas Sector Master Plan 2006 (estimated for gas pipeline network analysis) | | 2025 | - |
| P7 | Elenga - Dhanua | Planned in Gas Sector Master Plan 2006 (estimated for gas pipeline network analysis) | | 2025 | - |
| P8 | West Bank of Jamuna Bridge - Nalka | Planned in Gas Sector Master Plan 2006 (estimated for gas pipeline network analysis) | | 2025 | - |

Under Construction

| | List of Projects | Description | Start | End | Fund |
|---|---|---|---|---|---|
| U1 | Monohordi - Dhanua Pipeline, Elenga - East Bank of Jamuna Bridge Pipeline | 37 km (Monohordi - Dhanua), 14 km (Elenga - East Bank of Jamuna Bridge), 30 inch. | 2006 | 2012 | ADB |
| U2 | Compressor at Ashuganj and Elenga | | 2011 | 2014 | ADB |
| U3 | Compressor Stations at Muchai | | 2006 | 2012 | PCS Fund |
| U4 | Hatikumrul-Ishwardi-Bheramara Pipeline | 87 km, 30 inch | 2006 | 2012 | ADB |
| U5 | Bonpara-Rajshahi Pipeline | 53 km, 12 inch | 2006 | 2012 | ADB |
| U6 | Bheremara-Khulna Pipeline | 165 km, 20 inch | 2007 | 2013 | ADB |
| U7 | Bakhrabad-Siddhirganj Pipeline | 60 km, 30 inch | 2007 | 2013 | IDA |
| U8 | Ashuganj - Bakrabad Pipeline | 60 km, 30 inch | 2011 | 2013 | GoB/ GTCL |
| U9 | Titas Gas Field to A-B Pipeline | 8 km, 24 inch | 2010 | 2012 | GTCL |
| U10 | Bibiyana - Dhanua Pipeline | 138 km, 36 inch | 2011 | 2013 | GoB/ GTCL |
| U11 | Maheshkali - Anowara Pipeline | 91 km, 30 inch | 2011 | 2012 | GoB/ GTCL |

Panned Project

| | List of Projects | Description | Start | End | Fund |
|---|---|---|---|---|---|
| P1 | Langalband (Narayanganj) - Mawa pipeline. | 40 km, 30 inch | 2011 | 2014 | - |
| P2 | Pipeline along Padma Bridge | 20km, 30 inch | 2010 | 2013 | - |
| P3 | Bakhrabad - Feni pipeline. | 91 km, 30 inch | 2013 | 2017 | - |
| P4 | Zajira - Khulna pipeline. | 110km, 30 inch | 2013 | 2017 | - |
| P5 | Bogra - Rangpur pipeline. | 100 km, 20 inch | 2013 | 2016 | - |
| P6 | Feni- Chittagong | Planned in Gas Sector Master Plan 2006 (estimated for gas pipeline network analysis) | | 2025 | - |
| P7 | Dhanua – Elenga | Planned in Gas Sector Master Plan 2006 (estimated for gas pipeline network analysis) | | 2025 | - |
| P8 | West Bank of Jamuna Bridge – Nalka | Planned in Gas Sector Master Plan 2006 (estimated for gas pipeline network analysis) | | 2025 | - |
| P9 | Sunetra – Kishorganj | Accrodning to new discovery gas reserve of Sunetra 80km, 20” | | | |

**Minutes of Meeting**

| | | |
|---|---|---|
| Date: | 30 November 2011 | |
| Time: | 14:00~ | |
| Venue: | HCU office | |
| Participants: | HCU | : Mr. Anwar H Khan - Director General |
| | | : Mr. Md. Hasan Shahrier |
| | JICA Survey Team (JST) | : Mr. Iwamoto/Kono/Sasano/Matsuda |
| | | : Mr. Md. N.Alam - Local support |

**Subjects: Data Collection Survey on Bangladesh Natural Gas Sector**

1. There were questions and answers regarding the detail of Energy Balance Sheet which JST requested HCU to complete in the last meeting.

2. HCU agreed to complete the Energy Balance Sheet before JST leave for Japan.

This minutes prepared by JST

**Minutes of Meeting**

| | | |
|---|---|---|
| Date: | 30 November 2011 | |
| Time: | 16:00~ | |
| Venue: | BAPEX office | |
| Participants: | BAPEX | : Mr. Mortuza Ahmad Faruque - Managing Director |
| | JICA Survey Team (JST) | : Mr. Iwamoto/Kono/Sasano |
| | | : Mr. Md. Noor Alam - Local support service |

**Subjects: Data Collection Survey on Bangladesh Natural Gas Sector**

1. JST and Bapex continued to discuss the training of Bapex geophysical engineers. (2D/ 3D seismic and remote sensing)

2. Bapex provided a list of proposed training program (24 items), and equipment & software list for the training.

3. 3D seismic survey work of 5 fields (Titas, Bakhrabad, Sylhet Kailashitila and Rashidpur) by ADB/EMRD fund is carried out by Bapex seismic crew with CGG Veritas technical assistance including training.
   Bapex provided the scope of work and TOR of this project as a reference (Copy of original proposal).

4. Preparation of J/V with Sinopec in Chittagong Hill area is on-going and awaiting GOB permission. J/V Plan is including Sinopec drilling rig, equipment and their crew.

This minutes prepared by JST

**Minutes of Meeting**

| | | |
|---|---|---|
| Date: | 01 December 2011 | |
| Time: | 09:30~ | |
| Venue: | Petrocenter | |
| Participants: | Petrobangla (PSC) | : Mr. Muhammad Imaduddin (Director General) |
| | JICA Survey Team (JST) | : Mr. Iwamoto/Kono/Sasano |
| | | : Mr. Md. N.Alam - Local support |

**Subjects: Data Collection Survey on Bangladesh Natural Gas Sector**

1. JST asked about Chevron's gas augmentation plan. He replied that Chevron is now producing 965 MMcfd and planning to increase to 1,300 MMcfd in 2013. After 3D survey and appraisal well results, additional production of 500 MMcfd are expected by drilling more wells by 2015 and total production prediction will be 1,900 MMcfd in 2015.
   (Chevron will drill 3 wells in Moulavibazar with 100 MMcfd, 6 wells in Bibiyana with 300 MMcfd and 100 MMcfd after completion of Muchai Comp, Station.)

2. ConocoPhillips is planning 2D survey before the next monsoon season start in 2012, and expecting survey result by the end of 2012. ConocoPhillips PSC minimum obligation is 1,200 Km 2D survey in first 3 years. If Conoco extend the PSC, minimum obligation is drill 1 exploration well in next 2 years.

3. The schedule of Offshore bidding round 2011 fully depends on GOB's decision and PB is waiting for their decision.

4. Main reason of the delay of the signing and execution of PSC 2008 is mainly maritime dispute area issue with India. It needed to discuss with foreign ministry and required other formalities.

5. Offshore block no. 16 (Santos) has signed in 1994, and this PSC has option to sell gas to the third party other than PB. This is due to the gas demand is not much in Chittagong area at that time of the Contract was signed and the production is in surplus condition. This PSC clause is adaptable only to offshore and not onshore PSC.

6. Santos first well (South Sangu #4, deviated well) was abandoned due to the unexpected high formation pressure near the target depth.

7. Annual production data is published every 6 month.

This minutes prepared by JST

**Minutes of Meeting**

| | | |
|---|---|---|
| Date: | 01 December 2011 | |
| Time: | 10:50~ | |
| Venue: | KGDCL's office at Petrocentre | |
| Participants: | KGDCL | : Mr. Md. Sanowar H. C. - Managing Director |
| | JICA Survey Team (JST) | : Mr. Iwamoto/Kono/Sasano |
| | | : Mr. Md. N.Alam - Local support |

**Subjects: Data Collection Survey on Bangladesh Natural Gas Sector**

1. KGDCL's outline was explained as follows:
   KGDCL was formed on February 2010 and commenced the commercial activities from 01 July 2010. Their franchise area is greater Chittagong and Chittagong hill tracks area where were previously under BGSL.

2. KGDCL stated that they need JICA's assistance for the installation of pre-paid gas meters to domestic consumers. Details are as follows:
   1) Total required numbers: 326,000 nos.
   2) Estimated cost of pre-paid meter: Tk. 10,000/each including installation cost
      This cost is based on the pre-paid meter that is currently produced locally and installed at TGTDCL franchise area.
   3) Installation of these meters may result 30~40% of energy saving.

3. JST advised KGDCL to prepare the DPP for the above pre-paid meter installation project. KGDCL will send it to Petrobangla and copy to JST within next week.

This minutes prepared by JST

**Minutes of Meeting**

| | | |
|---|---|---|
| Date: | 01 December 2011 | |
| Time: | 14:40~ | |
| Venue: | Petrobangla's office | |
| Participants: | Petrobangla (PB) | : Mr. Md. Molla M. Hossain - Director (Op.& Mines) |
| | | : Mr. Md. Shaiful A. C. - Director (Planning) |
| | JICA Survey Team (JST) | : Mr. Iwamoto/Kono |
| | | : Mr. Md. N.Alam - Local support |

**Subjects: Data Collection Survey on Bangladesh Natural Gas Sector**

1. **With Mr. Md. Molla Md. M. Hossain, Director (Operation & Mines)**

   JST requested Mr. Molla to assist JST in making appointment for the meeting with TGTDCL. Mr. Molla advised JST to visit TGTDCL office on the same day while he make a telephone call to TGTDCL's Managing Director.

2. **With Mr. Shaiful A. Chowdhury, Director (Planning)**

   1) JST thanked the receipt of answers to questionnaire (see attached) from PB on 30th November 2011.
   2) JST requested the copy of DPP of LNG re-gasification plant project. However, PB stated there is no DPP because this project is not financed by any agency. PB outlined the project as follows:
      - The contract will be BOOT basis for 15 years
      - GOB will import LNG
      - The project will be completed after 24 months.
   3) JST requested the meeting with Mr. Shaiful early next week. Mr. Shaiful stated that he will confirm the date & time on coming Sunday over the phone.

This minutes prepared by JST

বাংলাদেশ তৈল, গ্যাস ও খনিজ সম্পদ করপোরেশন (পেট্রোবাংলা)
**Bangladesh Oil, Gas & Mineral Corporation (Petrobangla)**

Ref: 32.03.19/488

Date: 30/11/2011

ICHIGUCHI Tomohide
Director, South Asia Division 4
South Asia Department
Japan International Cooperation Agency

Subject: Answers to the JICA's Questionnaire during their 2nd Survey in Bangladesh.

Dear Sir,

With reference to your E-mail Dated 16/11/2011 on the above subject, as requested, please find enclosed the answers to the questionnaire during their 2nd survey in Bangladesh.

Thanking you,

Yours Sincerely,

(Mohammed Shaiful Alam Chowdhury)
Director (Planning)

Enclosure: As above

PETROCENTRE, 3 Kawran Bazar C/A, Dhaka 1215, GPO Box 849, **Cable :** Petrobangla, **PABX:** 9121010-16, 9121035-41; **Fax :** 88-02-9120224, **website :** www.petrobangla.org.bd **E-mail :** petchair@petrobangla.org.bd

| | | |
|---|---|---|
| 1 | National Energy Policy (NEP)<br>NEP2004 seems to be outdated and does not reflect the recent energy crisis. And NSAPR II states that the existing National Energy Policy is being updated<br>Please provide us with the latest draft of the National Energy Policy.<br>If the draft is not available please let us know the contents and the progress of updates in detail. | Draft NEP is under process of EMRD. May please communicate Energy and Mineral Resources Division (EMRD) of the Ministry of Power Energy and Mineral Resources. |
| 2 | Gas Sector Master Plan 2006 (GSMP)<br>During the last interview it was mentioned that GSMP is under review.<br>Please provide us with the latest draft. If the draft is not available please let us know the contents and the progress of the review in detail. | Following aspects of GSMP are being studied & updated by various consultants GSMP under a World Bank financed project of Petrobangla: (a) Preparation of Implementation and Financing Plan for gas sector Development, (b) Project preparatory Suport, (c) Prepaid metering and Interface/Zonal Meter Assessment, (d) Natural Gas Pricing Framework, Communication Strategy and Campaign on Gas and Energy Pricing and Reforms, etc. |
| 3 | Gas Sector Reform Roadmap (GSRR)<br>During the last interview we, the Survey team, requested the copy of GSRR, however we have not received it yet.<br>Please provide us with the copy of GSRR and also please let us know the actual progress of each action plans mentioned in GSRR. | Handed over to you on 17-11-2011 during meeting at Petrobangla. |
| 4 | Gas Demand<br>In recent years Bangladesh has been facing the gas supply shortage.<br>1) When did this shortage start?<br>2) How did this shortage increase?<br>3) How was each sector affected by this gas supply shortage?<br>4) What was done to restrain the demand increase so far? | Gas shortage has started gradually with the increase of demand since few years back. With the gas production management, Workover of wells, Development drilling, and strengthening exploration activities gas shortage problems are being addressed. |
| 5 | Energy Saving<br>1) Why is the daylight saving time not adopted after 2009?<br>2) How are the actual states of the following energy saving activities mentioned in NSAPR II?<br>- Adjusting shopping hours<br>- Staggering holiday for industries<br>- Creating awareness of CFL bulbs<br>3) Are ther any other energy saving activities presently planned or already implemented? | It concerns Power Division of the Ministry of Power Energy and Mineral Resources. May please communicate Power Division. |
| 6 | Demand & Supply Records<br>Please provide us with the past records of monthly average of gas demand and supply for last 10 years. | As discussed the yearly data is with JICA, but monthly data for 10yrs is to big need to be compiled. |
| 7 | Alternative Energy<br>1) Coal<br>Please provide us with the English version of Draft Coal Policy which is presently available in Petrobangla's web site.<br>When will the Coal Policy be finalized? | Draft Coal Policy is under process of EMRD. May please communicate Energy and Mineral Resources Division (EMRD) of the Ministry of Power Energy and Mineral Resources. |
| 8 | LNG import<br>Please explain the current plan in detail.<br>Who is responsible for LNG import in the energy sector? | Consultant is already appointed. To select the Terminal Developer for constructing the offshore LNG terminal PQ has been called. 10 (Ten) proposals have been received. RFP Document is under preparation by Consultant. Expected time to issue the RFP is 2nd week of December 2011 |
| 9 | Coal import<br>Who will be responsible for Coal import?<br>(not for brick field, as alternative fuel to natural gas) | Imported coal is possibly used for power sector. May be communicated to power division or BPDB. |
| 10 | Development Plan<br>Please let us know the development plans with CNPC, Gazprom and Sinopec. | CNPC is not applicable. 10 wells drilling issues with Gazprom is negotiation stage which will be finalized very soon |
| 11 | Offshore Bidding Round 2011<br>Please let us know the progress and timing. | Revised version of Model PSC is under consideration of EMRD. As soon as it would be finalized for further process of bidding round. |
| 12 | Organization<br>In general, governmental organization shows hierarchy of division, department and/or section of governmental offices except state own enterprises. However the position of Petrobangla seems to be same as department of EMRD. Please explain the exact position of Petrobangla. | Petrobangla is responsible to work for indigeneous natural gas exploration, production, transmission and distribution for and on behalf of Govt./EMRD. |
| 13 | Management plan for the profit and loss<br>Please explain the management plan for the profit and loss during past period and future. | The profit after tax of Petrobangla group in the last 05 financial years are:<br>- FY 2006-07 : 74,286.73 Lakh Taka -<br>FY 2007-08 : 160,873.05 Lakh Taka -<br>FY 2008-09 : 177,398.24 Lakh Taka -<br>FY 2009-10 : 177,622.09 Lakh Taka -<br>FY 20010-11 : 214,895.00 Lakh Taka |
| 14 | Gas Meter<br>Installation of gas meters are very important for fair charge of gas consumption and minimize the contract consumption loss. On the other hand, Petrobangla has a benefit and distribute the dividend. Why does not Petrobangla (distribution companies) install gas meters for all customers? | Distribution companies are operationally independent under the Petrobangla umbrella. As such those companies are implementing these. |
| 15 | Privatization<br>Please explain about the privatization plan of Petrobangla and group enterprises. | Government is actively considering Public Private Partnership (PPP) mechanism among others in the power and Energy sectors |
| 16 | Bureau of Mineral Development<br>Why does not Bureau of Mineral Development (BMD) take responsibility of two mining enterprises? | In concerns EMRD |

| | | |
|---|---|---|
| 17 | Subsidy<br>Please provide the governmental subsidy on natural gas sector by item for past five years in Table. | Petrobangla is the single buyer of both National Oil Companies and International Oil Companies gas. Variable prices are applicable for different consuming sectors which is centrally managed by petrobangla/ EMRD. Therefore, no individually applicable subsidies could be identified. |
| 18 | "TA to review the approach for increasing the efficiency of gas utilization in certain major users" with financial assistance from Japan Debt Cancellation Fund (JDCF)<br>Please explain the progress of the above TA and provide us with the related data if possible. | Described in Annex-A |

# Project Brief

Project Title: **TA to Review the Approach for Increasing the Efficiency of Gas Utilization in Certain Major Users**

**1. Objectives of the Project:**

The objectives of this project are identifying the inefficient major gas users, the cause of inefficiency, recommending the technical aspects to remedy the inefficiency of the identified major gas users, assessing the techno-economical and financial viability of the inefficient major gas users, evaluating the direct and indirect environmental impact of this project.

**2. Implementation Period:** January 2011 - June 2012.

**3. Physical Progress (October 23, 2011):**

Bangladesh Oil, Gas and Mineral Corporation (Petrobangla) has been allocated Japan Debt Cancellation Fund (JDCF) and Petrobangla's own fund toward the cost of the Project "TA to review the approach for increasing the efficiency of gas utilization in certain major users" and it intends to apply part of the proceeds of these funds to payments under the contract for the provision of consultancy services for the project by a consulting firm.

Petrobangla invited Expressions of Interest (EOI) from reputed consulting firms having requisite experience on related field in order to prepare a short list of consulting firm(s). Upon evaluation of the EOIs, and with the approval of Head of Procuring Entity, the Request for Proposal (RFP) had been issued to the shortlisted consulting firms.

A total four (04) numbers of RFPs were received within the last date of proposal submission. The Proposal Evaluation Committee (PEC) submitted the Technical Evaluation Report on September 20, 2011 and in accordance with the PPR-2008, the report was approved by the Head of the Procuring Entity (HOPE). Upon approval, the firms who attained at least the minimum technical points, specified in the RFP, were invited to a public opening of their Financial Proposals.

The Financial Proposals of the 3 (Three) technically responsive consulting Firms were publicly opened by the Proposal Evaluation Committee (PEC) in its meeting held on October 05, 2011 in presence of the representatives of the respective consulting firms. The PEC reviewed the detailed content of each financial proposal further.

To make a combined Technical and Financial Evaluation Report, the proposals were ranked carefully by the PEC according to their combined scores using the weights (weights given to the technical and financial proposal), pursuant to Rule 117(24) (b) and Rule 121 of the Public Procurement Rules-2008 and as specified in the Proposal Data Sheet (PDS) of the RFP. The combined Technical and Financial Evaluation Report was submitted by the PEC, which is now under process of approval. Upon approval, contract negotiations will be carried out with the first ranked evaluated consulting firm. After the successful contract negotiations, notification of award will be issued to the consulting firm.

**Minutes of Meeting**

| | | |
|---|---|---|
| Date: | 01 December 2011 | |
| Time: | 15:25~ | |
| Venue: | TGTDCL's office | |
| Participants: | TGTDCL | : Mr. Md. Abdul Aziz Khan - Managing Director |
| | JICA Survey Team (JST) | : Mr. Iwamoto/Kono |
| | | : Mr. Md. N.Alam - Local support |

**Subjects: Data Collection Survey on Bangladesh Natural Gas Sector**

1. JST explained the outline and objective of this survey.

2. JST presented questionnaire to TGTDCL and requested their answers.

3. TGTDCL agreed to provide answers and requested JST to contact the staff who will be in charge of this matter early next week.

This minutes prepared by JST

**Minutes of Meeting**

| | | |
|---|---|---|
| Date: | 01 December 2011 | |
| Time: | 16:00~ | |
| Venue: | GTCL's office | |
| Participants: | GTCL | : Mr. Md. Abdul Aziz Khan - Managing Director |
| | | : Mr. Md. Abul Kalam Azad - Project Director of Monohordi-Jamuna Project |
| | JICA Survey Team (JST) | : Mr. Iwamoto/Kono |

**Subjects: Data Collection Survey on Bangladesh Natural Gas Sector**

1. GTCL provided the copies of DPP for the following projects;
   1) Monohordi-Jamuna Project
   2) Jamuna-Bheramara Project

   that include the following pipelines that GTCL needs JICA's assistance:
   1) Dhanua-Elenga (D-E) pipeline
   2) Jamuna-Nalka (J-N) pipeline

2. GTCL stated that the reason why D-E and J-N pipelines were left out was simply the shortage of fund.

3. GTCL stated that environmental certificate for D-E and J-N pipelines were already issued at 2006, and it can be arranged again, if necessary.

4. GTCL stated that the upcoming Bibiyana-Dhanua pipeline project was planned after the omission of D-E and J-N pipelines, and the completion of Bibiyana-Dhanua pipeline as well as compressor stations will increase the necessity of D-E and J-N pipelines.

5. GTCL stated that Feasibility Study Report for D-E and J-N pipelines can be newly prepared by GTCL within three months.

6. JST asked the difference in the necessity of D-E pipeline and J-N pipeline. GTCL stated that necessity of D-E pipeline is more than J-N pipeline because gas demand at east side of Jamuna river is more than west side. However GTCL stated that J-N pipeline is also very important for the gas supply to west zone where the upcomoing Bheramara power plant is located.

This minutes prepared by JST

**Minutes of Meeting**

| | | |
|---|---|---|
| Date: | 05 December 2011 | |
| Time: | 16:00~ | |
| Venue: | EMRD office | |
| Participants: | EMRD | : Mr. Md. Sefaul Alam - Joint Secretary |
| | JICA Survey Team (JST) | : Mr. Iwamoto/Kono |
| | | : Mr. Md. N.Alam - Local support |

**Subjects: Data Collection Survey on Bangladesh Natural Gas Sector**

1. EMRD went through the questionnaire and verbally answered as attached.

2. JST presented and outlined the Main points of Draft Final Report, and requested EMRD to provide the written comments by 15/Dec. EMRD agreed to send their comments to JST by the said date.

This minutes prepared by JST

# Questionnaire to EMRD for the 2nd Survey in Bangladesh

| No. | Question | Answer |
|---|---|---|
| 1 | ~~Organization~~<br>~~Please explain:~~<br>~~- MoPEMR organization and the position of EMRD~~<br>~~- EMRD's organization~~ | |
| 2 | ~~Organization~~<br>~~Why does EMRD has several different name of organization, namely Unit, Bureau, Institute, etc. without department?~~ | |
| 3 | ~~Energy Balance Sheet~~<br>~~Please provide us the data of Simplified Energy Balance Sheet of Bangladesh for past five years.~~<br>~~We attached a blank table which introduced in Key World Energy Statistics by International Energy Agency.~~ | |
| 4 | Energy Mix<br>Please provide us with the past records of primary energy mix in Bangladesh at 1990, 1995, 2000, 2005 and 2010. (please fill the blanks of attached table) | Latest share of primary energy and commercial energy are as attached pie charts, and there have been not much changes for last 15~20 years. |
| 5 | National Energy Policy (NEP)<br>NEP2004 seems to be outdated and does not reflect the recent energy crisis. And NSAPR II states that the existing National Energy Policy is being updated.<br>Please provide us with the latest draft of the National Energy Policy.<br>If the draft is not available please let us know the contents and the progress of updates in detail. | Approved latest Policy is NEP1996. NEP2004 should be one of the draft version yet to be approved. The committee for the renewal of this policy has been formed and renewal is on going. However, no time limit is set up. |
| 6 | Alternative Energy<br>1) Coal<br>Please provide us with the English version of Draft Coal Policy which is presently available in Petrobangla's web site.<br>When will the Coal Policy be finalized? | Coal policy is not approved yet, therefore it cannot be provided. |
| 7 | ~~Bureau of Mineral Development~~<br>~~Why does not Bureau of Mineral Development (BMD) take responsibility of two mining enterprises?~~ | |
| 8 | Current Status of ADB TA 7758<br>Please provide us with the current status of ADB Technical Assistance (TA 7758) named as "Tariff Reform and Inter-sectoral Allocation of Natural Gas". | No activity on this project so far. |
| 9 | Information of Ongoing and Planned Projects<br>Please provide us with the latest information of ongoing and planned projects in the natural gas sector, such as "development partner", "Technical Assistance/Project Name", "Duration", "Outline", "Amount", dec. | List of on going projects are shown in the Petrobangla's latest annual report. There is no list of planned project at this moment. |

**Minutes of Meeting**

| | | |
|---|---|---|
| Date: | 07 December 2011 | |
| Time: | 10:30~ | |
| Venue: | Petrobangla office | |
| Participants: | Petrobangla (PB) | : Mr. Md. Shaiful A. Chowdhury - Director (Planning) |
| | JICA Survey Team (JST) | : Mr. Iwamoto/Kono |
| | | : Mr. Md. N.Alam - Local support |

**Subjects: Data Collection Survey on Bangladesh Natural Gas Sector**

1. JST presented and outlined the Main points of Draft Final Report, and requested PB to provide the written comments by 15/Dec. PB stated that they will make best efforts to send their comments by the said date.

This minutes prepared by JST

**Minutes of Meeting**

| | | |
|---|---|---|
| Date: | 07 December 2011 | |
| Time: | 11:30~ | |
| Venue: | TGTDCL office | |
| Participants: | TGTDCL | : Mr. Md. Atiquzzaman - GM Vigilance Division |
| | JICA Survey Team (JST) | : Mr. Iwamoto/Kono |
| | | : Mr. Md. N.Alam - Local support |

**Subjects: Data Collection Survey on Bangladesh Natural Gas Sector**

1. TGTDCL verbally answered to the questionnaire which was given to TGTDCL at last meeting on 01/Dec as attached.

2. JST presented and outlined the Main points of Draft Final Report, and requested TGTDCL to provide the written comments by 15/Dec. TGTDCL agreed to send their comments to JST by the said date.

This minutes prepared by JST

# Questionnaire to TGTDCL for the 2nd Survey in Bangladesh

| No. | Question | Answer |
|---|---|---|
| 1 | Gas Meter<br>Please let us know the present state of the following pilot projects for gas metering system included in the "Natural Gas Access Improvement Project" proposed by ADB.<br>- Remote sensing metering system for industrial consumers<br>- Prepaid metering system for domestic consumers | Latest status of the projects is mentioned in the new annual report 2010-2011. |
| 2 | Gas Stove<br>"Bangladesh Roadmap for Energy Efficiency Improvements and Demand Side Management (2009)" proposes to improve natural gas cook stoves of house hold gas consumers. Please let us know the present state of this plan. | There is no movement on this plan so far. |
| 3 | System Loss<br>Please let us know:<br>- Detail of Gas System Loss Reduction Plan (GSLRP)<br>- Present system loss | GSLRP is outlined in the annual report 2010-2011.<br>Status of the present system loss is "System Gain" mainly due to following reasons:<br>- Low pressure situation causes less supply than billing volume<br>- Less consumption than the minimum charge volume |
| 4 | Annual Reports<br>Please provide the previous annual reports since 2006. | Latest annual report 2010-2011 was provided to JST. |
| 5 | ~~Gas Price Distribution~~<br>~~Please provide us a table of detailed current "Gas Price Distribution between Government and Petrobangla" including VAT, SD, PDF Margin, BAPEX Head Margin, etc..~~ | |
| 6 | Redefining the franchise areas<br>Please let us know the present state of the activity for the proposal to form three companies dividing TGTDCL. | There is no movement on this plan so far. |
| 7 | Off-loaded shares<br>How many percent of shares are off-loaded? | 25% of the shares were already off-loaded, and another 10% will be off-loaded soon. |

Appendix-2

# Gas Sector Reform Road map 2005

## GAS SECTOR REFORM ROAD MAP

| Reform Area/Objective | Agenda | Time Frame | Responsible Authority | Monitoring Instrument | Expected Benefits/ Impacts |
|---|---|---|---|---|---|
| **A. Policy Framework** | | | | | |
| Energy policy to provide a broad framework for energy sector development | Finalize and submit to cabinet for approval of the revised energy policy. | 2006 | Energy and Mineral Resources (EMRD) Division | Energy policy statement | Promote energy sector development. |
| Policy formulation capabilities | Finalize and submit the draft Gas Act for approval by parliament. | 2006 | EMRD | Notification | Better management of gas sector policy |
| | Strengthen the policy formulation and monitoring capacity of the Planning Cell of EMRD. | | | on Planning Cell | |
| | Make the Hydrocarbon Unit (HCU) a permanent part of EMRD to provide technical advice. | 2006 | EMRD | Notification of new role of HCU | Streamlining technical capabilities of EMRD |
| | EMRD, with support of HCU and Bangladesh Oil, Gas, and Minerals Corporation (Petrobangla), to prepare long-term projections for gas production and 10-year rolling gas cost and blended prices. | 2006–2007 | EMRD/HCU/ Petrobangla | Gas supply projections | Balanced gas sector development |
| **B. Regulatory Instruments** | | | | | |
| Developing a transparent regulatory framework | Appoint the remaining two members of the Energy Regulatory | 2005 | EMRD | Notification by EMRD | An environment conducive to private investment and a competitive market |
| | Commission (ERC) to make it fully operational. Under the provisions of the ERC Act, the Government will transfer the responsibility for tariff setting and other regulatory functions to ERC. | 2005 | Government/ ERC | | |
| | Gas Transmission Company Limited (GTCL) will submit its proposal to ERC. ERC holds first hearing. | 2006 | GTCL/ERC | Approved tariff | Market-oriented energy pricing |
| Ensuring efficient and economic use of natural gas in safe and sustainable manner | Finalize and approve the Gas Act that would regulate transmission and distribution of natural gas, ensure private sector participation (PSP) including offloading shares. | 2005-2006 | EMRD | Approved Gas Act | Effective natural gas resource management and promotion of competitiveness |
| Access to gas infrastructure | EMRD to develop rules and regulations for PSP | 2005-2006 | EMRD | Relevant rules | Reduction of market dominance |
| | Identify facilities specifically for gas transmission and distribution that could be undertaken by PSP under different modalities. | 2006-2007 | EMRD | Investment guidelines | Reduced dependence of gas sector organizations on government funds |
| | Establish a framework for all gas companies concerning rights in relation to ownership of assets, access to transmission and distribution systems. | 2005-2007 | EMRD | Institutional structure of gas companies | Foster development of gas companies |
| | Establish contracts that reflect the rights of gas sector companies in gas purchase, sale, and transmission. | 2005 | Petrobangla | Formal contracts | Competition and efficiency enhancement |
| **C. Sector Planning** | | | | | |
| Ensuring nonconstrained supply of natural gas | Implement public sector investment program based on financial and economic viability and social development impact | Ongoing basis | PB/State Gas Companies (SGCs) | Investment proposals | Harmonization of gas sector development |

| Reform Area/Objective | Agenda | Time Frame | Responsible Authority | Monitoring Instrument | Expected Benefits/ Impacts |
|---|---|---|---|---|---|
| | Continually update the master plan and disseminate investment options for private sector. | 2005-2008 | PB | Private sector investment proposals | Optimal development through private sector participation |
| | Obtain inputs from energy sector in a participatory manner. | 2006-2009 | EMRD | Energy policy | Broad support for sector development |
| **D. Increased Access to Natural Gas** | | | | | |
| Natural gas resources discovered and delivered | Develop strategy for exploration and utilization of undiscovered reserves. | 2005-2006 | PB/ Bangladesh Petroleum Exploration and Production Company Limited (BAPEX) | Exploration proposals | Maximum utilization of indigenous non-renewable resources |
| | Expand natural gas network to cover less developed region. | 2006-2010 | Petrobangla /GTCL | Network plans | Regional economic development |
| Expanding natural gas access to more urban and rural areas | Develop a framework to expand the gas networks on an economically, financially, and socially acceptable manner. | 2005-2007 | SGCs | Network expansion plans | Extending the gas network in a market-friendly manner |
| **E. Corporate Governance** | | | | | |
| Flexibility and commercial focus | Operate commercially and independently as per Companies' Act. | 2005-2006 | Petrobangla /SGCs | SGC board decisions | Enhanced management capabilities |
| | Review the Government's dividend policy for gas sector companies. | 2005 | EMRD/Ministry of Finance (MOF) | New dividend guidelines | Efficient and financially sound gas companies |
| | Empower gas sector entities to adequately undertake all operational and financial activities, including decision making for investment budgets. | 2007-2008 | EMRD/ Petrobangla | Operational guidelines | Goal-oriented management |
| | Rationalize and limit participation of individuals in multiple boards to promote intercompany interactions in a commercial manner. | 2005-2006 | Petrobangla | Board guidelines | Dynamic decision making in response to changing reforms in the market and the economy |
| | Establish board-level audit, compensation, and investment committees. | 2006 | SGCs | Board guidelines | Sound financial management |
| | The Government should gradually move toward providing independence to gas sector companies in determining compensation structures. | 2005 | EMRD/MOF | Guidelines for benefits | Improved management |
| Improving commercial operation | Reduce accounts receivable from public and private consumers to no more than 3 months. | 2006-2007 | SGCs | Financial statements | Improved performance and financial management |
| | Establish cost centers for activities of BAPEX such as drilling, seismic surveys, gas development, and a promotion exploration. | 2006 | BAPEX | Annual report | Improved operational efficiency |
| Reducing system loss | Develop and implement a comprehensive action plan to minimize system loss in distribution and transmission. Establish proper and transparent accounting for system losses. | 2005-2007 | Petrobangla /SGCs | System loss reduction plan | Enhanced revenue generation for additional investment and improved debt-service coverage |
| | | | | | |

| Reform Area/Objective | Agenda | Time Frame | Responsible Authority | Monitoring Instrument | Expected Benefits/ Impacts |
|---|---|---|---|---|---|
| | Gas distribution companies to establish and carry out systematic, routine inspection and testing, including methods designed to locate and stop gas thefts and tampering of meters and bypass. | 2005-2006 | Petrobangla /SGCs | Monitoring reports | Improved management efficiency in monitoring distribution activities |
| **F. Gas Sector Restructuring** | | | | | |
| Improving enterprise performance<br>Redefining the franchise areas of the Titas Gas and Transmission and Distribution Company Limited (TGTDCL) and Bakhrabad Gas Systems Limited (BGSL) for unbundling into three and two companies, respectively | Capacity building of gas sector companies<br>Establish into three and two separate companies TGTDCL and BGSL, respectively, to decrease system losses and improve management efficiency. | Ongoing basis<br>2006 | Petrobangla /SGCs<br>EMRD/ Petrobangla<br>TGTDCL<br>BGSL | Institutional structure<br>Restructured companies | Improved sector efficiency<br>Improved performance |
| **G. Private Sector Participation** | | | | | |
| Institutional reforms and creating a competitive market | Petrobangla to perform as a single buyer to buy gas from each field monthly, blend prices, and sell gas to distribution companies. | 2007-2008 | Petrobangla | Gas pricing | Transparency in gas costing, financial planning, and pricing policy formulation |
| Promoting private sector involvement in gas sector development | Take steps to allow private financing and management of sections of the gas transmission network and competitive participation of the private sector in gas distribution. | 2005-2007 | EMRD/ Petrobangla SGCs | Private sector financing of gas projects | Reduced dependence on government funds |
| | Develop and implement a time-bound action plan for off-loading shares of gas sector companies. | 2005-2007 | Petrobangla /GTCL and other SGCs | Shareholding of SGCs | Diversification of ownership and management |
| **H. Pricing Reforms** | | | | | |
| Introducing flexible and transparent pricing mechanism | Eliminate from gas prices non-economic factors such as levies for BAPEX. | 2005-2007 | EMRD/ERC BAPEX | Pricing notifications | Exploration activities through revenue earnings |
| | Review the pricing framework to restructure to reflect volume of gas transported and distance of pipelines and return on investment for transmission and distribution. | 2005-2007 | ERC | Pricing notifications | Full pricing of gas to lead to more efficient use of gas |
| **I. Further Policy Dialogue** | | | | | |
| Reforming the gas sector through institutional and financial restructuring | Transfer the role of managing existing and future production sharing contracts (PSCs) to an appropriate body. | 2005-2006 | EMRD/ Petrobangla | Revised structure | Diversification of ownership and management |
| | Outline a time-bound plan for institutional restructuring of Petrobangla including reviewing the Petrobangla Act. | 2005-2006 | EMRD/ Petrobangla | Restructured entities | Diversification of ownership and management |
| | Implement the institutional restructuring program for Petrobangla. | 2007-2009 | EMRD/ Petrobangla | Restructured entities | Diversification of ownership and management |

Source: Ministry of Power, Energy and Mineral Resources.

Appendix-3

# Gas Sector Reform Road map 2009-2012

Government of the People's Republic of Bangladesh

# Gas Sector Reform Roadmap: 2009 – 2012

Energy and Mineral Resources Division
Ministry of Power, Energy & Mineral Resources
December 2008

# GAS SECTOR REFORM ROADMAP (GSRR)

(December- 2008)

**Background**

The Gas Sector Reform Roadmap (GSRR) was formulated in 2005 upon mutual discussion between ADB and GOB. It was appended in the Report and Recommendation of ADB's President to its Board for approval of the loan for Gas Transmission Development Project (GTDP) in 2005 and the Loan Agreement Numbers 2188-BAN and 2189-BAN (SF) were signed in 2006. The total GTDP loan amount is US$ 235.00 million and was made effective on November 28, 2006. A total of 11 projects have been undertaken under these loans comprising:

1. Part A : Gas Transmission Expansion and Reinforcement Project (Five sub- component). To be implemented by GTCL.
2. Part B: Appraisal of five gas fields (Rashidpur, Kailashtila, Sylhet, Bakhrabad and Titas) through 3-D seismic survey. To be implemented by SGFL & BGFCL with the help of BAPEX.
3. Part C: Rajshahi Gas Distribution Network. To be implemented by PGCL
4. Part D: Capacity Building (a) Strengthening of the Hydrocarbon Unit Phase-II by HCU, (b) Up-gradation of Data Center of BAPEX by BAPEX, (c) Capacity Building of EMRD, Petrobangla & its Companies by Petrobangla and (d) System Loss Reduction of TGTDCL by TGTDCL.

**Gas Sector Reform Roadmap (GSRR)**

| Reform Area/Objective | Agenda | Time Frame | Responsible Authority | Status as on 16-02-2011 |
|---|---|---|---|---|
| **A.Policy Framework** | | | | |
| Energy policy to provide broad framework for energy sector development | Finalization of National Energy Policy Updates | 2009 | Energy and Mineral Resources Division (EMRD) | The National Energy Policy (NEP) was initiated in 1993 by the Ministry of Power, Energy and Mineral Resources (MPEMR) and was prepared by a committee consisting of relevant officials and national experts. It may be mentioned that different groups of stakeholders also participated actively during preparation of the NEP. It was approved by the government in 1995 and published in the Gazette in 1996.<br><br>Due to rapid changes in global and domestic energy scenario an inter-ministerial committee has finalized a draft comprehensive updates. EMRD is processing it. |
| Policy formulation capabilities | Finalize and submit the draft Gas Act for approval. | 2009 | EMRD | Bangladesh Gas Act 2010 is approved on 19-07-2010 and has been published in the Gazette on the same date. |
| | Strengthen the policy formulation and monitoring capacity of EMRD | 2011 (It is an ongoing process) | EMRD | It is an ongoing process. Regular training of personnel through various projects and PSC training fund have been continuing. Presently training under ADB financed TA project entitled "Technical Assistance for Capacity Building of Energy and Mineral Resources Division (EMRD) of the Ministry of Power, Energy and Mineral Resources and Petrobangla and its Companies", has been going on. Another IDA financed TA project namely "TA for Strengthening Planning and Management Capacity of EMRD and Petrobangla Group" is being implemented. As a technical arm of the EMRD, Hydrocarbon Unit (HCU) was functioning as a Project, which has now been structured as a permanent Wing of the EMRD. The HCU Project Phase-2 is being implemented under Norwegian Grant (administered by ADB) with the view to establishing it on a strengthened footing. The government has already approved the organogram of the Hydrocarbon Unit. With this process the Policy Formulation and Monitoring Capacity of EMRD would be strengthened gradually. |

| Reform Area/Objective | Agenda | Time Frame | Responsible Authority | Status as on 16-02-2011 |
|---|---|---|---|---|
| | Prepare Long Term Gas Demand–Supply Projections | Ongoing process; to be reviewed at regular interval. | EMRD/ Hydrocarbon Unit (HCU)/ Petrobangla (PB) | The government in 2006 approved the Gas Sector Master Plan and Strategy (GSMP). It has a gas demand-supply projection up to 2025. Because of rapid increase of gas demand, the gas demand projected in the GSMP is found to be rather low and barely matches the actual demand. Therefore, the demand-supply balance is being updated regularly as an operational requirement. Moreover, with the view to preparing long-term strategic vision for the gas sector and to providing the basis of developing investment programs, long-term projections deserve continual updating. |
| **B.Regulatory Instruments** | | | | |
| Access to gas infrastructure | Development of rules and regulations for Private Sector Participation (PSP) | 2011 | EMRD/ Petrobangla | National Energy Policy and other Acts/Policies have general policy guidelines for PSP. Meanwhile, BOI has also developed policies for private sector entrepreneurs. Moreover, EMRD is considering developing a policy guideline for outsourcing gas distribution activities to the private sector. A Public-Private Joint Venture Policy for the gas sector has been taken up and is expected to be formulated soon. |
| | Establish contracts among production, transmission and distribution companies for gas purchase, sale, and transmission | 2010 (Ongoing Process) | Petrobangla & its companies | Contracts between the gas distribution companies and IPP, SIPP etc. in the power sector and industry sector entities are already available. Contracts between the gas distribution companies and Power Development Board entities need to be signed. Also, contracts between sector's own production, transmission and distribution companies, including the contracts between Petrobangla and its distribution companies are to be made under general guiding principle of the government/relevant authorities. |
| **C.Sector Planning** | | | | |
| | Update the master plan and disseminate investment options for private sector | Continuing activity | Petrobangla | The regular operational and policy issues of the master plan would be reviewed and updated, as practically and periodically required by Petrobangla outlining public and private sector investment requirements. The daily demand-supply analysis is an operational requirement. Therefore, such analysis and updates are done as a routine work.<br><br>Private sector investment options are well disseminated in the gas sector. For example, successful participation of International Oil Companies (IOCs) under Production Sharing Contracts (PSCs), conversion of vehicles into CNG mode, establishment of CNG workshops and refueling stations, offloading of shares of TGTDCL, launching of Sundarbans Gas Distribution Company with the provision of 49% private share, etc.. |
| | Obtaining inputs for energy sector through interaction among the stakeholders | Continuous Process | EMRD | Stakeholders meetings are being held at the headquarters regularly and occasionally at regional level. Public and private sector stakeholders' inputs through interactions are well taken in resolving gas sector problems, where applicable. Also in policy formulation, inputs are taken through participation and interaction of the stakeholders. Meanwhile, Better Business Forum of Stakeholders has been formed and BBF is actively providing inputs to the sector. |
| **D. Increased Access to Natural Gas** | | | | |
| Natural gas resources discovered and delivered. | Develop strategy for exploration and utilization of undiscovered reserves | Ongoing Process | Petrobangla/ Bangladesh Petroleum Exploration and | Conversion of gas resource into reserve through extensive exploration has been prioritized in the ongoing strategy of the sector. With this view, strengthening of BAPEX to achieve full exploration capability is pursued vigorously. Also, exploration efforts by IOCs under PSC have been continuing and as such |

| Reform Area/Objective | Agenda | Time Frame | Responsible Authority | Status as on 16-02-2011 |
|---|---|---|---|---|
| | | | Production Company Limited (BAPEX) | Offshore Bidding Round 2008 was floated. Success of this offshore bidding process would bring positive impact on the gas exploration in the offshore virgin areas of the country. All these strategies for exploration and utilization of undiscovered reserves will continue. |
| **E. Corporate Governance** | | | | |
| | Independence to gas sector companies in determining compensation structures | 2011 | EMRD/Ministry of Finance(MOF) | Companies are functioning under Company's Act 1994 and exercising their authorities as stipulated in the Act. Company Boards determine fringe benefit packages. The salary structures are adopted as per government pay structure. However, based on the nature of job and their speciality an integrated independent pay structure other than national pay scale needs to be formulated to keep the skilled/specialized and efficiently grown-up manpower to serve Petrobangla and its companies. However, this needs a decision from an appropriate body. |
| Improving commercial operation | Reduce accounts receivables from public and private consumers to not more than three months | Ongoing Activity | State Gas Companies (SGC) | As of Nov.'10 the average months' equivalent accounts receivables are TGTDCL 3.2, BGSL 2.59, KGDCL 2.59, JGTDSL 3.13, PGCL 2.21, GTCL 4.84, RPGCL 5.00, BGFCL 4.55 & SGFL 3.7 respectively. Continuous efforts are being made to reduce it to the acceptable limit. |
| | Establish cost centers for activities of BAPEX such as drilling, seismic, gas development and exploration promotion | 2015 | BAPEX | This is considered immature at this stage. BAPEX Board may consider such actions when the Company attains self-sustenance independent of BAPEX margin. Wellhead gas price of BAPEX's explored gas has been increased from Tk. 7.00 to Tk. 25.00 per MCF. Gas Development Fund (GDF) fund from gas sales margin has been created and being utilized by the national exploration and production companies. |
| Reducing system loss | Action plan to minimize system loss in distribution and transmission companies | Ongoing process (substantial progress has been achieved ). | PB/SGCs | Action plans already adopted have helped reduce average system loss from 7.57% during FY2004- 05 to almost Nil during the FY2009-10 and as such achieved the target of 2% by 2009- 10. It may be mentioned here that TGTDCL has now been implementing an ADB funded project (a component of GTDP) to reduce system loss. This project has the provision for procurement of meters and other equipment, and selection of consultants to advise gas distribution companies in system loss reduction. |
| **F. Gas Sector Restructuring** | | | | |
| Redefining the franchise areas of the Titas Gas Transmission and Distribution Company Limited (TGTDCL) and Bakhrabad Gas Systems Limited (BGSL) for unbundling into three and two companies, respectively. | Establish TGTDCL and BGSL into three and two companies respectively | 2011 | PB/SGCs EMRD/ TGTDCL/ BGSL | Bifurcating BGSL (including a part of TGTDCL franchise area) two companies namely KGDCL & BGDCL has been functioning. The other proposal to form three companies dividing TGTDCL is being examined. |
| **G. Private Sector Participation** | | | | |
| Promote private sector involvement in gas sector development | To allow private financing in gas distribution system network | 2012-13 | EMRD/PB/ SGCs | The establishment of a new southwest gas distribution company (Sundarbans Gas Distribution Company) in the Khulna region is in progress. This company will have 49% ownership by the private sector with Government owning 51% .The company's head office |

| Reform Area/Objective | Agenda | Time Frame | Responsible Authority | Status as on 16-02-2011 |
|---|---|---|---|---|
| | | | | at Khulna town has already been inaugurated. However, it would take some time to make it fully operational until transmission line to the region is completed and gas supply is ensured. |
| **H.Pricing Reforms** | As per BERC Act, BERC is an independent regulatory body and is mandated to regulate the transmission and distribution tariff. EMRD/Petrobangla will be required to fix/determine the commodity price of the indigenous natural gas comprising the exploration and production costs/prices. Therefore, the upstream and downstream pricing is inter related. The pricing parameters to be used in determining the upstream prices may be required to be adjusted/changed to follow the end users' price to be fixed by BERC. As such this has not been addressed in GSRR by EMRD. | | | |
| **I. Further Policy Dialogue** | | | | |
| Reforming the gas sector through institutional and financial restructuring | Outline a time-bound plan for institutional restructuring of Petrobangla including reviewing Petrobangla Act | Needs government's thorough review and as such no time limit could be ascertained at the moment. | EMRD/PB | Petrobangla was established as a Corporation under the Bangladesh Oil, Gas and Mineral Corporation Ordinance, 1974 and was subsequently amended in 1985 and 1989. The functions of Petrobangla stated in the Ordinance are: research, survey, study, plan, and implement, actions for exploration, development, exploitation, and production, marketing of oil, gas & minerals and matters incidental thereto. Petrobangla carries out various functions through its 11 (eleven) companies governed under Company's Act 1994. On behalf of the government, Petrobangla is also holding 100% shares of the companies (except the recently off-loaded shares of TGTDCL). Similarly, Petrobangla has the exclusive right and authority to exercise rights and powers of the government to explore and to exploit Petroleum in the territory, continental shelf and economic zone of the country and also to enter into a Petroleum Agreement with any person for the purpose of any Petroleum Operations. Accordingly, it has entered into several Agreements for hydrocarbon exploration and production by the International Oil Companies (IOCs) and it administers the PSCs. Petrobangla plays the role of buyer and seller of whole of the IOC's gas and coordinates to maintain the country's gas supply chain (production, transmission and distribution). It also appoints the Managing Directors of all the companies under its umbrella.<br><br>Operational expenses of Petrobangla are met by funds obtained as service charge from its companies according to a formula approved by its Board. Petrobangla acts as the single buyer of IOC gas. It buys IOC's gas at contracted price, which is presently much higher than the government administered national gas sales price. In addition to that, Petrobangla has to sell its own profit gas it receives from IOC at government administered lower gas sales price. Petrobangla has to pay the deficit price to IOC exhausting whole of its profit gas to meet the gap between much higher contracted buying price and the government administered lower sales price. As a consequence, Petrobangla has been facing deficit of fund and such deficit has been increasing day by day. Due to rapid increase of gas demand, particularly by the power sector, dependence on IOC gas has also been increasing with the widening of the demand-supply gap. At present about 50% of the daily gas demand is met from IOC gas, whereas three years back it was about 20% and after three years from now, it may well exceed 80% of the nations daily gas demand. If so happens in the future days, Petrobangla's deficit fund management and its day-to-day expenditure incurring would be uncertain and thereby |

| Reform Area/Objective | Agenda | Time Frame | Responsible Authority | Status as on 16-02-2011 |
|---|---|---|---|---|
| | | | | Petrobangla's day-to-day functional fund management would likely to be jeopardized. It may be noted that, the contracted price of IOC gas is even less than the sub-continental other regional gas prices.<br><br>BAPEX has been putting efforts to the gas exploration with the view to enhancing reserve status at the national arena. It is receiving only a notional margin for exploration and selling gas at the government administered lower gas sales price. To build the BAPEX to the State-of-the-Art level with appropriate manpower, equipment and technology, it deserves to be made financially viable. Its own explored gas could have the same as that of the IOC's gas price. The Production Companies (SGFL, BGFCL and BAPEX) of Petrobangla are producing and selling gas to the distributing companies directly and receiving production margin for it. GTCL receives transmission margin/wheeling charges for gas transmission.<br><br>But Petrobangla does not receive any margin to have its financial source of income or to make profit. Rather, it has been increasingly counting deficit and exhausting its profit gas in meeting deficit between buying and selling prices of the IOC gas and their Corporate Tax obligations. Such deficit has been increasing rapidly with increasing supply of gas. Therefore, such buying and sales prices requires to be at par and if possible at higher sales price so that Petrobangla could retain a cost for institutional expenses and could invest for exploration and development of the gas sector.<br><br>It may be mentioned that the employees of Petrobangla and companies under its umbrella receives their salaries as per National Pay Scale, but the fringe benefits of the companies are much higher than Petrobangla because the companies could earn profits from their allocated margins from the gas sale.<br><br>Petrobangla has to oversee all of its companies' functions and shares, particularly the gas reserve enhancement and management. Considering the limited reserve of gas in the country, the whole process of petroleum operation (National & IOC) starting from exploration to the burner tip has to be made technologically, institutionally and financially viable and enriched under Petrobangla umbrella. With this view, Petrobangla's close coordination, monitoring and management for itself and its companies, including IOCs has to be enriched to the state-of-the-art level through its internal reorganization so that Petrobangla may ensure its function for and on behalf of the government in the interest of the country. Petrobangla has been successfully carrying out such business for the last 30 plus years efficiently and it should continue in the coming days with improved management and appropriate delegation.<br><br>In view of the above, for sustainable development of gas sector, Petrobangla deserves to be set up on a strong organizational and financial backbone having sound infrastructure, appropriate technology and capacity building. Petrobangla needs to be made |

| Reform Area/Objective | Agenda | Time Frame | Responsible Authority | Status as on 16-02-2011 |
|---|---|---|---|---|
| | | | | operationally and financially more effective and autonomous. Whereas, while meeting the deficit arising out of administered gas sales price and payment of corporate tax of IOC, Petrobangla could not even hold a single portion of its profit gas for organizational improvement and re-investment for exploration and development of the gas sector. Therefore, instead of institutional restructuring of Petrobangla, **appropriate rules and regulations may be formulated under the existing Petrobangla Act** with special attention to the following:<br><br>i. Ensure Petrobangla to retain full price of its own Profit Gas at the respective contracted price with IOC for gas sector development and own institutional development. Also, to keep provision of getting profit margin from IOC gas portion also, because Petrobangla has its own institutional expenses in the process of buying and selling of IOC gas.<br>ii. Ensure Petrobangla, for and on behalf of the government, to own and hold 100% shares of the companies under its umbrella running under Company's Act 1994.<br>iii. Petrobangla has been functioning for and on behalf of the government. Therefore, government share of SD/VAT @55% of gas sales may be reduced to 50% in the interest of oil and gas sector development so that Petrobangla may utilize/re-invest this 5% directly in oil and gas exploration, development and institutional development. Also Petrobangla be allowed to distribute remaining 45% share of group margin in meeting different expenses like Hydrocarbon Development Fund, Price Deficit Fund, Petrobangla own Margin, Exploration Company Margin, Production Companies Margin, Transmission Company Margin and Distribution Companies Margin.<br>iv. Ensure Petrobangla dealing of PSC issues with effective delegations.<br>v. Major human resource development need to be executed to equip Petrobangla effectively supervise and manage PSCs and its inter-companies co-ordination.<br><br>However, all the above issues need government's thorough review and decision, in principle. |

Appendix-4

# Gas Evacuation Plan (2010-2015)

BANGLADESH OIL, GAS AND MINERAL CORPORATION
(PETROBANGLA)

# GAS EVACUATION PLAN (2010-15)

## AGAINST PROJECTED DEMAND AND PRODUCTION AUGMENTATION PROGRAM OF PETROBANGLA AND IOCs & PROPOSED LNG IMPORT

20 June 2010



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1. Introduction :

1.1 This report has been prepared jointly by Petrobangla, GTCL and TGTDCL with necessary inputs received from the production and marketing companies pursuant to decision taken in a meeting held on 12-04-2010 at Petrobangla with Chairman, Petrobangla in the chair. The meeting was convened to identify the need for development of additional transmission pipelines and associated facilities over and above the pipeline construction and compressor installation projects being currently implemented in the gas transmission system for the evacuation of the incremental gas production from different gas fields within a span of next five years i.e. up to FY 2014-15 as per the programs of Petrobangla and the IOCs. The decisions of the meeting issued under memo no. 42.12.02/111, dated:18-04-2010 are as follows:

(a) Director (Planning) will collect necessary data from Director (Opns. & Mines) and Director (PSC) and forward the same to Managing Director (GTCL) for running a simulation program;

(b) Managing Directors of GTCL, BGFCL and TGTDCL will carry out the simulation exercise under the guidance of Director (Planning), Petrobangla on the basis of data received as above and make a presentation in a meeting to be held on 21 April 2010.

(c) The related follow-up activities will be carried out through Director (Planning), Petrobangla.

1.2 As decided in the meeting, Petrobangla forwarded the required data pertaining to the production augmentation program to GTCL under memo no. 32.07.49/192, dated: 04-05-2010. The load data on the other hand, required for conducting the network simulation by GTCL owned Pipeline Studio software were needed to be collected from concerned sources which include BPDB's System Planning Directorate for the future power generation and gas demand forecast and Petrobangla's in house data for non-bulk gas demand projections of the marketing companies. The gas production and demand data were

systematically tabulated and analysed over the last three weeks and various options for future incremental gas evacuation were examined.

1.3 The ongoing and planned transmission capacity augmentation and expansion programs of GTCL including installation of two (2) compressor stations at Ashuganj and Elenga and one (1) compressor station at Muchai by Chevron as well as the transmission pipelines to be separately developed by marketing companies of Petrobangla were all taken into consideration in the study. This report presents the outcome of the study against a Base case dated December 2010 followed by five (5) annual case scenarios upto a terminal date of December 2015.

1.4 The study finally focuses on a case scenario reflecting the need for bridging the Production vs. Demand shortfall by way of import of LNG around December 2012 at an initial rate of 500 MMSCFD to address primarily the gas demand in the already severely starved Chittagong region and divert any surplus to other areas of supply for which necessary steps are already underway at the policy level of the Government.

## 2. Gas Demand Review :

### 2.1 Power :

2.1.1 As always, gas consumption scenario in the country will continue to be dominated by the power sector due to uncertainties and long drawn activities associated with harnessing other sources of primary commercial energy, both indigenous and imported, which include indigenous coal, imported petroleum and coal, nuclear fuel and renewable energy sources. Although the soaring demand of power in the country necessitates that power generation capacity be soon maximised for which natural gas is considered most convenient as

source of fuel, the depleting reserve of gas and the growth rate of gas consumption in the industrial and other sectors deter increased gas supply to the power sector in the years to come. Notwithstanding these realities, BPDB's plan to nearly double the power generation (4500 MW to 8901MW) requires present gas consumption of 945 MMSCFD to be raised to a level of 1841 MMSCFD by the end of next five (5) years.

2.1.2 It is a well known fact that due to an overall 400 MMSCFD current supply shortage, the power sector gas requirements cannot be met without curtailment of supply to other gas consuming sectors. Example of such curtailment of gas supply to fertilizer sector in recent times however demonstrated the ability of the existing gas infrastructure to ensure adequate supply to the power stations which are otherwise normally starved of fuel requirement, particularly during peak hours.

2.2 Fertilizer :

2.2.1 Fertilizer plants have steady gas demands except during the periods of maintenance outage, normally once a year. Number of fertilizer plants have not increased during the last ten years and there is no known program of capacity addition in future. The current gas demand level by all the seven (7) fertilizer plants in the country stays around 280 MMSCFD which is often required to be substantially curtailed to divert the gas to the power sector during irrigation and summer seasons when power demands surge in the country.

2.2.2 Diversion of gas from fertilizer to power and industrial sectors has, in recent times, been strongly advocated by concerned stakeholders with the arguments that fertilizer can be imported instead of being locally produced which according to them would offer good premium for the country's economy under the current global market prices of fertilizer.

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On the contrary, fertilizer plants being process units are also likely to be endangered by frequent inoperation if this view is translated into a recurring practice like in the recent past. The issue demands a pragmatic policy level decision.

2.3 Non - Bulk :

2.3.1 Industrial, captive power, CNG stations and the residential users of gas are the key components in this category contributing 34%, 32%, 11% and 23% respectively in the total non-bulk gas consumption of 1030 MMSCFD which by itself is about 47% of total gas consumption in the country at present.

2.3.2 Industrial establishments in the country are almost fully dependent on gas for their fuel supply needs in both the production units and for captive power generation. Over the years, large scale textiles, ceramics, steel, glass, sugar and other types of industrial customers had to be connected in the gas distribution networks often without due regard to the inadequacy of gas production and transportation capacities due probably to unabated pressures by the consumers. The resultant impact is widespread gas shortage demonstrated by chronic low pressure problems in nearly all industrial belts under the distribution companies' networks.

2.3.3 During the last five (5) years, phenomenal growth has also taken place in the transport sector using CNG as a substitute fuel in place of petroleum products. In Dhaka city alone a total number of 152 CNG stations are in operation while the total number of CNG stations so far connected with gas supply in the country are 502 which consume more than 100 MMSCFD of gas. A large number of CNG customer applications are also learnt to be on file awaiting gas connection despite limitations of the gas marketing companies in this regard. Some restrictions on the use of gas by CNG stations are also on card primarily to alleviate the

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difficulties of the industrial and residential consumers especially in the capital city and adjoining areas during peak hours of the day.

2.3.4 Captive power generation by industrial units to meet their own power requirements also burdens the gas distribution networks of the marketing companies to a substantial extent. The present level of gas demand by the captive power plants ranges between 320 to 360 MMSCFD. Captive power generating units have been the upshot of the stunted growth of the grid power generation in the public sector by BPDB over the last two decades during which period the industrial units switched from grid power to their own gas based full time as well as stand-by captive units. In recent years even 30 to 50 MW size of captive units have been connected in the gas distribution systems.

2.3.5 The use of gas by the residential consumers has a long history of four decades still growing at an annual rate of more or less 8%. This unmetered sector alone consumes nearly 230 MMSCFD of gas at abnormally low prices. Large scale gas wastage in this sector is a common experience and is alone responsible for high amount of Unaccounted For Gas (UFG) of the marketing companies. Due to unplanned urban growths in the areas of gas coverage, particularly in the densely populated parts of the cities and towns where in many cases the gas networks have already outlived their design lives, the networks are already excessively overloaded and the customers are exposed to hazards and accidents. Needless to mention, the low pressure problem in many parts of gas network continues as a common malady of the day.

2.3.6 In view of the severe gas shortage, the Government has already directed the gas marketing companies to restrict new connections until a level of 2200 MMSCFD of gas production as against the current rate of 2000

MMSCFD is attained for which various projects have already been undertaken for implementation in the next couple of years.

3. Methodology :

3.1 Production :

3.1.1 Petrobangla memo no: 32.07.49/192 dated 4 May, 2010 has been used as the basis for future gas production augmentation programs of the state owned gas producing companies (BGFCL, SGFL & BAPEX) and the International Oil Companies i.e IOCs ( Chevron & Tullow). Petrobangla has drawn up short (upto December 2010), medium ( upto June 2012) and long term ( upto December 2015) programs for capacity augmentation of various gas fields under its three (3) operating companies mentioned above. Petrobangla has also taken up a Fast Track Program (upto June 2012) to drill five (5) development wells and one (1) workover well under self financing projects. The relevant data are presented in Table-1 of the report.

3.1.2 The total current gas production of nearly 2000 MMSCFD comprises 924 MMSCFD (46%) by the Petrobangla companies and 1076 MMSCFD (54%) by the IOCs. The total production has been planned to be increased to a level of 3200 MMSCFD by December 2015 of which Petrobangla companies will produce 1445 MMSCFD (45%) and the remaining 1755 MMSCFD (55%) will come from the IOC fields.

3.1.3 Of the four IOCs presently operating in Bangladesh, only the production augmentation programs of Chevron have been considered in this study while the programs of the other three (3) companies (Tullow, Niko and Cairn) are not known. The three (3) existing producing fields under Chevron (Jalalabad, Bibiyana and Moulvibazar) have production augmentation plans raising the total current production of these three



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(3) fields from a level of 920 MMSCFD to nearly 1550 MMSCFD gradually up to the year 2015 and nearly 1700 MMSCFD gradually up to the year 2020. Gas exploration program in Block-7 (Char Kajol, Patuakhali) by Chevron has also been included in the data with an expected production of 100 MMSCFD by June 2013.

3.1.4 Production levels at each half-year ends of the financial years upto December 2015 have been tabulated and is presented in Table-2.

3.2 Demand :

3.2.1 Power (Grid) :

(a) The 132 KV and above power transmission grid operated by PGCB and partially by DPDC and the regional isolated 33 KV and below distribution networks operated by REB are supplied with the power generated by various power plants of which the share of gas based generation is currently about 80% of the total. According to BPDB's data the total gas requirement for the existing 4500 MW gas based generation capacity is 1050 MMSCFD but considering 90% plant availability due to maintenance outages from time to time BPDB sets its net gas requirement at 945 MMSCFD against which a shortfall of 150 to 200 MMSCFD generally prevails at times when there is no curtailment/diversion from the fertilizer sector.

(b) The power generation augmentation program and the future retirement schedule for gas based power stations collected from BPDB have been used as the basis for demand projection of gas for the grid power generation upto December 2015 for the purpose of this study. The relevent data are furnished in Tables-3, 4 & 5 of the report.

3.2.2 Power (Non-grid) :

(a) This category basically represents small gas based power plants, not too many at present, ranging between 5 to 50 MW units which produce electric power for the associated industrial establishments generally

under the same group of ownership with the provision as set by BERC regulations allowing them to sell any surplus generation to local REB distribution system under contractual arrangements. Such power plants are fully under private ownership and receive their gas supplies from 10 Bar gas distribution networks of the gas marketing companies. This category of power stations are different from the conventional captive power plants in that unlike the captive plants they can sell their surplus generation to local power distribution networks as already mentioned as well as to other nearby industrial establishments. The gas tariff applicable for this category is however the same as the captive plants.

(b) The demand for new connections in this category has been growing over the years but there is no real scope to allow additional connections in this category due to capacity limitations of the gas distribution pipeline systems. In this study, therefore, no growth has been considered. This is logical also considering the fact that with the augmentation of grid power generation the need for gas demand in this category would gradually diminish. However the gas demand for this sector on account of the pending applications upto December 2010 has been taken into consideration.

3.2.3 Fertilizer :

The gas demand in the fertilizer sector has been considered to remain static at the present level of 280 MMSCFD over the next five (5) years in absence of any concrete information about capacity addition. However the overall gas demand projection made in this report foresees no curtailment of gas supply in this sector over the next five (5) year period considering that the indigenous fertilizer production should better be not interrupted to ensure maintaining adequate fertilizer input to the agricultural sector as gas production is increased gradually.

3.2.4 Non-bulk :

(a) The gas demand by the non-bulk sector is intensely related with the needs of public life which entails great amount of sensitivity for any radical decision as to enforce any kind of intervention to control the ever growing demand. The need for clean and cheap fuel notwithstanding, the present gas supply shortage certainly inhibits any expansion of gas reticulations for consumers in this category. Provision of alternative fuels like LPG and furnace oil for the residential and industrial consumers respectively has already attracted attention at the policy level to reduce the burden on gas supply.

(b) In the absence of a definitive action plan, as of now, towards reducing gas supply for this sector, this study considered that the non-bulk demand in this sector would grow as before and hence would also require to be met from the increased production over the next five (5) years.

(c) The growth rates in this sector under the franchise areas of the gas marketing companies have been analysed for the purpose of this study indicating that the demands in TGTDCL area would grow at a half yearly rate of 5%, that in BGSL + KGCL area would grow at a half yearly rate of 3%, that in JGTDCL area would grow at a half yearly rate of 2% and that in PGCL area would grow at a half yearly rate of 3% over the next five (5) years. The demand in the newly formed SGCL area has been estimated on the basis of the projected gas demand furnished in the relevant DPP of the project.

4. Summarized gas demand projections:

The marketing company wise half yearly gas demand projections divided into the above mentioned four (4) categories are summarized in Table-6 of this report. The sector wise totals of the projected gas demands at year ends are furnished below for ready reference:

| Sector | Exist. met | Exist. un-met | Exist. demand | Pending | Dec-10 | Dec-11 | Dec-12 | Dec-13 | Dec-14 | Dec-15 |
|---|---|---|---|---|---|---|---|---|---|---|
| Power (Grid) | 708 | 237 | 945 | 78 | 1023 | 1090 | 1541 | 1721 | 1841 | 1841 |
| Power (Pvt. Non-Grid) | 35 | 10 | 45 | 25 | 70 | 70 | 70 | 70 | 70 | 70 |
| Fertilizer | 252 | 31 | 283 | 0 | 283 | 283 | 283 | 283 | 283 | 283 |
| Non-Bulk | 994 | 104 | 1098 | 145 | 1243 | 1357 | 1488 | 1638 | 1796 | 1968 |
| Total | **1989** | **382** | **2371** | **248** | **2619** | **2800** | **3382** | **3712** | **3990** | **4162** |

5. The Simulation:

Gas production and demand projections over the period 2010-15 have been used as inputs for network simulation exercise under six different case scenarios using GTCL's Pipeline Studio Software based on Panhandle-B gas flow equation. The simulations were carried out under steady-state convergence condition in each case where the production quantities were equated with demand quantities, both in volumetric terms (MMSCFD). Considering the facts that a portion of the total gas currently produced in the country is off-grid (meaning not transported by the gas grid system) and some portion of the peak hour demands will continue to be met under transient mode, this simulation exercise was conducted on the grid throughput as intake and the grid deliveries as off-takes. The data used in the simulations are therefore essentially those reflecting the grid intake and off-take volumes under steady-state mode of operations keeping aside between 5-10% of total production as off-grid gas as presented in the table below:

Production (Unit: MMSCFD)

| Description | Dec-10 | Dec-11 | Dec-12 | Dec-13 | Dec-14 | Dec-15 |
|---|---|---|---|---|---|---|
| (1)Total Production | 2153 | 2493 | 2788 | 2888 | 3198 | 3818 |
| a. Petrobangla Co's | 1055 | 1185 | 1340 | 1340 | 1350 | 1520 |
| b. IOCs | 1098 | 1308 | 1448 | 1548 | 1848 | 2298 |
| (2) Off-grid gas | 177 | 177 | 327 | 317 | 327 | 327 |
| (3) Grid Intake (1-2) | 1976 | 2316 | 2471 | 2571 | 2871 | 3491 |
| (4) LNG Import (Prop) | 0 | 0 | 500 | 500 | 500 | 500 |
| (5) Total System Intake (3+4) | 1976 | 2316 | 2971 | 3071 | 3371 | 3991 |

**Demand** (Unit: MMSCFD)

| Description | Dec-10 | Dec-11 | Dec-12 | Dec-13 | Dec-14 | Dec-15 |
|---|---|---|---|---|---|---|
| (1) Total Demand (Grid+Off-grid) | **2619** | **2800** | **3382** | **3712** | **3990** | **4162** |
| a. TGTDCL | 1838 | 1936 | 2268 | 2493 | 2694 | 2838 |
| b. BGSL+KGCL | 494 | 575 | 602 | 617 | 633 | 650 |
| c. JGTDSL | 180 | 181 | 308 | 301 | 303 | 305 |
| d. PGCL | 100 | 102 | 136 | 197 | 199 | 202 |
| e. BAPEX+SGCL | 7 | 7 | 68 | 104 | 160 | 167 |
| (2) Demand (Grid) | **1976** | **2316** | **2971** | **3071** | **3371** | **3991** |
| a. TGTDCL | 1470 | 1692 | 2106 | 2106 | 2328 | 2893 |
| b. BGSL+KGCL | 321 | 430 | 592 | 608 | 624 | 654 |
| c. JGTDSL | 84 | 90 | 97 | 103 | 109 | 115 |
| d. PGCL | 101 | 104 | 140 | 205 | 211 | 217 |
| e. BAPEX+SGCL | 0 | 0 | 36 | 49 | 99 | 112 |

6. Simulation Results:

The software based simulations under the six case scenarios demonstrated steady-state convergence in each case. A number of additional transmission pipelines between the gas fields and the gas transmission grid system as well as additional transmission loops between various locations emerged as necessary infrastructural expansions at different times during the period from now and the year 2015. Two major new pipelines over and above the ongoing transmission pipeline projects are considered as essential additions in the national gas transmission grid from the standpoint of the physical distance of the fast growing Chittagong region demand centre from the main additional gas producing field locations (Sylhet region) dictating that an LNG pipeline between Maheshkhali Island and south bank of Karnaphuli river (Rangadia of Anowara Upazilla) is immediately necessary to be in place and secondly a full capacity evacuation is also required quite immediately for the transportation of additional gas production by IOC fields operated by Chevron over and above the capacity of the three compressor stations at Muchai, Ashuganj & Elenga targeted for completion in full by the end of year 2012. Overall, the findings of the simulations suggest additional investments to be made in the development of pipelines and associated facilities at an exceptionally expeditious pace over the next five years because gas production augmentation without concomitant creation of evacuation facilities will not improve the prevailing commercial energy crisis in the

power and industrial sectors. The simulations clearly indicate the need for import of LNG at an initial rate of 500 MMSCFD (approx. 3.9 million tons per annum, MTPA).

7. Required Investments:

A preliminary estimate based upon pipeline and associated facilities construction costs during the recent past five years under different contracts awarded by GTCL under ADB funded projects has been prepared for the development of the physical facilities as suggested by the simulation exercise. The table of preliminary cost estimates is furnished herewith in the report (Table-10). It may be mentioned here that the cost estimate and implementation time would need to be more realistically decided keeping in view the urgent necessity of ensuring fastest possible implementation even at higher costs to some extent as deemed reasonable. It is also worth noting that the long term feasibility of the project activities listed in Table-10 is a matter to be separately examined but the obvious direction is towards taking up the steps right away to meet the future gas demands in the country together with an advance long term planning for sustained gas availability up to 2015 and beyond. The total investment requirement for the project activities listed in Table-10 is estimated to be in the order of 900 million USD.

Table - 1 : GAS PRODUCTION AUGMENTATION PROGRAMME

( Short , Mid & Long Term : 2010 - 2015)

Date: 20 June 2010

(Unit: MMSCFD)

| Sl. No | Wells | Expected Completion | Expected Production | Executing Company | Programme Type | Remarks |
|---|---|---|---|---|---|---|
| **I. Short Term Programme ( Up to Dec 2010)** | | | | | | |
| 1 | Sylhet # 7 | Jan-10 | 8 | SGFL | Workover | |
| 2 | Meghna # 1 | Jun-10 | 15 | BGFCL | Workover | |
| 3 | Habiganj # 11 | Jun-10 | 20 | BGFCL | Workover | |
| 4 | Titas # 12 | Jun-10 | 20 | BGFCL | Workover | |
| 5 | Semutang # 1,5 | Dec-10 | 15 | BAPEX | Workover | |
| 6 | Sundalpur # 1 | Oct-10 | 15 | BAPEX | Exploration | |
| 7 | Fenchuganj # 4 | Oct-10 | 20 | BAPEX | Appraisal | |
| 8 | Salda # 3 | Nov-10 | 15 | BAPEX | Appraisal | |
| 9 | Sangu (South) | Dec-10 | 30 | Cairn | Expl/Dev | Subject to amendment of PSC Agreement |
| | | **Subt-total (I) :** | **158** | | | |
| **II. Mid Term Programme ( Up to Dec 2013)** | | | | | | |
| **A. Petrobangla Companies** | | | | | | |
| 1 | Kapasia # 1 | Mar-11 | 15 | BAPEX | Exploration | |
| 2 | Srikail # 2 | Feb-11 | 15 | BAPEX | Exploration | |
| 3 | Mubarakpur # 1 | Sep-11 | 15 | BAPEX | Exploration | |
| 4 | Salda # 4 | Mar-11 | 15 | BAPEX | Appr/Dev | |
| 5 | Fenchuganj # 5 | Aug-11 | 20 | BAPEX | Appr/Dev | |
| 6 | Titas # 17 | Jun-11 | 25 | BGFCL | Appr/Dev | |
| 7 | Titas # 18 | Nov-11 | 25 | BGFCL | Appr/Dev | |
| 8 | Bakhrabad # 9 | Apr-12 | 20 | BGFCL | Development | |
| 9 | Titas # 19, 20, 21, 22 | Jun-12 | 100 | BGFCL | Development | Fast Track |
| 10 | Rashidpur # 5 | Jun-12 | 15 | SGFL | Workover | Fast Track |
| 11 | Rashidpur # 8 | Jun-12 | 20 | SGFL | Development | Fast Track |
| 12 | LNG | Dec-12 | 500 | | | Import |
| | | **Sub-total (A):** | **785** | | | |
| **B. IOCs** | | | | | | |
| 1 | Moulvibazar | Jun-12 | 100 | Chevron | Development | |
| 2 | Kajol | - | - | Chevron | Exploration | |
| 3 | Bibiyana | Dec-13 | 200 | Chevron | Development | |
| 4 | Mognama | - | - | Cairn | Exploration | |
| | | **Sub-total (B):** | **300** | | | |
| | | **Sub-total (II):** | **1085** | | | |
| **III. Long Term Programme (2015)** | | | | | | |
| **A. Petrobangla Companies** | | | | | | |
| 1 | Titas # 23, 24, 25 & 26 | 2015 | 100 | BGFCL | Appraisal | |
| 2 | Sylhet, Kailashtilla & Rashidpur | 2015 | 80 | SGFL | Appraisal | 5 wells |
| | **Sub-total (A):** | | **180** | | | |
| **B. IOCs** | | | | | | |
| 1 | Mognama | - | - | Cairn | Development | |
| 2 | Kajol | - | - | Chevron | Development | |
| 3 | Moulvibazar | 2015 | 200 | Chevron | Development | |
| 4 | Bibiyana | 2015 | 250 | Chevron | Development | |
| 5 | Jalalabad | 2015 | 250 | Chevron | Development | |
| 6 | Offshore bidding round 2008 | 2015 | 200 | Chevron | Exploration | |
| | | **Sub-total (B):** | **900** | | | |
| | | **Sub-total (III):** | 1080 | | | |
| | | **Grand total (I+II+III):** | **2323** | | | |

Notes: 1) Figures in "Expected Production" column represent the production capacities planned to be added in the particular gas field upon successful completion of the well(s) as indicated in the table.

2) Incremental production in various gas fields tabulated above reflects the projection recently prepared in connection with the National Budget (FY 2010-11) and are indicative/subject to exploration/development wells drilling results and reservoir conditions.

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Table - 1 (A) : DRILLING / EXPLORATION / WORKOVER PROGRAMME

**Date : 20 June 2010**

( Source : Petrobangla)

**(Unit: MMSCFD)**

| Sl. No. | Field / Block name & Well No. | Owner / Operator | Expected Completion | Expected production |
|---|---|---|---|---|
| **Development Drilling** | | | | |
| 1 | Fenchuganj # 4 | BAPEX | Oct-10 | 20 |
| 2 | Salda Nadi # 3 | BAPEX | Nov-10 | 15 |
| 3 | Sangu (South) | CAIRN | Dec-10 | 30 |
| 4 | Salda Nadi # 4 | BAPEX | Mar-11 | 15 |
| 5 | Titas # 17 | BGFCL | Jun-11 | 25 |
| 6 | Fenchuganj # 5 | BAPEX | Aug-11 | 20 |
| 7 | Titas # 18 | BGFCL | Nov-11 | 25 |
| 8 | Moulvibazar | Chevron | Jun-12 | 100 |
| 9 | Bakhrabad # 9 | BGFCL | Apr-12 | 20 |
| 10 | Titas #19, 20, 21, 22 | BGFCL | Jun-12 | 100 |
| 11 | Rashidpur # 8 | SGFL | Jun-12 | 20 |
| 12 | Bibyana | Chevron | Dec-13 | 200 |
| 13 | Titas # 23, 24, 25, 26 | BGFCL | Dec-15 | 100 |
| 14 | 5 wells at Haripur, KTL & Rashidpur | SGFL | Dec-15 | 80 |
| 15 | Moulvibazar | Chevron | Dec-15 | 200 |
| 16 | Bibyana | Chevron | Dec-15 | 250 |
| 17 | Jalalabad | Chevron | Dec-15 | 250 |
| | | **Total :** | | **1470** |
| **Exploration Drilling** | | | | |
| 1 | Sundalpur # 1 | BAPEX | Oct-10 | 15 |
| 2 | Srikail # 2 | BAPEX | Feb-11 | 15 |
| 3 | Kapasia # 1 | BAPEX | Mar-11 | 15 |
| 4 | Mubarakpur # I | BAPEX | Sep-11 | 15 |
| 5 | Offshore bidding round 2008 | | Dec-15 | 200 |
| | | **Total :** | | **260** |
| **Workover** | | | | |
| 1 | Sylhet # 7 (2nd) | SGFL | Jan-10 | 8 |
| 2 | Meghna # 1 | BGFCL | Jun-10 | 15 |
| 3 | Habiganj # 11 | BGFCL | Jun-10 | 20 |
| 4 | Titas # 12 | BGFCL | Jun-10 | 20 |
| 5 | Semutang # 1 & 5 | BAPEX | Dec-10 | 15 |
| 6 | Rashidpur # 5* | SGFL | Jun-12 | 15 |
| | | **Total :** | | **93** |
| **Program (2012)** | | | | |
| | LNG | | Dec-12 | 500 |
| | | **Grand Total :** | | **2323** |

Table - 2 : PROJECTED YEARWISE GAS PRODUCTION

Date: 20 June 2010

( Unit :MMSCFD)

| | Existing Capacity | Existing Production | Dec-10 | Jun-11 | Dec-11 | Jun-12 | Dec-12 | Jun-13 | Dec-13 | Jun-14 | Dec-14 | Jun-15 | Dec-15 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Petrobangla Fields:** | | | | | | | | | | | | | |
| Titas | 420 | 408 | 428 | 453 | 478 | 578 | 578 | 578 | 578 | 578 | 578 | 578 | 678 |
| Habiganj | 240 | 240 | 260 | 260 | 260 | 260 | 260 | 260 | 260 | 260 | 260 | 260 | 260 |
| Rashidpur | 53 | 49 | 49 | 49 | 49 | 84 | 84 | 84 | 84 | 84 | 84 | 84 | 124 |
| Fenchuganj | 32 | 25 | 45 | 45 | 65 | 65 | 65 | 65 | 65 | 65 | 65 | 65 | 65 |
| Kailashtila | 97 | 97 | 97 | 97 | 97 | 97 | 97 | 97 | 97 | 97 | 97 | 97 | 127 |
| Beanibazar | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 |
| Sylhet | 2 | 7 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 25 | 25 | 25 |
| Narsingdi | 35 | 33 | 33 | 33 | 33 | 33 | 33 | 33 | 33 | 33 | 33 | 33 | 33 |
| Salda | 11 | 8 | 23 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 |
| Bakhrabad | 34 | 36 | 36 | 36 | 36 | 56 | 56 | 56 | 56 | 56 | 56 | 56 | 56 |
| Shahbazpur | 15 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
| Meghna | 0 | 0 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 |
| Semutang | 0 | 0 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 |
| Sundalpur | 0 | 0 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 |
| Srikail | 0 | 0 | 0 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 |
| Kapasia | 0 | 0 | 0 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 |
| Mubarakpur | 0 | 0 | 0 | 0 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 |
| **Sub-total :** | **957** | **927** | **1055** | **1125** | **1185** | **1340** | **1340** | **1340** | **1340** | **1340** | **1350** | **1350** | **1520** |
| **IOC Fields:** | | | | | | | | | | | | | |
| Jalalabad | 230 | 130 | 130 | 130 | 230 | 230 | 230 | 230 | 230 | 280 | 330 | 380 | 380 |
| Moulvibazar | 75 | 60 | 60 | 90 | 120 | 160 | 160 | 160 | 160 | 210 | 260 | 310 | 360 |
| Bibiyana | 600 | 716 | 716 | 716 | 766 | 816 | 866 | 916 | 966 | 1016 | 1066 | 1116 | 1166 |
| Bangura | 100 | 120 | 120 | 120 | 120 | 120 | 120 | 120 | 120 | 120 | 120 | 120 | 120 |
| Feni | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Sangu | 35 | 40 | 40 | 40 | 40 | 40 | 40 | 40 | 40 | 40 | 40 | 40 | 40 |
| Sangu (South) | 0 | 0 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 |
| Offshore bidding 2008 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 200 |
| Block-7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Sub-total:** | **1043** | **1068** | **1098** | **1128** | **1308** | **1398** | **1448** | **1498** | **1548** | **1698** | **1848** | **1998** | **2298** |
| **LNG (Import)** | **0** | **0** | 0 | 0 | 0 | 0 | 500 | 500 | 500 | 500 | 500 | 500 | 500 |
| **Total :** | **2000** | **1995** | **2153** | **2253** | **2493** | **2738** | **3288** | **3338** | **3388** | **3538** | **3698** | **3848** | **4318** |

Notes . 1) Figures in the "Existing Production" column are those of 11 March 2010.

2) Incremental production in various gas fields over the years reflect the projection recently prepared in connection with the National Budget (FY 2010-11) and are indicative/subject to successful completion of the exploration/development wells and reservoir conditions.

Table - 2(A) : PROJECTED YEARWISE GAS INTAKES IN THE OVERALL TRANSMISSION SYSTEM AS USED IN THE SIMULATIONS

Date: 20 June 2010

( Unit :MMSCFD)

| | Existing Capacity | Existing Production | Transmission Intake Volumes | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Dec-10 | Jun-11 | Dec-11 | Jun-12 | Dec-12 | Jun-13 | Dec-13 | Jun-14 | Dec-14 | Jun-15 | Dec-15 |
| **Petrobangla Fields:** | | | | | | | | | | | | | |
| Titas | 420 | 408 | 428 | 453 | 478 | 578 | 578 | 578 | 578 | 578 | 578 | 578 | 678 |
| Habiganj | 240 | 240 | 200 | 200 | 200 | 200 | 200 | 200 | 200 | 200 | 200 | 200 | 200 |
| Rashidpur | 53 | 49 | 49 | 49 | 49 | 84 | 84 | 84 | 84 | 84 | 84 | 84 | 124 |
| Fenchuganj | 32 | 25 | 45 | 45 | 65 | 65 | 65 | 65 | 65 | 65 | 65 | 65 | 65 |
| Kailashtila | 74 | 74 | 74 | 74 | 74 | 74 | 74 | 74 | 74 | 74 | 74 | 74 | 104 |
| Narsingdi | 35 | 33 | 33 | 33 | 33 | 33 | 33 | 33 | 33 | 33 | 33 | 33 | 33 |
| Salda | 11 | 8 | 23 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 |
| Bakhrabad | 34 | 36 | 36 | 36 | 36 | 56 | 56 | 56 | 56 | 56 | 56 | 56 | 56 |
| Meghna | 0 | 0 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 |
| Sundalpur | 0 | 0 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 |
| Srikail | 0 | 0 | 0 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 |
| Kapasia | 0 | 0 | 0 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 |
| Mubarakpur | 0 | 0 | 0 | 0 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 |
| **Sub-total :** | **899** | **873** | **918** | **988** | **1048** | **1203** | **1203** | **1203** | **1203** | **1203** | **1203** | **1203** | **1373** |
| **IOC Fields:** | | | | | | | | | | | | | |
| Jalalabad | 230 | 130 | 130 | 130 | 230 | 230 | 230 | 230 | 230 | 280 | 330 | 380 | 380 |
| Moulvibazar | 75 | 60 | 60 | 90 | 120 | 160 | 160 | 160 | 160 | 210 | 260 | 310 | 360 |
| Bibiyana | 600 | 716 | 716 | 716 | 766 | 816 | 726 | 776 | 826 | 876 | 926 | 976 | 1026 |
| Bangura | 100 | 120 | 120 | 120 | 120 | 120 | 120 | 120 | 120 | 120 | 120 | 120 | 120 |
| Feni | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Sangu (South) | 0 | 0 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 |
| Offshore bidding 2008 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 200 |
| Block-7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Sub-total:** | **1008** | **1028** | **1058** | **1088** | **1268** | **1358** | **1268** | **1318** | **1368** | **1518** | **1668** | **1818** | **2118** |
| **LNG (Import)** | **0** | **0** | 0 | 0 | 0 | 0 | 500 | 500 | 500 | 500 | 500 | 500 | 500 |
| **Total :** | **1907** | **1901** | **1976** | **2076** | **2316** | **2561** | **2971** | **3021** | **3071** | **3221** | **3371** | **3521** | **3991** |

Notes : 1) Figures in the "Existing Production" column are those of 11 March 2010.

2) Incremental production in various gas fields over the years reflect the projection recently prepared in connection with the National Budget (FY 2010-11) and are indicative/subject to successful completion of the exploration/development wells.

## Table - 3 : FUTURE GAS REQUIREMENT FOR GRID POWER GENERATION

**Date : 20 June 2010**

(Source : BPDB)

**(Unit: MMSCFD)**

| Name | Exp. Comm | Gas Req. at 100% Plant Availability | Gas Req. at 90% Plant Availability | Remarks |
|---|---|---|---|---|
| **Existing power plants** | | 1050 | 945 | |
| **Future power plants** | | | | |
| | **FY: 2009-2010** | | | |
| Sikalbaha 150 GT | Jun-10 | 35 | | |
| Siddhirganj 120 GT (2nd unit) | Jun-10 | 27 | | 105 MW |
| Fenchuganj 50 E ( 3 yrs rental ) | Jun-10 | 10 | | |
| | **Sub-total :** | 72 | | |
| | **FY: 2010-2011** | | | |
| Fenchuganj 90 CC | Jul-10 | 20 | | 108 MW |
| Bogra 20 E (3 yrs rental) | Jul-10 | 4 | | |
| | **Sub-total :** | 24 | | |
| | **FY: 2011-2012** | | | |
| Dohazari 100 E | Sep-11 | 20 | | Gas/HFO |
| Hathazari 100 E | Sep-11 | 20 | | Gas/HFO |
| Daudkandi 50 E | Dec-11 | 10 | | Gas/HFO |
| Sylhet 150 CC | Dec-11 | 25 | | |
| Chandpur 150 CC | Dec-11 | 25 | | |
| Jamalpur 100 E | May-12 | 20 | | Gas/HFO |
| Comilla 50 E | May-12 | 10 | | Gas/HFO |
| Ghorashal 200 GT | Jun-12 | 50 | | Gas/Diesel |
| Khulna 150 GT | Jun-12 | 35 | | Gas/Oil |
| Sirajgonj 150 GT | Jun-12 | 35 | | Gas/Oil |
| Mymensing 150 E | Jun-12 | 30 | | Gas/HFO |
| Gazipur 50 E | Jun-12 | 10 | | |
| Raujan 20 E | Jun-12 | 4 | | Gas/HFO |
| | **Sub-total :** | 294 | | |
| | **FY :2012-2013** | | | |
| Keraniganj 150-225 CC | Jul-12 | 35 | | |
| Madanganj 150-225 CC | Jul-12 | 35 | | |
| Bhola 150-225 CC (2nd unit) | Jul-12 | 35 | | |
| Bibiyana 300-450 CC(1st unit) | Aug-12 | 70 | | |
| Bibiyana 300-450 CC (2nd unit) | Oct-12 | 70 | | |
| Meghnaghat 300-450 CC (2nd unit) | Oct-12 | 70 | | |
| Savar 100 E | Jan-13 | 20 | | Gas/HFO |
| Kaliakoir 100 E | Jan-13 | 20 | | Gas/HFO |
| Siddhirganj 2x150 GT | Feb-13 | 70 | | |
| Sirajganj 300-450 CC | Jun-13 | 70 | | |
| Ashuganj 150 CC | Jun-13 | 25 | | |
| Bhola 150 CC (1st unit) | Jun-13 | 25 | | |
| | **Sub-total :** | 545 | | |
| | **FY :2013-2014** | | | |
| Haripur 360 CC | Jun-14 | 55 | | |
| Bheramara 360 CC | Jun-14 | 55 | | |
| Siddhirganj 450 CC | Jun-14 | 70 | | |
| | **Sub-total :** | 180 | | |
| | **FY: 2014-2015** | | | |
| No gas based plants | | | | |
| | **TOTAL:** | **2165** | **1949** | |

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## Table - 4 : GAS BASED POWER STATIONS -- TENTATIVE RETIREMENT SCHEDULE

( Source: BPDB )

Date : 20 June 2010

Generation: MW
Gas Cons.:MMSCFD

| Gas Mktg. Co. Area | Power Plant Particulars | Dec-10 | Jun-11 | Dec-11 | Jun-12 | Dec-12 | Jun-13 | Dec-13 | Jun-14 | Dec-14 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| TGTDCL | Name | | | | | | Ashuganj (Rental) | | NEPC BMPP | Haripur SBU | |
| | Yr. Installed | | | | | | 2010 | | 1999 | 1987 | |
| | Installed Cap. | | | | | | 55 | | 110 | 99 | 264 |
| | Current Gen. | | | | | | 55 | | 110 | 96 | 261 |
| | Gas Cons. | | | | | | 15.5 | | 22 | 25 | 62.5 |
| BGSL+KGCL | Name | | | | | | | | | | |
| | Yr. Installed | | | | | | | | | | |
| | Installed Cap. | | | | | | | | | | |
| | Current Gen. | | | | | | | | | | |
| | Gas Cons. | | | | | | | | | | |
| JGTDCL | Name | Shahjibazar | | Kumargaon (Rental) | | | | Fenchuganj(Rental) | | | |
| | Yr. Installed | 1964 | | 2008 | | | | 2010 | | | |
| | Installed Cap. | 60 | | 48 | | | | 50 | | | 153 |
| | Current Gen. | 38 | | 48 | | | | 50 | | | 136 |
| | Gas Cons. | 9 | | 12.5 | | | | 10 | | | 31.5 |
| | Name | | | Shahjibazar (Rental) | | | | | | | |
| | Yr. Installed | | | 2008 | | | | | | | |
| | Installed Cap. | | | 50 | | | | | | | |
| | Current Gen. | | | 50 | | | | | | | |
| | Gas Cons. | | | 13 | | | | | | | |
| PGCL | Name | | | | | | | Bogra(Rental) | | | |
| | Yr. Installed | | | | | | | 2010 | | | |
| | Installed Cap. | | | | | | | 20 | | | 20 |
| | Current Gen. | | | | | | | 20 | | | 20 |
| | Gas Cons. | | | | | | | 4 | | | 4 |
| BAPEX + SGCL | Name | | | | | Bhola (Rental) | | | | | |
| | Yr. Installed | | | | | 2009 | | | | | |
| | Installed Cap. | | | | | 35 | | | | | 35 |
| | Current Gen. | | | | | 35 | | | | | 35 |
| | Gas Cons. | | | | | 8 | | | | | 8 |
| Total Capacity to be retired | | 38 | | 98 | | 35 | 55 | 70 | 110 | 96 | 502 |
| Total Gas consumption to be | | 9 | | 25.5 | | 8 | 15.5 | 14 | 22 | 25 | 119 |



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## TABLE - 5 : NET GAS BASED GRID POWER GENERATION Vs. GAS REQUIREMENT

Date : 20 June 2010

( Source: BPDB )

(Units: Generation- MW, Gas req- MMSCFD)

| Particulars | Existing | Dec-10 | Jun-11 | Dec-11 | Jun-12 | Dec-12 | Jun-13 | Dec-13 | Jun-14 | Dec-14 | Jun-15 | Dec-15 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **(A) TGTDCL** | | | | | | | | | | | | |
| Generation Capacity | 3182 | | | | | | | | | | | |
| Capacity addition | | 120 | 0 | 0 | 500 | 600 | 650 | 0 | 540 | 0 | 0 | 0 |
| Capacity retirement | | 0 | 0 | 0 | 0 | 0 | 55 | 0 | 110 | 96 | 0 | 0 |
| Net Generation capacity | | 3302 | 3302 | 3302 | 3802 | 4402 | 4997 | 4997 | 5427 | 5331 | 5331 | 5331 |
| Gas requirement (considering no retirement) | 721 | 748 | 748 | 748 | 858 | 998 | 1133 | 1133 | 1242 | 1220 | 1220 | 1220 |
| Gas requirement (considering retirement at Tab-4) | 721 | 748 | 748 | 748 | 858 | 998 | 1117 | 1117 | 1220 | 1195 | 1195 | 1195 |
| Net gas requirement considering 90% plant availability due to maintenance outage | 649 | 673 | 673 | 673 | 772 | 898 | 1005 | 1005 | 1098 | 1076 | 1076 | 1076 |
| **(B) BGSL+KGCL** | | | | | | | | | | | | |
| Generation Capacity | 595 | | | | | | | | | | | |
| Capacity addition | | 150 | 0 | 350 | 70 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Capacity retirement | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Net Generation capacity | | 745 | 745 | 1095 | 1165 | 1165 | 1165 | 1165 | 1165 | 1165 | 1165 | 1165 |
| Gas requirement (considering no retirement) | 130 | 165 | 165 | 240 | 254 | 254 | 254 | 254 | 254 | 254 | 254 | 254 |
| Gas requirement (considering retirement at Tab-4) | 130 | 165 | 165 | 240 | 254 | 254 | 254 | 254 | 254 | 254 | 254 | 254 |
| Net gas requirement considering 90% plant availability due to maintenance outage | 117 | 149 | 149 | 216 | 229 | 229 | 229 | 229 | 229 | 229 | 229 | 229 |
| **(C) JGTDCL** | | | | | | | | | | | | |
| Generation Capacity | 398 | | | | | | | | | | | |
| Capacity addition | | 110 | 0 | 100 | 0 | 600 | 0 | 0 | 0 | 0 | 0 | 0 |
| Capacity retirement | | 38 | 0 | 98 | 0 | 0 | 0 | 50 | 0 | 0 | 0 | 0 |
| Net Generation capacity | | 470 | 470 | 472 | 472 | 1072 | 1072 | 1022 | 1022 | 1022 | 1022 | 1022 |
| Gas requirement (considering no retirement) | 118 | 148 | 148 | 164 | 164 | 278 | 278 | 278 | 278 | 278 | 278 | 278 |
| Gas requirement (considering retirement at Tab-4) | 118 | 139 | 139 | 138 | 138 | 278 | 278 | 268 | 268 | 268 | 268 | 268 |
| Net gas requirement considering 90% plant availability due to maintenance outage | 106 | 125 | 125 | 124 | 124 | 250 | 250 | 241 | 241 | 241 | 241 | 241 |

Contd.----

| Particulars | Existing | Dec-10 | Jun-11 | Dec-11 | Jun-12 | Dec-12 | Jun-13 | Dec-13 | Jun-14 | Dec-14 | Jun-15 | Dec-15 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **(D) PGCL** | | | | | | | | | | | | |
| Generation Capacity | 291 | | | | | | | | | | | |
| Capacity addition | | 23 | 0 | 0 | 150 | 0 | 300 | 0 | 0 | 0 | 0 | 0 |
| Capacity retirement | | 0 | 0 | 0 | 0 | 0 | 0 | 20 | 0 | 0 | 0 | 0 |
| Net Generation capacity | | 314 | 314 | 314 | 464 | 464 | 764 | 744 | 744 | 744 | 744 | 744 |
| Gas requirement (considering no retirement) | 73 | 77 | 77 | 77 | 112 | 112 | 182 | 182 | 182 | 182 | 182 | 182 |
| Gas requirement (considering retirement at Tab-4) | 73 | 77 | 77 | 77 | 112 | 112 | 182 | 178 | 178 | 178 | 178 | 178 |
| Net gas requirement considering 90% plant availability due to maintenance outage | 66 | 69 | 69 | 69 | 101 | 101 | 164 | 160 | 160 | 160 | 160 | 160 |
| **(E) BAPEX/SGCL** | | | | | | | | | | | | |
| Generation Capacity | 34 | | | | | | | | | | | |
| Capacity addition | | 0 | 0 | 0 | 150 | 150 | 100 | 0 | 240 | 0 | 0 | 0 |
| Capacity retirement | | 0 | 0 | 0 | 0 | 35 | 0 | 0 | 0 | 0 | 0 | 0 |
| Net Generation capacity | | 34 | 34 | 34 | 184 | 299 | 399 | 399 | 639 | 639 | 639 | 639 |
| Gas requirement (considering no retirement) | 8 | 8 | 8 | 8 | 43 | 78 | 95 | 95 | 150 | 150 | 150 | 150 |
| Gas requirement (considering retirement at Tab-4) | 8 | 8 | 8 | 8 | 43 | 70 | 95 | 95 | 150 | 150 | 150 | 150 |
| Net gas requirement considering 90% plant availability due to maintenance outage | 7 | 7 | 7 | 7 | 39 | 63 | 86 | 86 | 135 | 135 | 135 | 135 |
| (F) TOTALS | | | | | | | | | | | | |
| Generation Capacity | 4500 | | | | | | | | | | | |
| Capacity addition | | 403 | 0 | 450 | 870 | 1350 | 1050 | 0 | 780 | 0 | 0 | 0 |
| Capacity retirement | | 38 | 0 | 98 | 0 | 35 | 55 | 70 | 110 | 96 | 0 | 0 |
| Net Generation capacity | | 4865 | 4865 | 5217 | 6087 | 7402 | 8397 | 8327 | 8997 | 8901 | 8901 | 8901 |
| Gas requirement (considering no retirement) | **1050** | **1146** | **1146** | **1237** | **1431** | **1720** | **1942** | **1942** | **2106** | **2084** | **2084** | **2084** |
| Gas requirement (considering retirement at Tab-4) | **1050** | **1137** | **1137** | **1211** | **1405** | **1712** | **1926** | **1912** | **2070** | **2045** | **2045** | **2045** |
| Net gas requirement considering 90% plant availability due to maintenance outage | **945** | **1023** | **1023** | **1090** | **1265** | **1541** | **1733** | **1721** | **1863** | **1841** | **1841** | **1841** |

## TABLE- 6 : COMPANY AND SECTOR WISE GAS DEMAND PROJECTION

Date: 20 June 2010

(Source : Petrobangla/BPDB/TGTDCL/GTCL/SGCL)

(Unit: MMSCFD)

| | Existing met | Existing un-met | Existing demand | Pending | Dec-10 | Jun-11 | Dec-11 | Jun-12 | Dec-12 | Jun-13 | Dec-13 | Jun-14 | Dec-14 | Jun-15 | Dec-15 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **TGTDCL** | | | | | | | | | | | | | | | |
| *Power (grid)* | 509 | 140 | 649 | 24 | 673 | 673 | 673 | 772 | 898 | 1005 | 1005 | 1095 | 1076 | 1076 | 1076 |
| *Power (Pvt. Non-grid)* | 30 | 5 | 35 | 25 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 |
| *Fertilizer* | 138 | 17 | 155 | 0 | 155 | 155 | 155 | 155 | 155 | 155 | 155 | 155 | 155 | 155 | 155 |
| *Non-Bulk* | 770 | 80 | 850 | 100 | 950 | 998 | 1047 | 1100 | 1155 | 1212 | 1273 | 1337 | 1404 | 1474 | 1547 |
| *Total* | **1447** | **242** | **1689** | **149** | **1838** | **1886** | **1936** | **2087** | **2268** | **2433** | **2493** | **2650** | **2694** | **2764** | **2838** |
| **BGSL+KGCL** | | | | | | | | | | | | | | | |
| *Power (grid)* | 68 | 89 | 137 | 12 | 149 | 149 | 216 | 229 | 229 | 229 | 229 | 229 | 229 | 229 | 229 |
| *Power (Pvt. Non-grid)* | 5 | 5 | 10 | 0 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| *Fertilizer* | 98 | 14 | 112 | 0 | 112 | 112 | 112 | 112 | 112 | 112 | 112 | 112 | 112 | 112 | 112 |
| *Non-Bulk* | 173 | 20 | 193 | 30 | 223 | 230 | 237 | 244 | 251 | 259 | 266 | 274 | 282 | 291 | 300 |
| *Total* | **344** | **108** | **452** | **42** | **494** | **500** | **575** | **594** | **602** | **609** | **617** | **625** | **633** | **642** | **650** |
| **JGTDCL** | | | | | | | | | | | | | | | |
| *Power (grid)* | 81 | 0 | 81 | 44 | 125 | 125 | 124 | 124 | 250 | 250 | 241 | 241 | 241 | 241 | 241 |
| *Power (Pvt. Non-grid)* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Fertilizer* | 16 | 0 | 16 | 0 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 |
| *Non-Bulk* | 34 | 0 | 34 | 5 | 39 | 40 | 41 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 |
| *Total* | **131** | **0** | **131** | **49** | **180** | **181** | **181** | **182** | **308** | **309** | **301** | **302** | **303** | **304** | **305** |
| **PGCL** | | | | | | | | | | | | | | | |
| *Power (grid)* | 43 | 29 | 70 | 0 | 69 | 69 | 69 | 101 | 101 | 134 | 160 | 160 | 160 | 160 | 160 |
| *Power (Pvt. Non-grid)* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Fertilizer* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Non-Bulk* | 17 | 4 | 21 | 10 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 42 |
| *Total* | **60** | **33** | **91** | **10** | **100** | **101** | **102** | **135** | **136** | **200** | **197** | **198** | **199** | **201** | **202** |
| **BAPEX/SGCL** | | | | | | | | | | | | | | | |
| *Power (grid)* | 8 | 0 | 8 | 0 | 7 | 7 | 7 | 39 | 63 | 86 | 68 | 135 | 135 | 135 | 135 |
| *Power (Pvt. Non-grid)* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Fertilizer* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Non-Bulk* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 5 | 15 | 18 | 22 | 25 | 28 | 32 |
| *Total* | **8** | **0** | **8** | **0** | **7** | **7** | **7** | **41** | **68** | **101** | **104** | **157** | **160** | **163** | **167** |
| **SECTOR TOTALS** | | | | | | | | | | | | | | | |
| *Power (grid)* | 708 | 237 | 945 | 78 | 1023 | 1023 | 1090 | 1265 | 1541 | 1733 | 1721 | 1863 | 1841 | 1841 | 1841 |
| *Power (Pvt. Non-grid)* | 35 | 10 | 45 | 25 | 70 | 70 | 70 | 70 | 70 | 70 | 70 | 70 | 70 | 70 | 70 |
| *Fertilizer* | 252 | 31 | 283 | 0 | 283 | 283 | 283 | 283 | 283 | 283 | 283 | 283 | 283 | 283 | 283 |
| *Non-Bulk* | 994 | 104 | 1098 | 145 | 1243 | 1299 | 1357 | 1421 | 1488 | 1565 | 1638 | 1716 | 1796 | 1880 | 1968 |
| *Total* | **1989** | **382** | **2371** | **248** | **2619** | **2675** | **2800** | **3038** | **3382** | **3651** | **3712** | **3932** | **3990** | **4073** | **4162** |

Notes: 1. Power Sector (grid) loads are based on Demand projections (May 2010). , collected from System Planning Drectorate of BPDB.

2. Non-bulk load comprises demands of residential, commercial, industrial, captive power and CNG customers.

3. Non-bulk demands in TGTDCL , BGSL ,JGTDCL & PGCL areas have been forecast at half-yearly growth rates of 5% ,3%, 2% & 3% respectively.

4. Non-bulk gas demands of BAPEX/SGCL are based on approved DPP of South-West Region Gas Distribution network Project (Nov. 2009)

Table -7 : GAS PRODUCTION Vs. DEMAND PROJECTION AND SHORTFALL MAKE-UP PLAN

Date : 14 June 2010

( Unit :MMSCFD)

| | Existing Production | Dec-10 | Jun-11 | Dec-11 | Jun-12 | Dec-12 | Jun-13 | Dec-13 | Jun-14 | Dec-14 | Jun-15 | Dec-15 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Production** | | | | | | | | | | | | |
| *Petrobangla* | *927* | *1055* | *1125* | *1185* | *1340* | *1340* | *1340* | *1340* | *1340* | *1350* | *1350* | *1520* |
| *IOC* | *1068* | *1098* | *1128* | *1308* | *1398* | *1448* | *1498* | *1548* | *1698* | *1848* | *1998* | *2298* |
| ***Total Production*** | ***1995*** | ***2153*** | ***2253*** | ***2493*** | ***2738*** | ***2788*** | ***2838*** | ***2888*** | ***3038*** | ***3198*** | ***3348*** | ***3818*** |
| **Demand** | | | | | | | | | | | | |
| *Power (grid)* | *945* | *1023* | *1023* | *1090* | *1265* | *1541* | *1733* | *1721* | *1863* | *1841* | *1841* | *1841* |
| *Power (Pvt. Non-grid)* | *45* | *70* | *70* | *70* | *70* | *70* | *70* | *70* | *70* | *70* | *70* | *70* |
| *Fertilizer* | *283* | *283* | *283* | *283* | *283* | *283* | *283* | *283* | *283* | *283* | *283* | *283* |
| *Non-bulk* | *1098* | *1243* | *1299* | *1357* | *1421* | *1488* | *1565* | *1638* | *1716* | *1796* | *1880* | *1968* |
| ***Total Demand*** | ***2371*** | ***2619*** | ***2675*** | ***2800*** | ***3038*** | ***3382*** | ***3651*** | ***3712*** | ***3932*** | ***3990*** | ***4073*** | ***4162*** |
| ***Total Demand at 90% Load Factor*** | | 2357 | 2408 | 2520 | 2734 | 3043 | 3286 | 3341 | 3539 | 3591 | 3666 | 3746 |
| **Shortfall (Production - Demand):** | | | | | | | | | | | | |
| Against total demand | -376 | -466 | -422 | -307 | -300 | -594 | -813 | -824 | -894 | -792 | -725 | -344 |
| Against 90% demand | | -204 | -155 | -27 | 4 | -255 | -448 | -453 | -501 | -393 | -318 | 72 |
| **Shortfall make-up through probable LNG import** | | | | | | 500 | 500 | 500 | 500 | 500 | 500 | 500 |

TABLE - 8 : LOAD CENTREWISE DEMAND ALLOCATION

| Marketing Area | CASE-A (DEC'2010) | | | | | CASE-B (DEC'2011) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Power (Grid) | Power (Non-Grid) | Fert. | Non-Bulk | Total | Power (Grid) | Power (Non-Grid) | Fert. | Non-Bulk | Total |
| TGTDCL | | | | | | | | | | |
| *AGMS* | 0 | 0 | 0 | 0 | **0** | 0 | 0 | 0 | 0 | 0 |
| *VS3-Ashuganj PS* | 175 | 0 | 53 | 5 | **233** | 175 | 0 | 53 | 6 | **234** |
| *GUFF-PUFF-NB* | 0 | 0 | 60 | 2 | **62** | 0 | 0 | 60 | 2 | **62** |
| *Joydevpur* | 0 | 15 | 0 | 132 | **147** | 0 | 15 | 0 | 146 | **161** |
| *Tarabo-SEB* | 0 | 0 | 0 | 160 | **160** | 0 | 0 | 0 | 176 | **176** |
| *TGTDCL-Demra* | 0 | 0 | 0 | 140 | **140** | 0 | 0 | 0 | 154 | **154** |
| *Siddhirganj* | 50 | 2 | 0 | 88 | **140** | 50 | 2 | 0 | 97 | **149** |
| *N' Singdi* | 12 | 0 | 0 | 10 | **22** | 12 | 0 | 0 | 11 | **23** |
| *RPCL. Bhaluka & Mym.* | 36 | 0 | 0 | 22 | **58** | 36 | 0 | 0 | 24 | **60** |
| *Tarakandi-JFCL / Elenga* | 0 | 0 | 42 | 3 | **45** | 0 | 0 | 42 | 3 | **45** |
| *Elenga* | 5 | 0 | 0 | 35 | **40** | 5 | 0 | 0 | 38 | **43** |
| *Dhanua* | 8 | 0 | 0 | 132 | **140** | 8 | 0 | 0 | 146 | **154** |
| *Gojaria* | 0 | 0 | 0 | 5 | **5** | 0 | 0 | 0 | 6 | **6** |
| *Meghnaghat* | 69 | 16 | 0 | 10 | **95** | 69 | 16 | 0 | 11 | **96** |
| *Sonargaon* | 0 | 0 | 0 | 5 | **5** | 0 | 0 | 0 | 6 | **6** |
| *HPS & NEPC* | 42 | 0 | 0 | 0 | **42** | 42 | 0 | 0 | 0 | **42** |
| *GTCL-Demra* | 0 | 0 | 0 | 20 | **20** | 0 | 0 | 0 | 22 | **22** |
| *Ghorashal PS* | 185 | 0 | 0 | 0 | **185** | 185 | 0 | 0 | 0 | **185** |
| *Aminbazar* | 0 | 0 | 0 | 60 | **60** | 0 | 0 | 0 | 66 | **66** |
| *Ashulia* | 32 | 7 | 0 | 91 | **130** | 32 | 7 | 0 | 100 | **139** |
| *Rupganj* | 8 | 20 | 0 | 30 | **58** | 8 | 20 | 0 | 33 | **61** |
| *HPL* | 51 | 0 | 0 | 0 | **51** | 51 | 0 | 0 | 0 | **51** |
| *Shid. PS-Prop* | 0 | 0 | 0 | 0 | **0** | 0 | 0 | 0 | 0 | **0** |
| *Haripur PS-Prop* | 0 | 0 | 0 | 0 | **0** | 0 | 0 | 0 | 0 | **0** |
| *Meghnaghat-Prop* | 0 | 0 | 0 | 0 | **0** | 0 | 0 | 0 | 0 | **0** |
| *Madanganj PS* | 0 | 0 | 0 | 0 | **0** | 0 | 0 | 0 | 0 | **0** |
| *Sub-Total :* | **673** | **60** | **155** | **950** | **1838** | **673** | **60** | **155** | **1047** | **1935** |
| JGTDSL | | | | | | | | | | |
| *KTL-1, BB & HGF* | 20 | 0 | 0 | 26 | **46** | 30 | 0 | 0 | 27 | **57** |
| *Fenchuganj* | 61 | 0 | 16 | 0 | **77** | 61 | 0 | 16 | 0 | **77** |
| *KTL-II off take* | 0 | 0 | 0 | 13 | **13** | 0 | 0 | 0 | 14 | **14** |
| *Shahjibazar* | 44 | 0 | 0 | 0 | **44** | 34 | 0 | 0 | 0 | **34** |
| *BIBiyana PS* | 0 | 0 | 0 | 0 | **0** | 0 | 0 | 0 | 0 | **0** |
| *Sub-Total :* | **125** | **0** | **16** | **39** | **180** | **125** | **0** | **16** | **41** | **182** |
| BGSL + KGCL | | | | | | | | | | |
| *CGS ctg.* | 125 | 10 | 112 | 141 | **388** | 161 | 10 | 112 | 150 | **433** |
| *Feni* | 7 | 0 | 0 | 18 | **25** | 7 | 0 | 0 | 19 | **26** |
| *B'Kunda* | 5 | 0 | 0 | 25 | **30** | 5 | 0 | 0 | 27 | **32** |
| *Chandpur* | 0 | 0 | 0 | 4 | **4** | 0 | 0 | 0 | 4 | **4** |
| *Laksham* | 0 | 0 | 0 | 2 | **2** | 0 | 0 | 0 | 2 | **2** |
| *Comilla* | 12 | 0 | 0 | 33 | **45** | 21 | 0 | 0 | 35 | **56** |
| *Chandpur PS* | 0 | 0 | 0 | 0 | **0** | 22 | 0 | 0 | 0 | **22** |
| *Sub-Total :* | **149** | **10** | **112** | **223** | **494** | **216** | **10** | **112** | **237** | **575** |
| PGCL | | | | | | | | | | |
| *Baghabari* | 58 | 0 | 0 | 7 | **65** | 58 | 0 | 0 | 7 | **65** |
| *Bogra* | 9 | 0 | 0 | 10 | **19** | 9 | 0 | 0 | 11 | **20** |
| *Sirajgonj* | 3 | 0 | 0 | 14 | **17** | 3 | 0 | 0 | 15 | **18** |
| *Rajshahi* | 0 | 0 | 0 | 0 | **0** | 0 | 0 | 0 | 0 | **0** |
| *Ishwardi* | 0 | 0 | 0 | 0 | **0** | 0 | 0 | 0 | 0 | **0** |
| *Sirajgonj PS* | 0 | 0 | 0 | 0 | **0** | 0 | 0 | 0 | 0 | **0** |
| *Sub-Total :* | **70** | **0** | **0** | **31** | **101** | **70** | **0** | **0** | **33** | **103** |
| BAPEX + SGCL | | | | | | | | | | |
| *Bhola( off gas grid)* | 8 | 0 | 0 | 0 | **8** | 8 | 0 | 0 | 0 | **8** |
| *Bheramara* | 0 | 0 | 0 | 0 | **0** | 0 | 0 | 0 | 0 | **0** |
| *Kushtia* | 0 | 0 | 0 | 0 | **0** | 0 | 0 | 0 | 0 | **0** |
| *Jhinaidah* | 0 | 0 | 0 | 0 | **0** | 0 | 0 | 0 | 0 | **0** |
| *Kaliganj* | 0 | 0 | 0 | 0 | **0** | 0 | 0 | 0 | 0 | **0** |
| *Jessore* | 0 | 0 | 0 | 0 | **0** | 0 | 0 | 0 | 0 | **0** |
| *Khulna* | 0 | 0 | 0 | 0 | **0** | 0 | 0 | 0 | 0 | **0** |
| *Sub-Total :* | **8** | **0** | **0** | **0** | **8** | **8** | **0** | **0** | **0** | **8** |
| Totals : | **1025** | **70** | **283** | **1243** | **2621** | **1092** | **70** | **283** | **1358** | **2803** |

TABLE - 8 : LOAD CENTREWISE DEMAND ALLOCATION

| Marketing Area | CASE-C (DEC'2012) | | | | | CASE-D (DEC'2013) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Power (Grid) | Power (Non-Grid) | Fert. | Non-Bulk | Total | Power (Grid) | Power (Non-Grid) | Fert. | Non-Bulk | Total |
| **TGTDCL** | | | | | | | | | | |
| *AGMS* | 0 | 0 | 0 | 0 | **0** | 0 | 0 | 0 | 0 | **0** |
| *VS3-Ashuganj PS* | 175 | 0 | 53 | 7 | **235** | 184 | 0 | 53 | 8 | **245** |
| *GUFF-PUFF-NB* | 0 | 0 | 60 | 2 | **62** | 0 | 0 | 60 | 2 | **62** |
| *Joydevpur* | 9 | 15 | 0 | 161 | **185** | 9 | 15 | 0 | 178 | **202** |
| *Tarabo-SEB* | 0 | 0 | 0 | 194 | **194** | 0 | 0 | 0 | 214 | **214** |
| *TGTDCL-Demra* | 0 | 0 | 0 | 170 | **170** | 0 | 0 | 0 | 187 | **187** |
| *Siddhirganj* | 50 | 2 | 0 | 107 | **159** | 50 | 2 | 0 | 118 | **170** |
| *N' Singdi* | 12 | 0 | 0 | 12 | **24** | 12 | 0 | 0 | 13 | **25** |
| *RPCL. Bhaluka & Mym.* | 81 | 0 | 0 | 26 | **107** | 81 | 0 | 0 | 29 | **110** |
| *Tarakandi-JFCL* | 0 | 0 | 42 | 3 | **45** | 0 | 0 | 42 | 3 | **45** |
| *Elenga* | 5 | 0 | 0 | 42 | **47** | 23 | 0 | 0 | 46 | **69** |
| *Dhanua* | 8 | 0 | 0 | 161 | **169** | 8 | 0 | 0 | 178 | **186** |
| *Gojaria* | 0 | 0 | 0 | 7 | **7** | 0 | 0 | 0 | 7 | **7** |
| *Meghnaghat* | 69 | 16 | 0 | 12 | **97** | 69 | 16 | 0 | 13 | **98** |
| *Sonargaon* | 0 | 0 | 0 | 7 | **7** | 0 | 0 | 0 | 7 | **7** |
| *HPS & NEPC* | 42 | 0 | 0 | 0 | **42** | 42 | 0 | 0 | 0 | **42** |
| *GTCL-Demra* | 0 | 0 | 0 | 24 | **24** | 0 | 0 | 0 | 26 | **26** |
| *Ghorashal PS* | 230 | 0 | 0 | 0 | **230** | 230 | 0 | 0 | 0 | **230** |
| *Aminbazar* | 32 | 0 | 0 | 73 | **105** | 32 | 0 | 0 | 80 | **112** |
| *Ashulia* | 32 | 7 | 0 | 110 | **149** | 49 | 7 | 0 | 121 | **177** |
| *Rupganj* | 8 | 20 | 0 | 36 | **64** | 8 | 20 | 0 | 40 | **68** |
| *HPL* | 51 | 0 | 0 | 0 | **51** | 51 | 0 | 0 | 0 | **51** |
| *Shid. PS-Prop* | 0 | 0 | 0 | 0 | **0** | 63 | 0 | 0 | 0 | **63** |
| *Haripur PS-Prop* | 0 | 0 | 0 | 0 | **0** | 0 | 0 | 0 | 0 | **0** |
| *Meghnaghat-Prop* | 63 | 0 | 0 | 0 | **63** | 63 | 0 | 0 | 0 | **63** |
| *Madanganj PS* | 31 | 0 | 0 | 0 | **31** | 31 | 0 | 0 | 0 | **31** |
| *Sub-Total :* | **898** | **60** | **155** | **1154** | **2267** | **1005** | **60** | **155** | **1270** | **2490** |
| **JGTDSL** | | | | | | | | | | |
| *KTL-1, BB & HGF* | 30 | 0 | 0 | 28 | **58** | 30 | 0 | 0 | 29 | **59** |
| *Fenchuganj* | 61 | 0 | 16 | 0 | **77** | 52 | 0 | 16 | 0 | **68** |
| *KTL-II off take* | 0 | 0 | 0 | 15 | **15** | 0 | 0 | 0 | 16 | **16** |
| *Shahjibazar* | 34 | 0 | 0 | 0 | **34** | 34 | 0 | 0 | 0 | **34** |
| *BiBiyana PS* | 125 | 0 | 0 | 0 | **125** | 125 | 0 | 0 | 0 | **125** |
| *Sub-Total* | **250** | **0** | **16** | **43** | **309** | **241** | **0** | **16** | **45** | **302** |
| **BGSL + KGCL** | | | | | | | | | | |
| *CGS Ctg.* | 165 | 10 | 112 | 159 | **446** | 165 | 10 | 112 | 169 | **456** |
| *Feni* | 7 | 0 | 0 | 20 | **27** | 7 | 0 | 0 | 21 | **28** |
| *B'Kunda* | 5 | 0 | 0 | 29 | **34** | 5 | 0 | 0 | 31 | **36** |
| *Chandpur* | 0 | 0 | 0 | 4 | **4** | 0 | 0 | 0 | 4 | **4** |
| *Laksham* | 0 | 0 | 0 | 2 | **2** | 0 | 0 | 0 | 2 | **2** |
| *Comilla* | 30 | 0 | 0 | 37 | **67** | 30 | 0 | 0 | 39 | **69** |
| *Chandpur PS* | 22 | 0 | 0 | 0 | **22** | 22 | 0 | 0 | 0 | **22** |
| *Sub-Total :* | **229** | **10** | **112** | **251** | **602** | **229** | **10** | **112** | **266** | **617** |
| **PGCL** | | | | | | | | | | |
| *Baghabari* | 58 | 0 | 0 | 7 | **65** | 58 | 0 | 0 | 7 | **65** |
| *Bogra* | 9 | 0 | 0 | 12 | **21** | 5 | 0 | 0 | 13 | **18** |
| *Sirajgonj* | 3 | 0 | 0 | 16 | **19** | 3 | 0 | 0 | 17 | **20** |
| *Rajshahi* | 0 | 0 | 0 | 0 | **0** | 0 | 0 | 0 | 0 | **0** |
| *Ishwardi* | 0 | 0 | 0 | 0 | **0** | 0 | 0 | 0 | 0 | **0** |
| *Sirajgonj PS* | 31 | 0 | 0 | 0 | **31** | 94 | 0 | 0 | 0 | **94** |
| *Sub-Total:* | **101** | **0** | **0** | **35** | **136** | **160** | **0** | **0** | **37** | **197** |
| **BAPEX + SGCL** | | | | | | | | | | |
| *Bhola( off gas grid)* | 32 | 0 | 0 | 0 | **32** | 55 | 0 | 0 | 0 | **55** |
| *Bheramara* | 0 | 0 | 0 | 0 | **0** | 0 | 0 | 0 | 0 | **0** |
| *Kushtia* | 0 | 0 | 0 | 0 | **0** | 0 | 0 | 0 | 0 | **0** |
| *Jhinaidah* | 0 | 0 | 0 | 0 | **0** | 0 | 0 | 0 | 0 | **0** |
| *Kaliganj* | 0 | 0 | 0 | 0 | **0** | 0 | 0 | 0 | 0 | **0** |
| *Jessore* | 0 | 0 | 0 | 0 | **0** | 0 | 0 | 0 | 0 | **0** |
| *Khulna* | 31 | 0 | 0 | 5 | **36** | 31 | 0 | 0 | 18 | **49** |
| *Sub-Total :* | 63 | 0 | 0 | 5 | **68** | 86 | 0 | 0 | 18 | **104** |
| *Totals :* | **1541** | **70** | **283** | **1488** | **3382** | **1721** | **70** | **283** | **1636** | **3710** |

TABLE - 8 : LOAD CENTREWISE DEMAND ALLOCATION

| Marketing Area | CASE-E (DEC'2014) | | | | | CASE-F (DEC'2015) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Power (Grid) | Power (Non-Grid) | Fert. | Non-Bulk | Total | Power (Grid) | Power (Non-Grid) | Fert. | Non-Bulk | Total |
| **TGTDCL** | | | | | | | | | | |
| *AGMS* | 0 | 0 | 0 | 0 | **0** | 0 | 0 | 0 | 0 | **0** |
| *VS3-Ashuganj PS* | 184 | 0 | 53 | 9 | **246** | 184 | 0 | 53 | 10 | **247** |
| *GUFF-PUFF-NB* | 0 | 0 | 60 | 2 | **62** | 0 | 0 | 60 | 2 | **62** |
| *Joydevpur* | 9 | 15 | 0 | 196 | **220** | 9 | 15 | 0 | 216 | **240** |
| *Tarabo-SEB* | 0 | 0 | 0 | 236 | **236** | 0 | 0 | 0 | 260 | **260** |
| *TGTDCL-Demra* | 0 | 0 | 0 | 206 | **206** | 0 | 0 | 0 | 227 | **227** |
| *Siddhirganj* | 50 | 2 | 0 | 130 | **182** | 50 | 2 | 0 | 143 | **195** |
| *N' Singdi* | 12 | 0 | 0 | 14 | **26** | 12 | 0 | 0 | 15 | **27** |
| *RPCL. Bhaluka & Mym.* | 81 | 0 | 0 | 32 | **113** | 81 | 0 | 0 | 34 | **115** |
| *Tarakandi-JFCL* | 0 | 0 | 42 | 3 | **45** | 0 | 0 | 42 | 3 | **45** |
| *Elenga* | 23 | 0 | 0 | 50 | **73** | 23 | 0 | 0 | 55 | **78** |
| *Dhanua* | 8 | 0 | 0 | 196 | **204** | 8 | 0 | 0 | 216 | **224** |
| *Gojaria* | 0 | 0 | 0 | 7 | **7** | 0 | 0 | 0 | 7 | **7** |
| *Meghnaghat* | 69 | 16 | 0 | 14 | **99** | 69 | 16 | 0 | 15 | **100** |
| *Sonargaon* | 0 | 0 | 0 | 7 | **7** | 0 | 0 | 0 | 7 | **7** |
| *HPS & NEPC* | 0 | 0 | 0 | 0 | **0** | 0 | 0 | 0 | 0 | **0** |
| *GTCL-Demra* | 0 | 0 | 0 | 28 | **28** | 0 | 0 | 0 | 31 | **31** |
| *Ghorashal PS* | 230 | 0 | 0 | 0 | **230** | 230 | 0 | 0 | 0 | **230** |
| *Aminbazar* | 32 | 0 | 0 | 88 | **120** | 32 | 0 | 0 | 97 | **129** |
| *Ashulia* | 49 | 7 | 0 | 133 | **189** | 49 | 7 | 0 | 147 | **203** |
| *Rupganj* | 8 | 20 | 0 | 44 | **72** | 8 | 20 | 0 | 49 | **77** |
| *HPL* | 51 | 0 | 0 | 0 | **51** | 51 | 0 | 0 | 0 | **51** |
| *Shid. PS-Prop* | 126 | 0 | 0 | 0 | **126** | 126 | 0 | 0 | 0 | **126** |
| *Haripur PS-Prop* | 50 | 0 | 0 | 0 | **50** | 50 | 0 | 0 | 0 | **50** |
| *Meghnaghat-Prop* | 63 | 0 | 0 | 0 | **63** | 63 | 0 | 0 | 0 | **63** |
| *Madanganj PS* | 31 | 0 | 0 | 0 | **31** | 31 | 0 | 0 | 0 | **31** |
| *Sub-Total :* | **1076** | **60** | **155** | **1395** | **2686** | **1076** | **60** | **155** | **1534** | **2825** |
| **JGTDSL** | | | | | | | | | | |
| *KTL-1, BB & HGF* | 30 | 0 | 0 | 30 | **60** | 30 | 0 | 0 | 31 | **61** |
| *Fenchuganj* | 52 | 0 | 16 | 0 | **68** | 52 | 0 | 16 | 0 | **68** |
| *KTL-II off take* | 0 | 0 | 0 | 17 | **17** | 0 | 0 | 0 | 18 | **18** |
| *Shahjibazar* | 34 | 0 | 0 | 0 | **34** | 34 | 0 | 0 | 0 | **34** |
| *BiBiyana PS* | 125 | 0 | 0 | 0 | **125** | 125 | 0 | 0 | 0 | **125** |
| *Sub-Total :* | **241** | **0** | **16** | **47** | **304** | **241** | **0** | **16** | **49** | **306** |
| **BGSL + KGCL** | | | | | | | | | | |
| *CGS Ctg.* | 165 | 10 | 112 | 179 | **466** | 165 | 10 | 112 | 190 | **477** |
| *Feni* | 7 | 0 | 0 | 22 | **29** | 7 | 0 | 0 | 23 | **30** |
| *B'Kunda* | 5 | 0 | 0 | 33 | **38** | 5 | 0 | 0 | 35 | **40** |
| *Chandpur* | 0 | 0 | 0 | 4 | **4** | 0 | 0 | 0 | 4 | **4** |
| *Laksham* | 0 | 0 | 0 | 2 | **2** | 0 | 0 | 0 | 2 | **2** |
| *Comilla* | 30 | 0 | 0 | 41 | **71** | 30 | 0 | 0 | 44 | **74** |
| *Chandpur PS* | 22 | 0 | 0 | 0 | **22** | 22 | 0 | 0 | 0 | **22** |
| *Sub-Total :* | **229** | **10** | **112** | **281** | **632** | **229** | **10** | **112** | **298** | **649** |
| **PGCL** | | | | | | | | | | |
| *Baghabari* | 58 | 0 | 0 | 7 | **65** | 58 | 0 | 0 | 7 | **65** |
| *Bogra* | 5 | 0 | 0 | 14 | **19** | 5 | 0 | 0 | 15 | **20** |
| *Sirajgonj* | 3 | 0 | 0 | 18 | **21** | 3 | 0 | 0 | 19 | **22** |
| *Rajshahi* | 0 | 0 | 0 | 0 | **0** | 0 | 0 | 0 | 0 | **0** |
| *Ishwardi* | 0 | 0 | 0 | 0 | **0** | 0 | 0 | 0 | 0 | **0** |
| *Sirajgonj PS* | 94 | 0 | 0 | 0 | **94** | 94 | 0 | 0 | 0 | **94** |
| *Sub-Total :* | **160** | **0** | **0** | **39** | **199** | **160** | **0** | **0** | **41** | **201** |
| **BAPEX + SGCL** | | | | | | | | | | |
| *Bhola( off gas grid)* | 55 | 0 | 0 | 0 | **55** | 55 | 0 | 0 | 0 | **55** |
| *Bheramara* | 49 | 0 | 0 | 0 | **49** | 49 | 0 | 0 | 0 | **49** |
| *Kushtia* | 0 | 0 | 0 | 0 | **0** | 0 | 0 | 0 | 0 | **0** |
| *Jhinaidah* | 0 | 0 | 0 | 0 | **0** | 0 | 0 | 0 | 0 | **0** |
| *Kaliganj* | 0 | 0 | 0 | 0 | **0** | 0 | 0 | 0 | 0 | **0** |
| *Jessore* | 0 | 0 | 0 | 0 | **0** | 0 | 0 | 0 | 0 | **0** |
| *Khulna* | 31 | 0 | 0 | 25 | **56** | 31 | 0 | 0 | 32 | **63** |
| *Sub-Total :* | **135** | **0** | **0** | **25** | **160** | **135** | **0** | **0** | **32** | **167** |
| **Totals :** | **1841** | **70** | **283** | **1787** | **3981** | **1841** | **70** | **283** | **1954** | **4148** |

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TABLE - 8(A) : LOAD CENTREWISE DEMAND ALLOCATION IN THE OVERALL TRANSMISSION SYSTEM AS USED IN THE SIMUL

| Marketing Area | CASE-A (DEC'2010) | | | | | CASE-B (DEC'2011) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Power (Grid) | Power (Non-Grid) | Fert. | Non-Bulk | Total | Power (Grid) | Power (Non-Grid) | Fert. | Non-Bulk | Total |
| TGTDCL | | | | | | | | | | |
| *AGMS* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *VS3-Ashuganj PS* | 145 | 0 | 53 | 5 | 203 | 165 | 0 | 53 | 6 | 224 |
| *GUFF-PUFF-NB* | 0 | 0 | 5 | 2 | 7 | 0 | 0 | 60 | 2 | 62 |
| *Joydevpur* | 0 | 8 | 0 | 100 | 108 | 0 | 8 | 0 | 110 | 118 |
| *Tarabo-SEB* | 0 | 0 | 0 | 77 | 77 | 0 | 0 | 0 | 85 | 85 |
| *TGTDCL-Demra* | 0 | 0 | 0 | 118 | 118 | 0 | 0 | 0 | 125 | 125 |
| *Siddhirganj* | 60 | 0 | 0 | 100 | 160 | 60 | 0 | 0 | 105 | 165 |
| *N' Singdi* | 12 | 0 | 0 | 15 | 27 | 12 | 0 | 0 | 17 | 29 |
| *RPCL. Bhaluka & Mym.* | 25 | 0 | 0 | 22 | 47 | 36 | 0 | 0 | 24 | 60 |
| *Tarakandi-JFCL / Elenga* | 0 | 0 | 0 | 3 | 3 | 0 | 0 | 42 | 3 | 45 |
| *Elenga* | 5 | 0 | 0 | 45 | 50 | 5 | 0 | 0 | 50 | 55 |
| *Dhanua* | 8 | 0 | 0 | 100 | 108 | 8 | 0 | 0 | 105 | 113 |
| *Gojaria* | 0 | 0 | 0 | 5 | 5 | 0 | 0 | 0 | 6 | 6 |
| *Meghnaghat* | 72 | 12 | 0 | 10 | 94 | 72 | 12 | 0 | 11 | 95 |
| *Sonargaon* | 0 | 0 | 0 | 5 | 5 | 0 | 0 | 0 | 6 | 6 |
| *HPS & NEPC* | 20 | 0 | 0 | 0 | 20 | 20 | 0 | 0 | 0 | 20 |
| *GTCL-Demra* | 0 | 0 | 0 | 20 | 20 | 0 | 0 | 0 | 22 | 22 |
| *Ghorashal PS* | 155 | 0 | 0 | 0 | 155 | 185 | 0 | 0 | 0 | 185 |
| *Aminbazar* | 0 | 0 | 0 | 50 | 50 | 0 | 0 | 0 | 55 | 55 |
| *Ashulia* | 30 | 7 | 0 | 90 | 127 | 30 | 7 | 0 | 99 | 136 |
| *Rupganj* | 8 | 6 | 0 | 20 | 34 | 8 | 6 | 0 | 22 | 36 |
| *HPL* | 52 | 0 | 0 | 0 | 52 | 52 | 0 | 0 | 0 | 52 |
| *Shid. PS-Prop* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Haripur PS-Prop* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Meghnaghat-Prop* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Madanganj PS* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Keraniganj* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Sub-Total :* | 592 | 33 | 58 | 787 | 1470 | 653 | 33 | 155 | 851 | 1692 |
| JGTDSL | | | | | | | | | | |
| *KTL-1, BB & HGF* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Fenchuganj* | 61 | 0 | 16 | 2 | 79 | 61 | 0 | 16 | 3 | 80 |
| *KTL-II off take* | 0 | 0 | 0 | 5 | 5 | 0 | 0 | 0 | 10 | 10 |
| *Shahjibazar* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *BiBiyana PS* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Sub-Total :* | 61 | 0 | 16 | 7 | 84 | 61 | 0 | 16 | 13 | 90 |
| BGSL + KGCL | | | | | | | | | | |
| CGS Ctg. | | | | | | | | | | |
| CGS Rangadia | 30 | 9 | 96 | 80 | 215 | 73 | 9 | 96 | 110 | 288 |
| *Feni* | 7 | 0 | 0 | 18 | 25 | 7 | 0 | 0 | 19 | 26 |
| *B'Kunda* | 5 | 0 | 0 | 25 | 30 | 5 | 0 | 0 | 27 | 32 |
| *Chandpur* | 0 | 0 | 0 | 4 | 4 | 0 | 0 | 0 | 4 | 4 |
| *Laksham* | 0 | 0 | 0 | 2 | 2 | 0 | 0 | 0 | 2 | 2 |
| *Comilla* | 12 | 0 | 0 | 33 | 45 | 21 | 0 | 0 | 35 | 56 |
| *Chandpur PS* | 0 | 0 | 0 | 0 | 0 | 22 | 0 | 0 | 0 | 22 |
| *Sub-Total :* | 54 | 9 | 96 | 162 | 321 | 128 | 9 | 96 | 197 | 430 |
| PGCL | | | | | | | | | | |
| *Baghabari* | 58 | 0 | 0 | 7 | 65 | 58 | 0 | 0 | 8 | 66 |
| *Bogra* | 9 | 0 | 0 | 10 | 19 | 9 | 0 | 0 | 11 | 20 |
| *Sirajgonj* | 3 | 0 | 0 | 14 | 17 | 3 | 0 | 0 | 15 | 18 |
| *Rajshahi* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Ishwardi* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Sirajgonj PS* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Sub-Total :* | 70 | 0 | 0 | 31 | 101 | 70 | 0 | 0 | 34 | 104 |
| BAPEX + SGCL | | | | | | | | | | |
| *Bhola( off gas grid)* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Bheramara* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Kushtia* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Jhinaidah* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Kaliganj* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Jessore* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Khulna* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Sub-Total :* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Totals : | 777 | 42 | 170 | 987 | 1976 | 912 | 42 | 267 | 1095 | 2316 |

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TABLE - 8(A) : LOAD CENTREWISE DEMAND ALLOCATION IN THE OVERALL TRANSMISSION SYSTEM AS USED IN THE SIMULATIONS

| Marketing Area | CASE-C (DEC'2012) | | | | | CASE-D (DEC'2013) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Power (Grid) | Power (Non-Grid) | Fert. | Non-Bulk | Total | Power (Grid) | Power (Non-Grid) | Fert. | Non-Bulk | Total |
| TGTDCL | | | | | | | | | | |
| *AGMS* | 0 | 0 | 0 | 0 | **0** | 0 | 0 | 0 | 0 | **0** |
| *VS3-Ashuganj PS* | 165 | 0 | 53 | 6 | **224** | 168 | 0 | 53 | 6 | **227** |
| *GUFF-PUFF-NB* | 0 | 0 | 60 | 3 | **63** | 0 | 0 | 60 | 3 | **63** |
| *Joydevpur* | 9 | 8 | 0 | 127 | **144** | 8 | 8 | 0 | 127 | **143** |
| *Tarabo-SEB* | 0 | 0 | 0 | 105 | **105** | 0 | 0 | 0 | 105 | **105** |
| *TGTDCL-Demra* | 0 | 0 | 0 | 162 | **162** | 0 | 0 | 0 | 162 | **162** |
| *Siddhirganj* | 60 | 0 | 0 | 127 | **187** | 60 | 0 | 0 | 127 | **187** |
| *N' Singdi* | 12 | 0 | 0 | 24 | **36** | 12 | 0 | 0 | 24 | **36** |
| *RPCL. Bhaluka & Mym.* | 66 | 0 | 0 | 28 | **94** | 66 | 0 | 0 | 28 | **94** |
| *Tarakandi-JFCL* | 15 | 0 | 42 | 4 | **61** | 15 | 0 | 42 | 4 | **61** |
| *Elenga* | 5 | 0 | 0 | 65 | **70** | 21 | 0 | 0 | 57 | **78** |
| *Dhanua* | 8 | 0 | 0 | 145 | **153** | 8 | 0 | 0 | 145 | **153** |
| *Gojaria* | 0 | 0 | 0 | 6 | **6** | 0 | 0 | 0 | 6 | **6** |
| *Meghnaghat* | 72 | 12 | 0 | 13 | **97** | 72 | 12 | 0 | 13 | **97** |
| *Sonargaon* | 0 | 0 | 0 | 6 | **6** | 0 | 0 | 0 | 6 | **6** |
| *HPS & NEPC* | 42 | 0 | 0 | 0 | **42** | 12 | 0 | 0 | 0 | **12** |
| *GTCL-Demra* | 0 | 0 | 0 | 25 | **25** | 0 | 0 | 0 | 25 | **25** |
| *Ghorashal PS* | 230 | 0 | 0 | 0 | **230** | 201 | 0 | 0 | 0 | **201** |
| *Aminbazar* | 0 | 0 | 0 | 63 | **63** | 0 | 0 | 0 | 63 | **63** |
| *Ashulia* | 32 | 7 | 0 | 114 | **153** | 30 | 7 | 0 | 114 | **151** |
| *Rupganj* | 8 | 6 | 0 | 25 | **39** | 8 | 6 | 0 | 25 | **39** |
| *HPL* | 52 | 0 | 0 | 0 | **52** | 52 | 0 | 0 | 0 | **52** |
| *Shid. PS-Prop* | 0 | 0 | 0 | 0 | **0** | 63 | 0 | 0 | 0 | **63** |
| *Haripur PS-Prop* | 0 | 0 | 0 | 0 | **0** | 0 | 0 | 0 | 0 | **0** |
| *Meghnaghat-Prop* | 63 | 0 | 0 | 0 | **63** | 61 | 0 | 0 | 0 | **61** |
| *Madanganj PS* | 31 | 0 | 0 | 0 | **31** | 31 | 0 | 0 | 0 | **31** |
| *Keraniganj* | 0 | 0 | 0 | 0 | **0** | 0 | 0 | 0 | 0 | **0** |
| *Sub-Total :* | 870 | 33 | 155 | 1048 | 2106 | 888 | 33 | 155 | 1040 | 2116 |
| JGTDSL | | | | | | | | | | |
| *KTL-1, BB & HGF* | 0 | 0 | 0 | 0 | **0** | 0 | 0 | 0 | 0 | **0** |
| *Fenchuganj* | 61 | 0 | 16 | 5 | **82** | 61 | 0 | 16 | 6 | **83** |
| *KTL-II off take* | 0 | 0 | 0 | 15 | **15** | 0 | 0 | 0 | 20 | **20** |
| *Shahjibazar* | 0 | 0 | 0 | 0 | **0** | 0 | 0 | 0 | 0 | **0** |
| *BiBiyana PS* | 0 | 0 | 0 | 0 | **0** | 0 | 0 | 0 | 0 | **0** |
| *Sub-Total* | 61 | 0 | 16 | 20 | 97 | 61 | 0 | 16 | 26 | 103 |
| BGSL + KGCL | | | | | | | | | | |
| CGS Ctg. | 0 | 0 | 0 | 0 | **0** | 0 | 0 | 0 | 0 | **0** |
| CGS Rangadia | 165 | 9 | 112 | 150 | **436** | 165 | 9 | 112 | 160 | **446** |
| *Feni* | 7 | 0 | 0 | 20 | **27** | 7 | 0 | 0 | 22 | **29** |
| *B'Kunda* | 5 | 0 | 0 | 29 | **34** | 5 | 0 | 0 | 31 | **36** |
| *Chandpur* | 0 | 0 | 0 | 4 | **4** | 0 | 0 | 0 | 4 | **4** |
| *Laksham* | 0 | 0 | 0 | 2 | **2** | 0 | 0 | 0 | 2 | **2** |
| *Comilla* | 30 | 0 | 0 | 37 | **67** | 30 | 0 | 0 | 39 | **69** |
| *Chandpur PS* | 22 | 0 | 0 | 0 | **22** | 22 | 0 | 0 | 0 | **22** |
| *Sub-Total :* | 229 | 9 | 112 | 242 | 592 | 229 | 9 | 112 | 258 | 608 |
| PGCL | | | | | | | | | | |
| *Baghabari* | 58 | 0 | 0 | 9 | **67** | 58 | 0 | 0 | 10 | **68** |
| *Bogra* | 9 | 0 | 0 | 12 | **21** | 5 | 0 | 0 | 13 | **18** |
| *Sirajgonj* | 3 | 0 | 0 | 16 | **19** | 3 | 0 | 0 | 17 | **20** |
| *Rajshahi* | 0 | 0 | 0 | 2 | **2** | 0 | 0 | 0 | 3 | **3** |
| *Ishwardi* | 0 | 0 | 0 | 0 | **0** | 0 | 0 | 0 | 2 | **2** |
| *Sirajgonj PS* | 31 | 0 | 0 | 0 | **31** | 94 | 0 | 0 | 0 | **94** |
| *Sub-Total:* | 101 | 0 | 0 | 39 | 140 | 160 | 0 | 0 | 45 | 205 |
| BAPEX + SGCL | | | | | | | | | | |
| *Bhola( off gas grid)* | 0 | 0 | 0 | 0 | **0** | 0 | 0 | 0 | 0 | **0** |
| *Bheramara* | 0 | 0 | 0 | 0 | **0** | 0 | 0 | 0 | 0 | **0** |
| *Kushtia* | 0 | 0 | 0 | 0 | **0** | 0 | 0 | 0 | 0 | **0** |
| *Jhinaidah* | 0 | 0 | 0 | 0 | **0** | 0 | 0 | 0 | 0 | **0** |
| *Kaliganj* | 0 | 0 | 0 | 0 | **0** | 0 | 0 | 0 | 0 | **0** |
| *Jessore* | 0 | 0 | 0 | 0 | **0** | 0 | 0 | 0 | 0 | **0** |
| *Khulna* | 31 | 0 | 0 | 5 | **36** | 31 | 0 | 0 | 18 | **49** |
| *Sub-Total :* | 31 | 0 | 0 | 5 | 36 | 31 | 0 | 0 | 18 | 49 |
| Totals : | 1292 | 42 | 283 | 1354 | 2971 | 1369 | 42 | 283 | 1387 | 3081 |

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TABLE - 8(A) : LOAD CENTREWISE DEMAND ALLOCATION IN THE OVERALL TRANSMISSION SYSTEM AS USED IN THE SIMULATIONS

| Marketing Area | CASE-E (DEC'2014) | | | | | CASE-F (DEC'2015) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Power (Grid) | Power (Non-Grid) | Fert. | Non-Bulk | Total | Power (Grid) | Power (Non-Grid) | Fert. | Non-Bulk | Total |
| TGTDCL | | | | | | | | | | |
| *AGMS* | 0 | 0 | 0 | 0 | **0** | 0 | 0 | 0 | 0 | **0** |
| *VS3-Ashuganj PS* | 168 | 0 | 53 | 7 | **228** | 175 | 0 | 53 | 11 | **239** |
| *GUFF-PUFF-NB* | 0 | 0 | 60 | 3 | **63** | 0 | 0 | 60 | 4 | **64** |
| *Joydevpur* | 9 | 8 | 0 | 135 | **152** | 9 | 8 | 0 | 210 | **227** |
| *Tarabo-SEB* | 0 | 0 | 0 | 105 | **105** | 0 | 0 | 0 | 162 | **162** |
| *TGTDCL-Demra* | 0 | 0 | 0 | 164 | **164** | 0 | 0 | 0 | 252 | **252** |
| *Siddhirganj* | 60 | 0 | 0 | 137 | **197** | 60 | 0 | 0 | 185 | **245** |
| *N' Singdi* | 12 | 0 | 0 | 21 | **33** | 12 | 0 | 0 | 32 | **44** |
| *RPCL, Bhaluka & Mym.* | 66 | 0 | 0 | 30 | **96** | 66 | 0 | 0 | 46 | **112** |
| *Tarakandi-JFCL* | 15 | 0 | 42 | 4 | **61** | 15 | 0 | 42 | 6 | **63** |
| *Elenga* | 23 | 0 | 0 | 63 | **86** | 23 | 0 | 0 | 95 | **118** |
| *Dhanua* | 8 | 0 | 0 | 145 | **153** | 8 | 0 | 0 | 210 | **218** |
| *Gojaria* | 0 | 0 | 0 | 7 | **7** | 0 | 0 | 0 | 11 | **11** |
| *Meghnaghat* | 72 | 12 | 0 | 14 | **98** | 69 | 12 | 0 | 21 | **102** |
| *Sonargaon* | 0 | 0 | 0 | 7 | **7** | 0 | 0 | 0 | 11 | **11** |
| *HPS & NEPC* | 0 | 0 | 0 | 0 | **0** | 0 | 0 | 0 | 0 | **0** |
| *GTCL-Demra* | 0 | 0 | 0 | 27 | **27** | 0 | 0 | 0 | 42 | **42** |
| *Ghorashal PS* | 225 | 0 | 0 | 0 | **225** | 230 | 0 | 0 | 0 | **230** |
| *Aminbazar* | 0 | 0 | 0 | 68 | **68** | 0 | 0 | 0 | 105 | **105** |
| *Ashulia* | 49 | 7 | 0 | 119 | **175** | 49 | 7 | 0 | 189 | **245** |
| *Rupganj* | 8 | 6 | 0 | 27 | **41** | 8 | 6 | 0 | 42 | **56** |
| *HPL* | 52 | 0 | 0 | 0 | **52** | 52 | 0 | 0 | 0 | **52** |
| *Shid. PS-Prop* | 114 | 0 | 0 | 0 | **114** | 120 | 0 | 0 | 0 | **120** |
| *Haripur PS-Prop* | 50 | 0 | 0 | 0 | **50** | 50 | 0 | 0 | 0 | **50** |
| *Meghnaghat-Prop* | 63 | 0 | 0 | 0 | **63** | 63 | 0 | 0 | 0 | **63** |
| *Madanganj PS* | 31 | 0 | 0 | 0 | **31** | 31 | 0 | 0 | 0 | **31** |
| *Keraniganj* | 32 | 0 | 0 | 0 | **32** | 32 | 0 | 0 | 0 | **32** |
| *Sub-Total :* | 1057 | 33 | 155 | 1083 | 2328 | 1072 | 33 | 155 | 1633 | 2893 |
| JGTDSL | | | | | | | | | | |
| *KTL-1, BB & HGF* | 0 | 0 | 0 | 0 | **0** | 0 | 0 | 0 | 0 | **0** |
| *Fenchuganj* | 61 | 0 | 16 | 7 | **84** | 61 | 0 | 16 | 8 | **85** |
| *KTL-II off take* | 0 | 0 | 0 | 25 | **25** | 0 | 0 | 0 | 30 | **30** |
| *Shahjibazar* | 0 | 0 | 0 | 0 | **0** | 0 | 0 | 0 | 0 | **0** |
| *BiBiyana PS* | 0 | 0 | 0 | 0 | **0** | 0 | 0 | 0 | 0 | **0** |
| *Sub-Total :* | 61 | 0 | 16 | 32 | 109 | 61 | 0 | 16 | 38 | 115 |
| BGSL + KGCL | | | | | | | | | | |
| CGS Ctg. | 0 | 0 | 0 | 0 | **0** | 0 | 0 | 0 | 0 | **0** |
| CGS Rangadia | 165 | 9 | 112 | 170 | **456** | 165 | 9 | 112 | 190 | **476** |
| *Feni* | 7 | 0 | 0 | 23 | **30** | 7 | 0 | 0 | 25 | **32** |
| *B'Kunda* | 5 | 0 | 0 | 33 | **38** | 5 | 0 | 0 | 35 | **40** |
| *Chandpur* | 0 | 0 | 0 | 5 | **5** | 0 | 0 | 0 | 6 | **6** |
| *Laksham* | 0 | 0 | 0 | 3 | **3** | 0 | 0 | 0 | 4 | **4** |
| *Comilla* | 30 | 0 | 0 | 40 | **70** | 30 | 0 | 0 | 44 | **74** |
| *Chandpur PS* | 22 | 0 | 0 | 0 | **22** | 22 | 0 | 0 | 0 | **22** |
| *Sub-Total :* | 229 | 9 | 112 | 274 | 624 | 229 | 9 | 112 | 304 | 654 |
| PGCL | | | | | | | | | | |
| *Baghabari* | 58 | 0 | 0 | 11 | **69** | 58 | 0 | 0 | 12 | **70** |
| *Bogra* | 5 | 0 | 0 | 14 | **19** | 5 | 0 | 0 | 15 | **20** |
| *Sirajgonj* | 3 | 0 | 0 | 18 | **21** | 3 | 0 | 0 | 19 | **22** |
| *Rajshahi* | 0 | 0 | 0 | 4 | **4** | 0 | 0 | 0 | 5 | **5** |
| *Ishwardi* | 0 | 0 | 0 | 4 | **4** | 0 | 0 | 0 | 6 | **6** |
| *Sirajgonj PS* | 94 | 0 | 0 | 0 | **94** | 94 | 0 | 0 | 0 | **94** |
| *Sub-Total :* | 160 | 0 | 0 | 51 | 211 | 160 | 0 | 0 | 57 | 217 |
| BAPEX + SGCL | | | | | | | | | | |
| *Bhola( off gas grid)* | 0 | 0 | 0 | 0 | **0** | 0 | 0 | 0 | 0 | **0** |
| *Bheramara* | 49 | 0 | 0 | 0 | **49** | 49 | 0 | 0 | 0 | **49** |
| *Kushtia* | 0 | 0 | 0 | 0 | **0** | 0 | 0 | 0 | 0 | **0** |
| *Jhinaidah* | 0 | 0 | 0 | 0 | **0** | 0 | 0 | 0 | 0 | **0** |
| *Kaliganj* | 0 | 0 | 0 | 0 | **0** | 0 | 0 | 0 | 0 | **0** |
| *Jessore* | 0 | 0 | 0 | 0 | **0** | 0 | 0 | 0 | 0 | **0** |
| *Khulna* | 31 | 0 | 0 | 19 | **50** | 31 | 0 | 0 | 32 | **63** |
| *Sub-Total :* | 80 | 0 | 0 | 19 | 99 | 80 | 0 | 0 | 32 | 112 |
| Totals : | 1587 | 42 | 283 | 1459 | 3371 | 1602 | 42 | 283 | 2064 | 3991 |

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TABLE - 9 : GAS SUPPLY, DEMAND AND INFRASTRUCTURE DEVELOPMENT SCENARIOS

| SCENARIO | CASE-1 | CASE-2 | CASE-3 | CASE-4 | CASE-5 | CASE-6 |
|---|---|---|---|---|---|---|
| | Dec-10 | Dec-11 | Dec-12 | Dec-13 | Dec-14 | Dec-15 |
| **1. Supply** | **2153** | **2493** | **3288** | **3388** | **3698** | **4318** |
| *Petrobangla* | *1055* | *1185* | *1340* | *1340* | *1350* | *1520* |
| *IOC* | *1098* | *1308* | *1448* | *1548* | *1848* | *2298* |
| *LNG (import)* | *0* | *0* | *500* | *500* | *500* | *500* |
| **2. Demand** | **2619** | **2800** | **3382** | **3712** | **3990** | **4162** |
| *Power (grid)* | *1023* | *1090* | *1541* | *1721* | *1841* | *1841* |
| *Power (Pvt. Non-grid)* | *70* | *70* | *70* | *70* | *70* | *70* |
| *Fertilizer* | *283* | *283* | *283* | *283* | *283* | *283* |
| *Non-bulk* | *1243* | *1357* | *1488* | *1638* | *1796* | *1968* |
| **3. Demand at 0.9 LF** | **2357** | **2520** | **3043** | **3341** | **3591** | **3746** |
| **4. Supply-Demand gap** | | | | | | |
| **(1) - (2) :** | **-466** | **-307** | **-94** | **-324** | **-292** | **156** |
| **(1) - (3) :** | -204 | -27 | 245 | 47 | 107 | 572 |
| **5. Infrastructure** | | | | | | |
| **Production Wells (nos.)** | 75 | 79 | 80 | 85 | 94 | 94 |
| **Major Trans. Pipelines (km)** | | | | | | |
| **12-inch** | 153 | 205 | 205 | 205 | 205 | 205 |
| **14-inch** | 158 | 158 | 158 | 158 | 158 | 158 |
| **16-inch** | 58 | 58 | 58 | 58 | 58 | 58 |
| **20-inch** | 301 | 326 | 426 | 426 | 526 | 526 |
| **24-inch** | 504 | 512 | 512 | 512 | 512 | 512 |
| **30-inch** | 234 | 368 | 518 | 701 | 701 | 701 |
| **Total** | **1408** | **1627** | **1877** | **2060** | **2160** | **2160** |
| **Compressor Stations** | None | 1 (M) | 3 (M,A & E) | 3 (M,A & E) | 3 (M,A & E) | 3 (M,A & E) |
| **LNG facilities** | None | None | 1 | 1 | 1 | 1 |

**TABLE-10 : LIST AND COST ESTIMATES OF REQUIRED NEW PIPELINES AND ASSOCIATED FACILITIES (2010-15)**

| Sl No. | Description of Facilities to be developed | | Objective | Executing Agency | Required Completion | Estimated Cost (Crore taka) | | | Financing | Project Status |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Total | LC | FC | | |
| 1. | Pipeline Name | **Khatihata to Bhadugar** | To evacuate gas from Titas Well nos. 19, 20, 21 & 22 under Fast Track program to be completed within December 2012. | GTCL | Dec-12 | 105.00 | 42.00 | 63.00 | Not yet decided | Envisaged from the simulation exercise. Preliminary survey and preparation of PDPP will be completed within August 2010. |
| | Location | B.Baria (Titas gas fields area) | | | | | | | | |
| | Pipeline Size | 24 inch ND X 12 km | | | | | | | | |
| | Design Capacity | 200 MMSCFD | | | | | | | | |
| | River Crossing | 1 no. 24 inch ND X 200 m HDD | | | | | | | | |
| | M & R Station | 1 no (at Chaibaria tie-in point) | | | | | | | | |
| | Consultancy | None | | | | | | | | |
| 2. | Pipeline Name | **Maheshkhali to Fouzdarhat** | To evacuate gas from imported LNG receiving point at Maheskhali upto Chittagong and further north in the transmission system. | GTCL | Dec-12 | 1800.00 | 720.00 | 1080.00 | Not yet decided | Preliminary route survey already completed in April 2010. Preparations for detail route survey and PDPP are underway. Policy level decision of the authority is necessary to further proceed with the project in the overall context of importation of LNG by the end of year 2012. |
| | Location | Chittagong | | | | | | | | |
| | Pipeline Size | 30 inch ND X 115 km | | | | | | | | |
| | Design Capacity | 700-800 MMSCFD | | | | | | | | |
| | River Crossing | 6 nos. 30 inch ND X total length 3000 m HDD | | | | | | | | |
| | M & R Station | 2 nos (1 at Maheshkhali & 1 at Rangadia) | | | | | | | | |
| | Consultancy | None | | | | | | | | |
| 3. | Pipeline Name | **Dhanua to Elenga** | To ensure de-bottlenecking of the upstream and downstream capacities due to non-existence of Dhanua-Elenga pipeline section in order to ensure unrestricted evacuation. | GTCL | Dec-13 | 494.00 | 197.60 | 296.40 | Not yet decided | This 52 km pipeline section was included in the DPP of Monohordi - Jamuna pipeline project approved by ECNEC in 2006. But due to non-inclusion of this section under GTDP project loan (ADB loan no. 2188 BAN), this pipeline could not be implemented. Efforts are underway to implement the project by utilizing the unspent balance of the loan amount estimated as USD 30 million subject to final calculation and ADB's concurrence. |
| | Location | Gazipur & Tangail | | | | | | | | |
| | Pipeline Size | 30 inch ND X 52 km | | | | | | | | |
| | Design Capacity | 700 MMSCFD | | | | | | | | |
| | River Crossing | 3 nos. 30 inch ND X total length 1800 m HDD | | | | | | | | |
| | M & R Station | None | | | | | | | | |
| | Consultancy | None | | | | | | | | |
| 4. | Pipeline Name | **Bangabandhu Bridge West End to Nalka** | To ensure de-bottlenecking of the upstream and downstream capacities due to non-existence of Bangabandhu Bridge West End to Nalka pipeline section in order to ensure unrestricted evacuation . | GTCL | Dec-13 | 133.00 | 53.20 | 79.80 | Not yet decided | This 14 km pipeline section was included in the DPP of Jamuna West Bank to Bheramara project approved by ECNEC in 2006. But this pipeline section could not be taken up for implementation due to non-availability of fund under GTDP project loan (ADB loan no. 2188 BAN). |
| | Location | Sirajganj | | | | | | | | |
| | Pipeline Size | 30 inch ND X 14 km | | | | | | | | |
| | Design Capacity | 700 MMSCFD | | | | | | | | |
| | River Crossing | None | | | | | | | | |
| | M & R Station | None | | | | | | | | |
| | Consultancy | None | | | | | | | | |

| Sl No. | Description of Facilities to be developed | | Objective | Executing Agency | Required Completion | Estimated Cost (Crore taka) | | | Financing | Project Status |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Total | LC | FC | | |
| 5. | Pipeline Name | **Langalband-Maowa-Jajira** | To transport gas across Padma Bridge and create connectivity with probable new gas source to be in place at Block-7 (Char Kajol) presently under exploration by PSC operator Chevron. | GTCL | Dec-13 | 805.00 | 352.00 | 453.00 | Not yet decided. BBA has already agreed to include the cost of bridge section of the pipeline in the DPP of the bridge project on a deposit work basis to be reimbursed by GTCL. | The project comprises three parts: Langalbandh to Mawa 40 km pipeline, 10 km bridge portion including 6 km main bridge section and 10 km pipeline on the western side upto Jajira. Two separate PDPPs for the pipeline and bridge section have been approved by the Planning Commission. Detail route survey is also underway. The 10 km bridge portion of the pipeline will be implemented as an integral part of the main bridge by the EPC contractor to be engaged by the Bangladesh Bridge Authority (BBA). |
| | Location | Narayangonj, Munshiganj & Shariatpur | | | | | | | | |
| | Pipeline Size | 30 inch ND X 60 km | | | | | | | | |
| | Design Capacity | | | | | | | | | |
| | River Crossing | 3 nos. 30 inch X total length 2500 m HDD + Padma Bridge Section 30 inch ND X 9 km | | | | | | | | |
| | M & R Station | 2 nos.(1 at Maowa and 1 at Jajira) | | | | | | | | |
| | Consultancy | Bridge section of the pipeline will be covered under the services of the project consultant of the main bridge to be engaged by BBA. | | | | | | | | |
| 6. | Pipeline Name | **Jalalabad GF to Kailashtila** | The existing production capacity of 230 MMSCFD at Jalalabad GF will be fully evacuated after Muchai Compressor station is commssioned around Oct-Nov 2011. However, this loop line will be necessary to evacuate the planned additional production of 150 MMSCFD from the Field to GTCL transmission pipeline via Kailashtila GMS. | Chevron under PSC agreement | Dec-14 | 90.00 | 36.00 | 54.00 | Under PSC agreement | Envisaged from the simulation exercise. To be pursued under PSC Agreement. |
| | Location | Sylhet | | | | | | | | |
| | Pipeline Size | 14 inch ND X 18 km | | | | | | | | |
| | Design Capacity | 200 MMSCFD | | | | | | | | |
| | River Crossing | None | | | | | | | | |
| | M & R Station | None | | | | | | | | |
| | Consultancy | None | | | | | | | | |
| 7. | Pipeline Name | **Bibiyana GF to Dhanua** | Upto nearly 800 MMSCFD as against 730 MMSCFD current production at Bibiyana GF will be fully evacuated after Muchai, Ashuganj & Elenga Compressor stations are in place around Dec 2012. However, this new pipeline will be necessary to evacuate any future additional production upto a level of 800 MMSCFD from the field to GTCL transmission pipeline. | GTCL | Dec-13 | 2074.00 | 907.00 | 1167.00 | Not yet decided | Envisaged from the simulation exercise. Preliminary survey and preparation of PDPP will be completed within December 2010. |
| | Location | Habiganj, Kishoreganj & Gazipur | | | | | | | | |
| | Pipeline Size | 30 inch ND X 150 km | | | | | | | | |
| | Design Capacity | 700-800 MMSCFD | | | | | | | | |
| | River Crossing | 3 nos 30 inch ND X total length 2500 m HDD | | | | | | | | |
| | M & R Station | 1 no | | | | | | | | |
| | Consultancy | Required (Expatriate) | | | | | | | | |

| Sl No. | Description of Facilities to be developed | | Objective | Executing Agency | Required Completion | Estimated Cost (Crore taka) | | | Financing | Project Status |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Total | LC | FC | | |
| 8. | Pipeline Name | **Mubarakpur GF to Baghabari** | To create connectivity for the evacuation of 15 MMSCFD gas production from Mubarakpur GF (under exploration) to Baghabari CGS' | GTCL | Dec-11 | 135.00 | 54.00 | 81.00 | Not yet decided | Preliminary survey and prepararion of PDPP will be completed within September 2010. |
| | Location | Pabna & Sirajganj | | | | | | | | |
| | Pipeline Size | 12 inch ND X 30 km | | | | | | | | |
| | Design Capacity | 100 MMSCFD | | | | | | | | |
| | River Crossing | 1 no 12 inch ND X 500 m HDD | | | | | | | | |
| | M & R Station | 1 no | | | | | | | | |
| | Consultancy | None | | | | | | | | |
| 9. | Pipeline Name | **Kapasia GF to Amraid** | To create connectivity for the evacuation of 15 MMSCFD gas production from Kapasia GF (under exploration) with Monohordi-Dhanua pipeline. | GTCL | Dec-11 | 18.00 | 7.20 | 10.80 | Not yet decided | Preliminary survey and prepararion of PDPP will be completed within September 2010. |
| | Location | Gazipur | | | | | | | | |
| | Pipeline Size | 12 inch ND X 4 km | | | | | | | | |
| | Design Capacity | 100 MMSCFD | | | | | | | | |
| | River Crossing | None | | | | | | | | |
| | M & R Station | 1 no | | | | | | | | |
| | Consultancy | None | | | | | | | | |
| 10. | Pipeline Name | **Sundalpur GF to Feni** | To create connectivity for the evacuation of 15 MMSCFD gas production from Sundalpur GF (under exploration) with Bakhrabad-Chittagong pipeline. | GTCL | Dec-10 | 135.00 | 54.00 | 81.00 | Not yet decided | Preliminary survey and prepararion of PDPP will be completed within September 2010. |
| | Location | Feni & Noakhali | | | | | | | | |
| | Pipeline Size | 12 inch ND X 30 km | | | | | | | | |
| | Design Capacity | 100 MMSCFD | | | | | | | | |
| | River Crossing | None | | | | | | | | |
| | M & R Station | 1 no | | | | | | | | |
| | Consultancy | None | | | | | | | | |
| 11. | Pipeline Name | **Monohordi to Joydevpur** | To ensure increase gas supply towards Gazipur, Tongi, Savar & Kaliakoir industrial belts under TGTDCL marketing franchise area through Joydevpur CGS location in order to improve the acute low pressure problem in the distribution system. | GTCL | Dec-15 | 416.00 | 166.40 | 249.60 | Not yet decided | Envisaged from the simulation exercise. Preliminary survey and prepararion of PDPP will be completed within December 2010. |
| | Location | Narsingdi & Gazipur | | | | | | | | |
| | Pipeline Size | 20 inch ND X 52 km | | | | | | | | |
| | Design Capacity | 300 MMSCFD | | | | | | | | |
| | River Crossing | 3 nos. 20 inch ND X total length 15 | | | | | | | | |
| | M & R Station | 1 nos | | | | | | | | |
| | Consultancy | None | | | | | | | | |
| 12. | Pipeline Name | **Moulvibazar GF to Muchai** | Upto nearly 160 MMSCFD as against 60 MMSCFD current production at Moulvibazar GF will be fully evacuated after Muchai, Ashuganj & Elenga Compressor stations are in place around Dec 2012. However, this new pipeline will be necessary to evacuate any future additional production upto a level of 360 MMSCFD from the field to GTCL transmission pipeline. | Chevron under PSC agreement | Dec-15 | 110.00 | 44.00 | 66.00 | Under PSC agreement | Envisaged from the simulation exercise. To be pursued under PSC Agreement. |
| | Location | Moulvibazar | | | | | | | | |
| | Pipeline Size | 14 inch ND X 22 km | | | | | | | | |
| | Design Capacity | 200 MMSCFD | | | | | | | | |
| | River Crossing | None | | | | | | | | |
| | M & R Station | None | | | | | | | | |
| | Consultancy | None | | | | | | | | |
| | | | | | Total | 6315.00 | 2633.40 | 3681.60 | | |



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Appendix-5

# Basis of Gas Demand Projection

## Sector-wise Gas Demand Projection

(MMCFD)

| Year | Power | Captive P. | Fertilizer | Industrial | Comm. | Domestic | CNG,Tea | Total |
|---|---|---|---|---|---|---|---|---|
| 2010 - 2011 | 932 | 330 | 281 | 351 | 23 | 259 | 112 | 2,289 |
| 2011 - 2012 | 1,080 | 363 | 281 | 387 | 25 | 287 | 121 | 2,544 |
| 2012 - 2013 | 1,342 | 399 | 281 | 418 | 27 | 312 | 131 | 2,910 |
| 2013 - 2014 | 1,442 | 438 | 281 | 451 | 29 | 339 | 142 | 3,123 |
| 2014 - 2015 | 1,586 | 481 | 281 | 488 | 31 | 369 | 153 | 3,389 |
| 2015 - 2016 | 1,567 | 531 | 303 | 539 | 34 | 410 | 166 | 3,551 |
| 2016 - 2017 | 1,567 | 587 | 303 | 595 | 38 | 456 | 180 | 3,726 |
| 2017 - 2018 | 1,550 | 649 | 329 | 658 | 41 | 506 | 195 | 3,928 |
| 2018 - 2019 | 1,550 | 717 | 329 | 727 | 45 | 563 | 211 | 4,142 |
| 2019 - 2020 | 1,550 | 792 | 329 | 803 | 50 | 625 | 229 | 4,378 |
| 2020 - 2021 | 1,539 | 879 | 322 | 891 | 55 | 697 | 249 | 4,632 |
| 2021 - 2022 | 1,539 | 781 | 322 | 971 | 59 | 764 | 271 | 4,708 |
| 2022 - 2023 | 1,514 | 684 | 322 | 1,058 | 64 | 839 | 295 | 4,775 |
| 2023 - 2024 | 1,414 | 586 | 322 | 1,153 | 69 | 919 | 321 | 4,783 |
| 2024 - 2025 | 1,443 | 488 | 322 | 1,256 | 74 | 1,007 | 349 | 4,939 |
| 2025 - 2026 | 1,402 | 391 | 322 | 1,372 | 81 | 1,107 | 380 | 5,054 |
| 2026 - 2027 | 1,393 | 293 | 322 | 1,499 | 87 | 1,218 | 414 | 5,227 |
| 2027 - 2028 | 1,388 | 195 | 322 | 1,637 | 95 | 1,339 | 451 | 5,429 |
| 2028 - 2029 | 1,352 | 98 | 322 | 1,789 | 103 | 1,473 | 492 | 5,628 |
| 2029 - 2030 | 1,286 | 0 | 322 | 1,954 | 111 | 1,619 | 536 | 5,829 |

## Gas Demand Projection for TGTDCL

(MMCFD)

| Year | Power | Captive P. | Fertilizer | Industrial | Comm. | Domestic | CNG,Tea | Total |
|---|---|---|---|---|---|---|---|---|
| 2010 - 2011 | 616 | 286 | 156 | 294 | 15 | 175 | 74 | 1,616 |
| 2011 - 2012 | 689 | 314 | 156 | 324 | 16 | 195 | 80 | 1,774 |
| 2012 - 2013 | 824 | 346 | 156 | 350 | 17 | 212 | 87 | 1,992 |
| 2013 - 2014 | 935 | 381 | 156 | 378 | 18 | 232 | 94 | 2,193 |
| 2014 - 2015 | 918 | 419 | 156 | 408 | 19 | 253 | 101 | 2,274 |
| 2015 - 2016 | 887 | 463 | 156 | 451 | 21 | 282 | 110 | 2,370 |
| 2016 - 2017 | 887 | 512 | 156 | 499 | 23 | 314 | 119 | 2,510 |
| 2017 - 2018 | 887 | 565 | 182 | 551 | 25 | 351 | 129 | 2,691 |
| 2018 - 2019 | 887 | 625 | 182 | 609 | 28 | 391 | 140 | 2,862 |
| 2019 - 2020 | 887 | 690 | 182 | 673 | 31 | 437 | 152 | 3,051 |
| 2020 - 2021 | 887 | 766 | 130 | 746 | 34 | 489 | 165 | 3,217 |
| 2021 - 2022 | 887 | 681 | 130 | 813 | 36 | 539 | 180 | 3,265 |
| 2022 - 2023 | 887 | 596 | 130 | 886 | 39 | 593 | 195 | 3,326 |
| 2023 - 2024 | 809 | 510 | 130 | 965 | 42 | 653 | 212 | 3,322 |
| 2024 - 2025 | 837 | 425 | 130 | 1,051 | 45 | 719 | 231 | 3,439 |
| 2025 - 2026 | 811 | 340 | 130 | 1,149 | 49 | 793 | 252 | 3,524 |
| 2026 - 2027 | 846 | 255 | 130 | 1,255 | 53 | 876 | 275 | 3,690 |
| 2027 - 2028 | 842 | 170 | 130 | 1,371 | 57 | 967 | 299 | 3,838 |
| 2028 - 2029 | 846 | 85 | 130 | 1,498 | 62 | 1,068 | 326 | 4,016 |
| 2029 - 2030 | 729 | 0 | 130 | 1,636 | 67 | 1,179 | 356 | 4,098 |

## Gas Demand Projection for BGSL

(MMCFD)

| Year | Power | Captive P. | Fertilizer | Industrial | Comm. | Domestic | CNG,Tea | Total |
|---|---|---|---|---|---|---|---|---|
| 2010 - 2011 | 162 | 35 | 107 | 41 | 7 | 53 | 23 | 427 |
| 2011 - 2012 | 181 | 39 | 107 | 45 | 7 | 58 | 24 | 461 |
| 2012 - 2013 | 181 | 42 | 107 | 48 | 8 | 63 | 26 | 475 |
| 2013 - 2014 | 181 | 45 | 107 | 52 | 9 | 68 | 29 | 490 |
| 2014 - 2015 | 181 | 49 | 107 | 56 | 10 | 73 | 31 | 507 |
| 2015 - 2016 | 181 | 54 | 107 | 62 | 11 | 81 | 33 | 529 |
| 2016 - 2017 | 181 | 60 | 107 | 69 | 12 | 89 | 36 | 553 |
| 2017 - 2018 | 181 | 66 | 107 | 76 | 13 | 99 | 39 | 581 |
| 2018 - 2019 | 181 | 73 | 107 | 84 | 14 | 109 | 43 | 611 |
| 2019 - 2020 | 181 | 80 | 107 | 93 | 16 | 120 | 46 | 644 |
| 2020 - 2021 | 170 | 89 | 107 | 103 | 18 | 134 | 50 | 671 |
| 2021 - 2022 | 170 | 79 | 107 | 112 | 19 | 146 | 55 | 688 |
| 2022 - 2023 | 170 | 69 | 107 | 122 | 21 | 159 | 59 | 708 |
| 2023 - 2024 | 170 | 59 | 107 | 133 | 23 | 173 | 65 | 730 |
| 2024 - 2025 | 141 | 50 | 107 | 145 | 25 | 188 | 70 | 726 |
| 2025 - 2026 | 141 | 40 | 107 | 159 | 27 | 206 | 77 | 756 |
| 2026 - 2027 | 96 | 30 | 107 | 173 | 30 | 225 | 83 | 744 |
| 2027 - 2028 | 96 | 20 | 107 | 189 | 32 | 246 | 91 | 781 |
| 2028 - 2029 | 54 | 10 | 107 | 207 | 35 | 268 | 99 | 781 |
| 2029 - 2030 | 54 | 0 | 107 | 226 | 39 | 293 | 108 | 827 |

## Gas Demand Projection for JGTDSL

(MMCFD)

| Year | Power | Captive P. | Fertilizer | Industrial | Comm. | Domestic | CNG,Tea | Total |
|---|---|---|---|---|---|---|---|---|
| 2010 - 2011 | 87 | 7 | 18 | 15 | 1 | 15 | 10 | 153 |
| 2011 - 2012 | 144 | 8 | 18 | 16 | 1 | 16 | 11 | 215 |
| 2012 - 2013 | 240 | 9 | 18 | 17 | 1 | 17 | 12 | 315 |
| 2013 - 2014 | 229 | 9 | 18 | 19 | 1 | 19 | 13 | 308 |
| 2014 - 2015 | 336 | 10 | 18 | 20 | 2 | 20 | 14 | 420 |
| 2015 - 2016 | 320 | 11 | 40 | 22 | 2 | 22 | 15 | 433 |
| 2016 - 2017 | 320 | 12 | 40 | 25 | 2 | 25 | 16 | 440 |
| 2017 - 2018 | 320 | 14 | 40 | 27 | 2 | 27 | 18 | 448 |
| 2018 - 2019 | 320 | 15 | 40 | 30 | 2 | 30 | 19 | 457 |
| 2019 - 2020 | 320 | 17 | 40 | 34 | 2 | 34 | 21 | 466 |
| 2020 - 2021 | 320 | 19 | 40 | 37 | 2 | 37 | 23 | 478 |
| 2021 - 2022 | 320 | 17 | 40 | 41 | 2 | 41 | 25 | 484 |
| 2022 - 2023 | 320 | 14 | 40 | 44 | 2 | 44 | 27 | 492 |
| 2023 - 2024 | 303 | 12 | 40 | 48 | 2 | 48 | 29 | 483 |
| 2024 - 2025 | 335 | 10 | 40 | 52 | 2 | 53 | 32 | 524 |
| 2025 - 2026 | 320 | 8 | 40 | 57 | 2 | 58 | 34 | 520 |
| 2026 - 2027 | 321 | 6 | 40 | 63 | 2 | 63 | 38 | 533 |
| 2027 - 2028 | 320 | 4 | 40 | 68 | 2 | 69 | 41 | 545 |
| 2028 - 2029 | 321 | 2 | 40 | 75 | 2 | 75 | 45 | 560 |
| 2029 - 2030 | 321 | 0 | 40 | 82 | 2 | 82 | 49 | 576 |

## Gas Demand Projection for PGCL

(MMCFD)

| Year | Power | Captive P. | Fertilizer | Industrial | Comm. | Domestic | CNG,Tea | Total |
|---|---|---|---|---|---|---|---|---|
| 2010 - 2011 | 66 | 2 | 0 | 2 | 1 | 5 | 5 | 82 |
| 2011 - 2012 | 66 | 2 | 0 | 2 | 1 | 6 | 5 | 83 |
| 2012 - 2013 | 98 | 3 | 0 | 2 | 1 | 7 | 6 | 115 |
| 2013 - 2014 | 98 | 3 | 0 | 2 | 1 | 7 | 6 | 117 |
| 2014 - 2015 | 98 | 3 | 0 | 3 | 1 | 8 | 7 | 119 |
| 2015 - 2016 | 125 | 3 | 0 | 3 | 1 | 8 | 7 | 148 |
| 2016 - 2017 | 125 | 4 | 0 | 3 | 1 | 9 | 8 | 150 |
| 2017 - 2018 | 107 | 4 | 0 | 3 | 1 | 10 | 9 | 135 |
| 2018 - 2019 | 107 | 5 | 0 | 4 | 1 | 11 | 10 | 138 |
| 2019 - 2020 | 107 | 5 | 0 | 4 | 1 | 13 | 10 | 141 |
| 2020 - 2021 | 107 | 6 | 45 | 5 | 1 | 14 | 11 | 189 |
| 2021 - 2022 | 107 | 5 | 45 | 5 | 2 | 15 | 12 | 191 |
| 2022 - 2023 | 82 | 4 | 45 | 6 | 2 | 17 | 13 | 169 |
| 2023 - 2024 | 78 | 4 | 45 | 6 | 2 | 18 | 14 | 167 |
| 2024 - 2025 | 75 | 3 | 45 | 7 | 2 | 20 | 16 | 167 |
| 2025 - 2026 | 75 | 2 | 45 | 7 | 2 | 21 | 17 | 171 |
| 2026 - 2027 | 75 | 2 | 45 | 8 | 2 | 23 | 19 | 174 |
| 2027 - 2028 | 75 | 1 | 45 | 9 | 3 | 26 | 20 | 179 |
| 2028 - 2029 | 75 | 1 | 45 | 9 | 3 | 28 | 22 | 183 |
| 2029 - 2030 | 126 | 0 | 45 | 10 | 3 | 31 | 24 | 239 |

## Gas Demand Projection for SGCL

(MMCFD)

| Year | Power | Captive P. | Fertilizer | Industrial | Comm. | Domestic | CNG,Tea | Total |
|---|---|---|---|---|---|---|---|---|
| 2010 - 2011 | 0 | | | | | 11 | | 11 |
| 2011 - 2012 | 0 | | | | | 12 | | 12 |
| 2012 - 2013 | 0 | | | | | 13 | | 13 |
| 2013 - 2014 | 0 | | | | | 14 | | 14 |
| 2014 - 2015 | 54 | | | | | 15 | | 69 |
| 2015 - 2016 | 54 | | | | | 17 | | 71 |
| 2016 - 2017 | 54 | | | | | 18 | | 72 |
| 2017 - 2018 | 54 | | | | | 19 | | 73 |
| 2018 - 2019 | 54 | | | | | 21 | | 75 |
| 2019 - 2020 | 54 | | | | | 22 | | 76 |
| 2020 - 2021 | 54 | | | | | 23 | | 77 |
| 2021 - 2022 | 54 | | | | | 24 | | 78 |
| 2022 - 2023 | 54 | | | | | 26 | | 80 |
| 2023 - 2024 | 54 | | | | | 27 | | 81 |
| 2024 - 2025 | 54 | | | | | 28 | | 82 |
| 2025 - 2026 | 54 | | | | | 29 | | 83 |
| 2026 - 2027 | 54 | | | | | 31 | | 85 |
| 2027 - 2028 | 54 | | | | | 32 | | 86 |
| 2028 - 2029 | 54 | | | | | 33 | | 87 |
| 2029 - 2030 | 54 | | | | | 34 | | 88 |

## Gas Demand Calculation

Area: TGTDCL

y = A * x ^B

y = Sales (Demand)

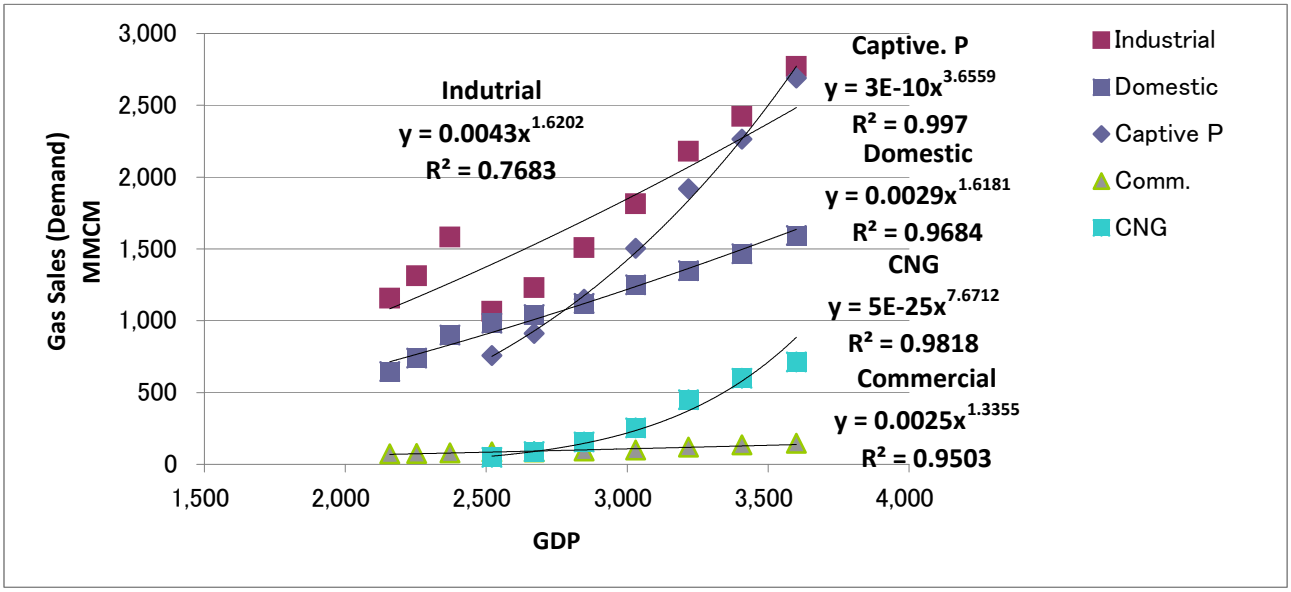
x = GDP

**Gas Sales & GDP (2000 to 2010)**

GDP: billion Taka

Gas: MMCM

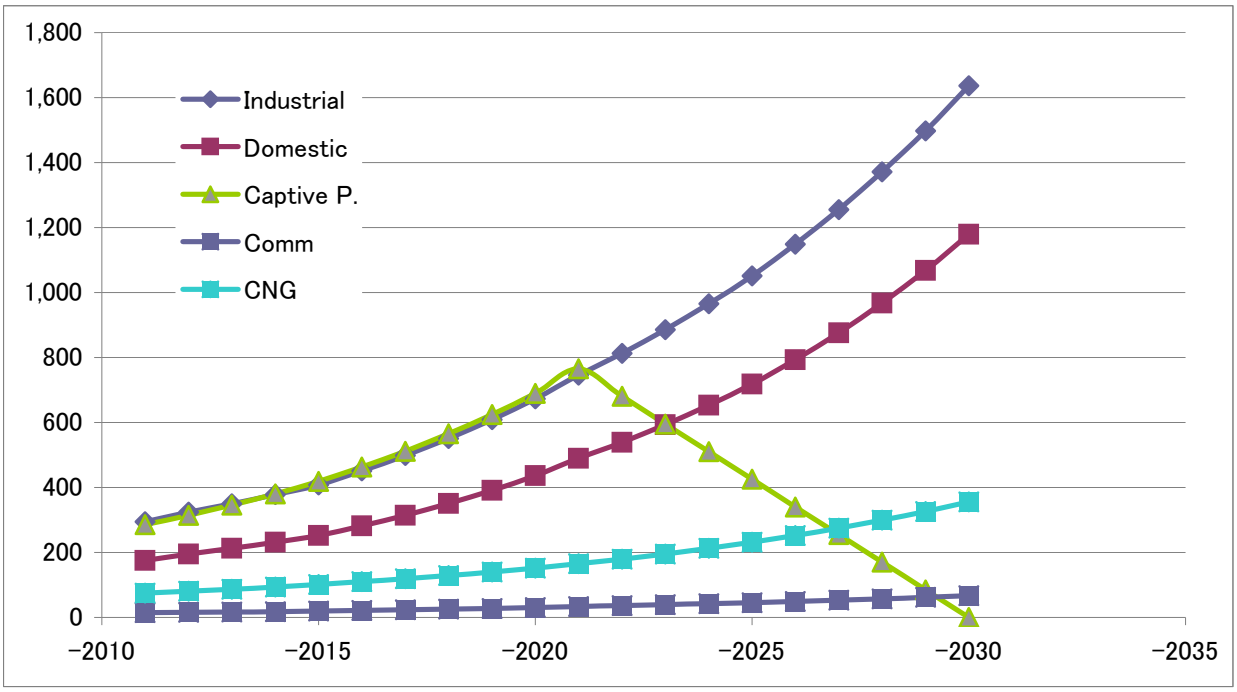
| | GDP | Industrial | Domestic | Captive P | Comm. | CNG |
|---|---|---|---|---|---|---|
| 2000 | 2,157.350 | 1,157 | 647 | | 73 | |
| 2001 | 2,252.610 | 1,313 | 741 | | 75 | |
| 2002 | 2,371.010 | 1,582 | 901 | | 81 | |
| 2003 | 2,519.680 | 1,065 | 982 | 757 | 87 | 50 |
| 2004 | 2,669.740 | 1,230 | 1,042 | 911 | 86 | 89 |
| 2005 | 2,846.730 | 1,510 | 1,122 | 1150 | 94 | 155 |
| 2006 | 3,029.710 | 1,814 | 1,251 | 1504 | 101 | 254 |
| 2007 | 3,217.260 | 2,180 | 1,348 | 1920 | 120 | 450 |
| 2008 | 3,406.520 | 2,422 | 1,466 | 2265 | 135 | 600 |
| 2009 | 3,600.470 | 2,770 | 1,594 | 2690 | 146 | 714 |
| A | | 0.00429616 | 0.0028793 | 2.7604E-10 | 0.00245681 | 4.6304E-25 |
| B | | 1.62021901 | 1.61813159 | 3.6559481 | 1.33546784 | 7.67124011 |



## Gas Demand Calculation Area: TGTDCL

Demand in MMCFD

| Year | Industrial | Domestic | Captive P. | Comm | CNG | Total | Demand Growth Rate |
|---|---|---|---|---|---|---|---|
| -2011 | 294 | 175 | 286 | 15 | 74 | 844 | 10% |
| -2012 | 324 | 195 | 314 | 16 | 80 | 929 | 10% |
| -2013 | 350 | 212 | 346 | 17 | 87 | 1,012 | 9% |
| -2014 | 378 | 232 | 381 | 18 | 94 | 1,102 | 9% |
| -2015 | 408 | 253 | 419 | 19 | 101 | 1,201 | 9% |
| -2016 | 451 | 282 | 463 | 21 | 110 | 1,327 | 11% |
| -2017 | 499 | 314 | 512 | 23 | 119 | 1,467 | 11% |
| -2018 | 551 | 351 | 565 | 25 | 129 | 1,622 | 11% |
| -2019 | 609 | 391 | 625 | 28 | 140 | 1,793 | 11% |
| -2020 | 673 | 437 | 690 | 31 | 152 | 1,982 | 11% |
| -2021 | 746 | 489 | 766 | 34 | 165 | 2,200 | 11% |
| -2022 | 813 | 539 | 681 | 36 | 180 | 2,248 | 2% |
| -2023 | 886 | 593 | 596 | 39 | 195 | 2,309 | 3% |
| -2024 | 965 | 653 | 510 | 42 | 212 | 2,383 | 3% |
| -2025 | 1,051 | 719 | 425 | 45 | 231 | 2,472 | 4% |
| -2026 | 1,149 | 793 | 340 | 49 | 252 | 2,583 | 5% |
| -2027 | 1,255 | 876 | 255 | 53 | 275 | 2,714 | 5% |
| -2028 | 1,371 | 967 | 170 | 57 | 299 | 2,865 | 6% |
| -2029 | 1,498 | 1,068 | 85 | 62 | 326 | 3,039 | 6% |
| -2030 | 1,636 | 1,179 | 0 | 67 | 356 | 3,238 | 7% |



## Gas Demand Calculation

Area: JGTDSL

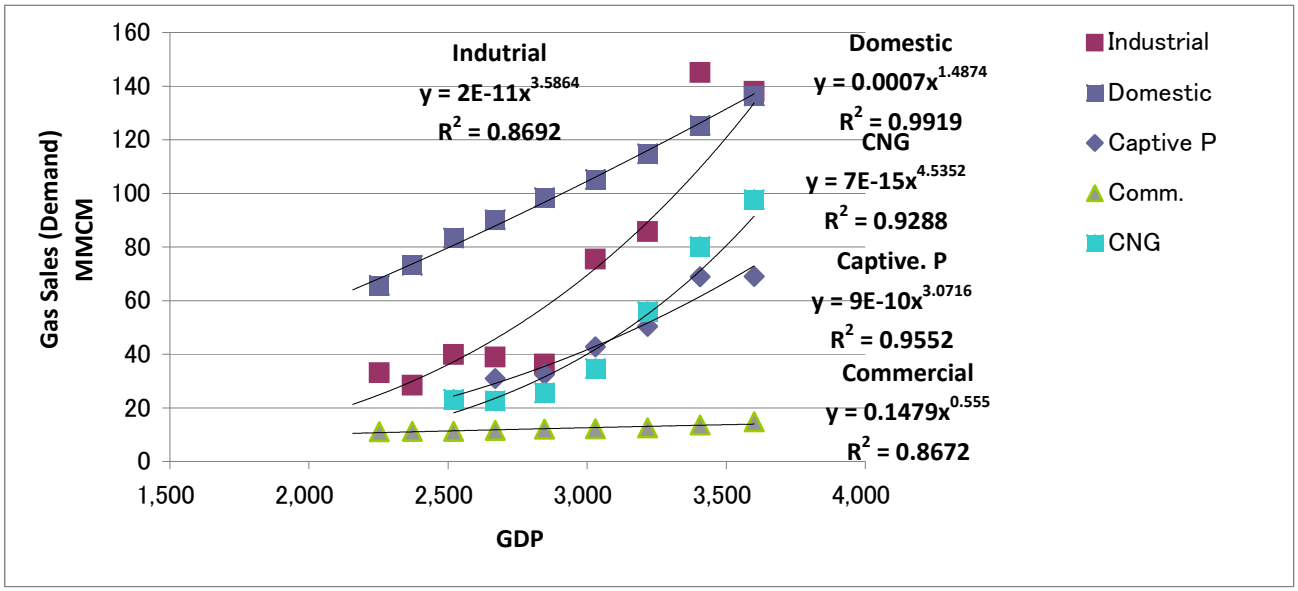
y = A * x ^B  y = Sales (Demand)
x = GDP

**Gas Sales & GDP (2000 to 2010)**

GDP: billion Taka

Gas: MMCM

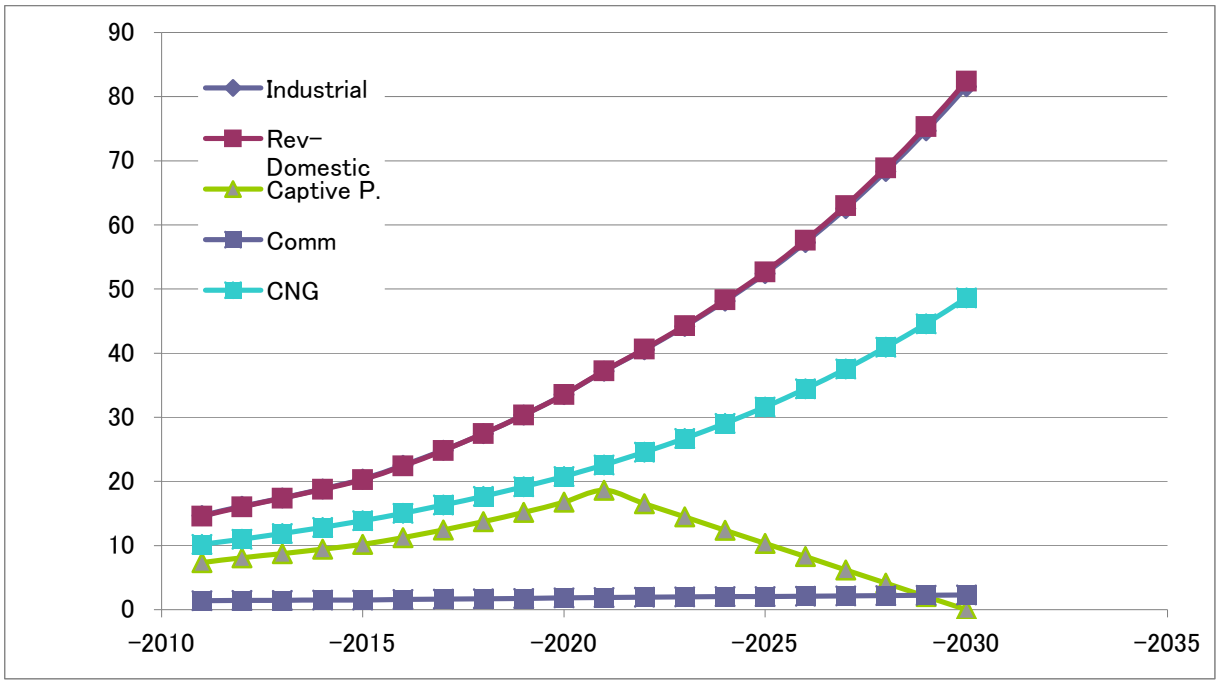
| | GDP | Industrial | Domestic | Captive P | Comm. | CNG |
|---|---|---|---|---|---|---|
| 2000 | 2,157.350 | | | | | |
| 2001 | 2,252.610 | 33 | 66 | | 11 | 22 |
| 2002 | 2,371.010 | 28 | 73 | | 11 | 23 |
| 2003 | 2,519.680 | 40 | 83 | | 11 | 23 |
| 2004 | 2,669.740 | 39 | 90 | 31 | 12 | 23 |
| 2005 | 2,846.730 | 36 | 98 | 32 | 12 | 26 |
| 2006 | 3,029.710 | 75 | 105 | 43 | 12 | 35 |
| 2007 | 3,217.260 | 86 | 115 | 50 | 13 | 56 |
| 2008 | 3,406.520 | 145 | 125 | 69 | 14 | 80 |
| 2009 | 3,600.470 | 138 | 136 | 69 | 15 | 98 |
| A | | 2.3536E-11 | 0.0007036 | 8.6977E-10 | 0.14793118 | 1.2423E-10 |
| B | | 3.58635296 | 1.48742094 | 3.07160998 | 0.5549838 | 3.3185251 |



## Gas Demand Calculation Area: JGTDSL

Demand in MMCFD

| Year | Industrial | Rev-Domestic | Captive P. | Comm | CNG | Total | Demand Growth Rate |
|---|---|---|---|---|---|---|---|
| -2011 | 15 | 15 | 7 | 1 | 10 | 48 | 9% |
| -2012 | 16 | 16 | 8 | 1 | 11 | 53 | 9% |
| -2013 | 17 | 17 | 9 | 1 | 12 | 57 | 8% |
| -2014 | 19 | 19 | 9 | 1 | 13 | 61 | 8% |
| -2015 | 20 | 20 | 10 | 2 | 14 | 66 | 8% |
| -2016 | 22 | 22 | 11 | 2 | 15 | 73 | 10% |
| -2017 | 25 | 25 | 12 | 2 | 16 | 80 | 10% |
| -2018 | 27 | 27 | 14 | 2 | 18 | 88 | 10% |
| -2019 | 30 | 30 | 15 | 2 | 19 | 97 | 10% |
| -2020 | 34 | 34 | 17 | 2 | 21 | 106 | 10% |
| -2021 | 37 | 37 | 19 | 2 | 23 | 118 | 10% |
| -2022 | 41 | 41 | 17 | 2 | 25 | 124 | 6% |
| -2023 | 44 | 44 | 14 | 2 | 27 | 132 | 6% |
| -2024 | 48 | 48 | 12 | 2 | 29 | 140 | 6% |
| -2025 | 52 | 53 | 10 | 2 | 32 | 149 | 7% |
| -2026 | 57 | 58 | 8 | 2 | 34 | 160 | 7% |
| -2027 | 63 | 63 | 6 | 2 | 38 | 171 | 7% |
| -2028 | 68 | 69 | 4 | 2 | 41 | 184 | 8% |
| -2029 | 75 | 75 | 2 | 2 | 45 | 199 | 8% |
| -2030 | 82 | 82 | 0 | 2 | 49 | 215 | 8% |



## Gas Demand Calculation

Area: PGCL

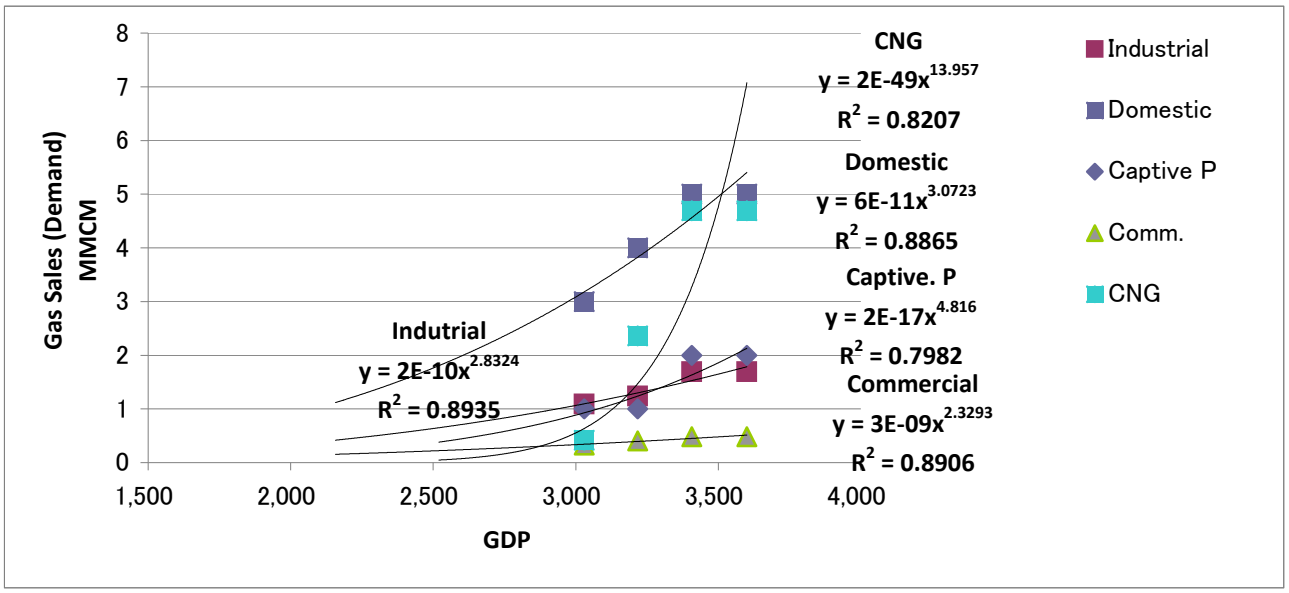
y = A * x ^B  y = Sales (Demand)
x = GDP

**Gas Sales & GDP (2000 to 2010)**

GDP: billion Taka

Gas: MMCFD

| | GDP | Industrial | Domestic | Captive P | Comm. | CNG |
|---|---|---|---|---|---|---|
| 2000 | 2,157.350 | | | | | |
| 2001 | 2,252.610 | | | | | |
| 2002 | 2,371.010 | | | | | |
| 2003 | 2,519.680 | | | | | |
| 2004 | 2,669.740 | | | | | |
| 2005 | 2,846.730 | | | | | |
| 2006 | 3,029.710 | 1 | 3 | 1 | 0 | 0 |
| 2007 | 3,217.260 | 1 | 4 | 1 | 0 | 2 |
| 2008 | 3,406.520 | 2 | 5 | 2 | 0 | 5 |
| 2009 | 3,600.470 | 2 | 5 | 2 | 0 | 5 |
| A | | 1.5095E-10 | 6.4051E-11 | 1.5892E-17 | 2.6675E-09 | 1.6353E-49 |
| B | | 2.83242925 | 3.0723385 | 4.81599037 | 2.32930517 | 13.9570064 |



## Gas Demand Calculation　　Area: PGCL

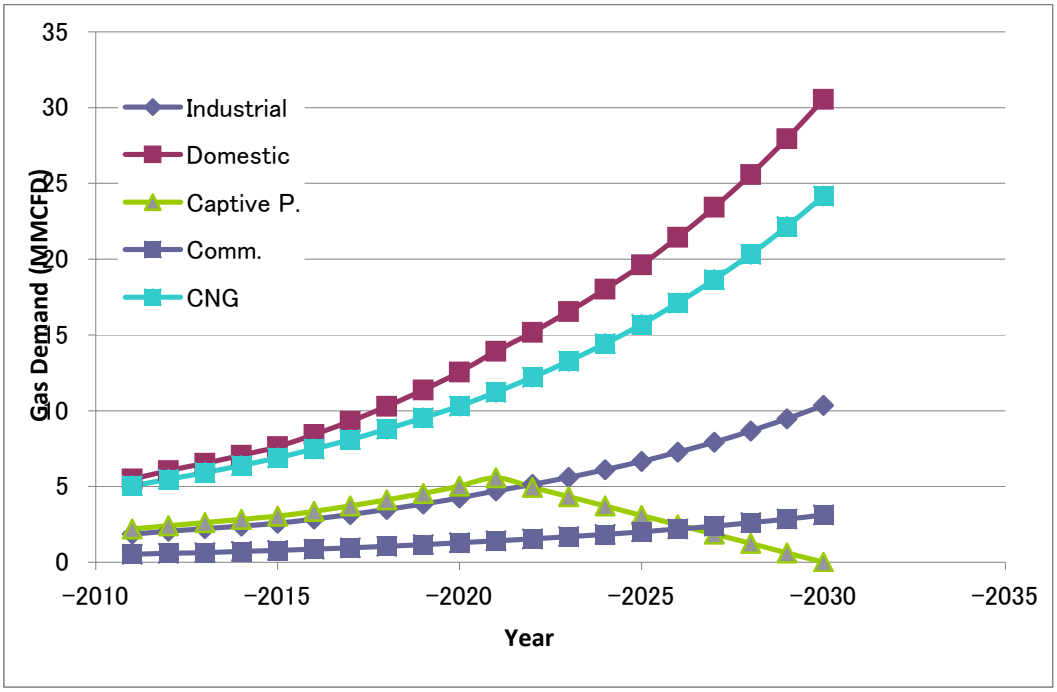
20年をピークに減少（比例直線）

適正価格への調整期間(2011-2015)において2%の需要抑制効果

前年実績（予測）からの伸び率： GDP伸び率 × 1.5
但し、CNGのみ × 1.2

Demand in MMCFD

| Year | Industrial | Domestic | Captive P. | Comm. | CNG | Total | Demand Growth Rate |
|---|---|---|---|---|---|---|---|
| -2011 | 2 | 5 | 2 | 1 | 5 | 15 | 9% |
| -2012 | 2 | 6 | 2 | 1 | 5 | 17 | 9% |
| -2013 | 2 | 7 | 3 | 1 | 6 | 18 | 8% |
| -2014 | 2 | 7 | 3 | 1 | 6 | 19 | 8% |
| -2015 | 3 | 8 | 3 | 1 | 7 | 21 | 8% |
| -2016 | 3 | 8 | 3 | 1 | 7 | 23 | 10% |
| -2017 | 3 | 9 | 4 | 1 | 8 | 25 | 10% |
| -2018 | 3 | 10 | 4 | 1 | 9 | 28 | 10% |
| -2019 | 4 | 11 | 5 | 1 | 10 | 30 | 10% |
| -2020 | 4 | 13 | 5 | 1 | 10 | 33 | 10% |
| -2021 | 5 | 14 | 6 | 1 | 11 | 37 | 10% |
| -2022 | 5 | 15 | 5 | 2 | 12 | 39 | 6% |
| -2023 | 6 | 17 | 4 | 2 | 13 | 41 | 6% |
| -2024 | 6 | 18 | 4 | 2 | 14 | 44 | 6% |
| -2025 | 7 | 20 | 3 | 2 | 16 | 47 | 7% |
| -2026 | 7 | 21 | 2 | 2 | 17 | 50 | 7% |
| -2027 | 8 | 23 | 2 | 2 | 19 | 54 | 7% |
| -2028 | 9 | 26 | 1 | 3 | 20 | 58 | 8% |
| -2029 | 9 | 28 | 1 | 3 | 22 | 63 | 8% |
| -2030 | 10 | 31 | 0 | 3 | 24 | 68 | 8% |



## Gas Demand Calculation

Area: BGSL

y = A * x ^B  y = Sales (Demand)
x = GDP

**Gas Sales & GDP (2000 to 2010)**

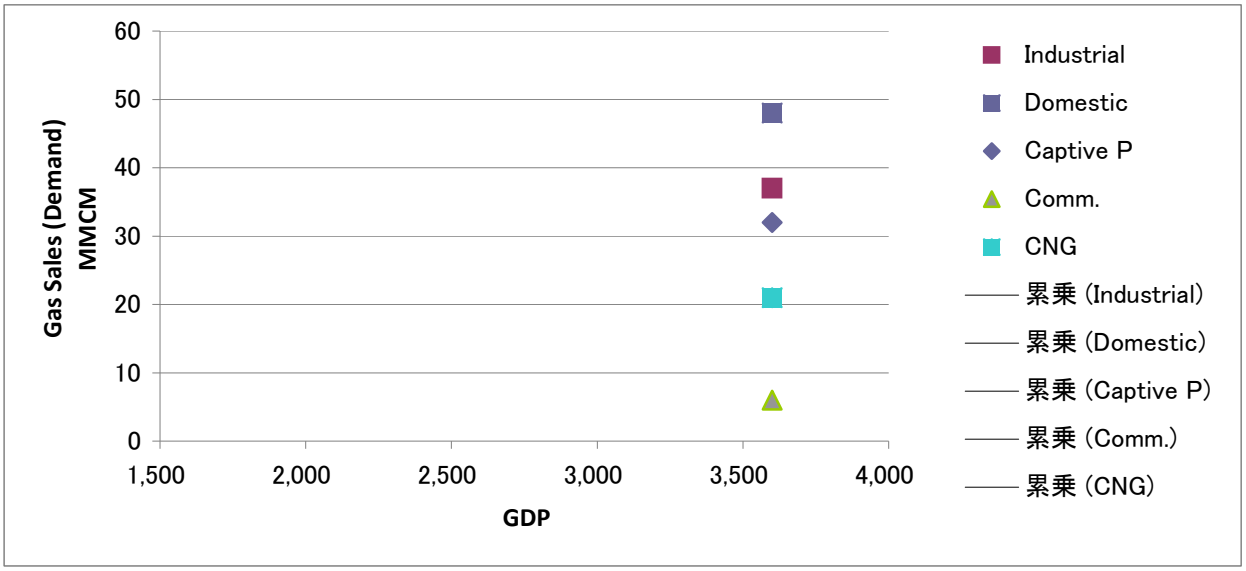
GDP: billion Taka

Gas: MMCFD

| | GDP | Industrial | Domestic | Captive P | Comm. | CNG |
|---|---|---|---|---|---|---|
| 2000 | 2,157.350 | | | | | |
| 2001 | 2,252.610 | | | | | |
| 2002 | 2,371.010 | | | | | |
| 2003 | 2,519.680 | | | | | |
| 2004 | 2,669.740 | | | | | |
| 2005 | 2,846.730 | | | | | |
| 2006 | 3,029.710 | | | | | |
| 2007 | 3,217.260 | | | | | |
| 2008 | 3,406.520 | | | | | |
| 2009 | 3,600.470 | 37 | 48 | 32 | 6 | 21 |

Since no data is available, the following data of the year 2009 in PSMP2010's is used.

A
B



## Gas Demand Calculation　　Area: BGSL

220.57002
39.8675

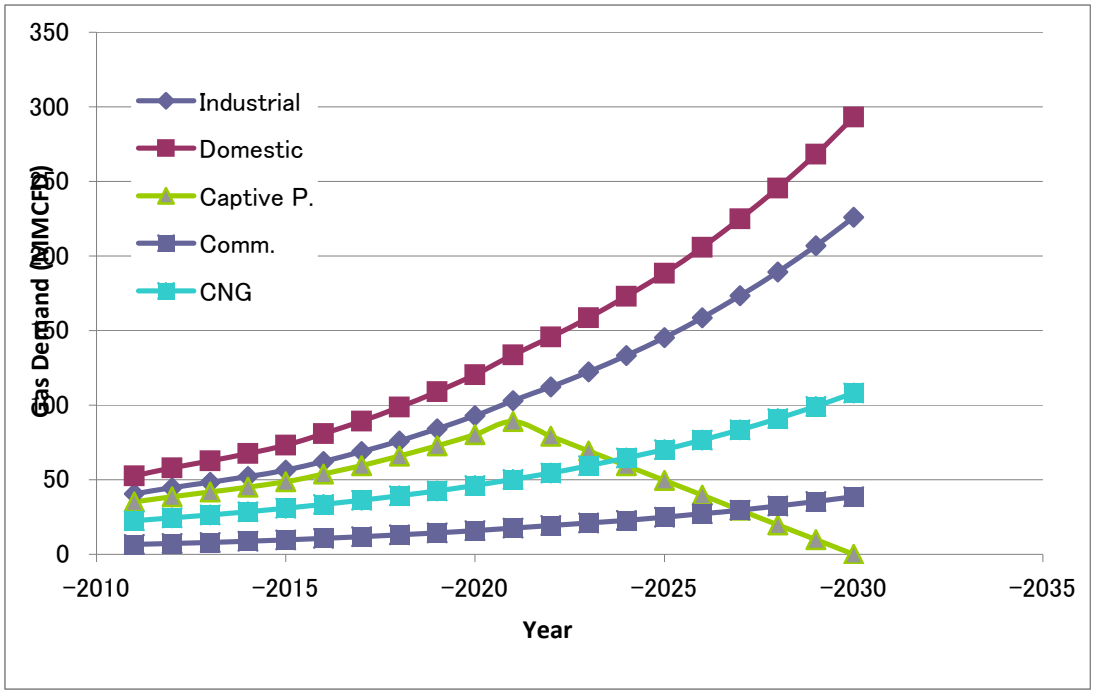
20年をピークに減少（比例直線）

適正価格への調整期間(2011-2015)において、2%の需要抑制効果

前年実績（予測）からの伸び率: GDP伸び率 × 1.5
但し、CNGのみ × 1.2

Demand in MMCFD

| Year | Industrial | Domestic | Captive P. | Comm. | CNG | Total | Demand Growth Rate |
|---|---|---|---|---|---|---|---|
| -2011 | 41 | 53 | 35 | 7 | 23 | 158 | 9% |
| -2012 | 45 | 58 | 39 | 7 | 24 | 173 | 10% |
| -2013 | 48 | 63 | 42 | 8 | 26 | 187 | 8% |
| -2014 | 52 | 68 | 45 | 9 | 29 | 202 | 8% |
| -2015 | 56 | 73 | 49 | 10 | 31 | 219 | 8% |
| -2016 | 62 | 81 | 54 | 11 | 33 | 241 | 10% |
| -2017 | 69 | 89 | 60 | 12 | 36 | 266 | 10% |
| -2018 | 76 | 99 | 66 | 13 | 39 | 293 | 10% |
| -2019 | 84 | 109 | 73 | 14 | 43 | 323 | 10% |
| -2020 | 93 | 120 | 80 | 16 | 46 | 356 | 10% |
| -2021 | 103 | 134 | 89 | 18 | 50 | 394 | 11% |
| -2022 | 112 | 146 | 79 | 19 | 55 | 411 | 4% |
| -2023 | 122 | 159 | 69 | 21 | 59 | 431 | 5% |
| -2024 | 133 | 173 | 59 | 23 | 65 | 453 | 5% |
| -2025 | 145 | 188 | 50 | 25 | 70 | 478 | 6% |
| -2026 | 159 | 206 | 40 | 27 | 77 | 508 | 6% |
| -2027 | 173 | 225 | 30 | 30 | 83 | 541 | 7% |
| -2028 | 189 | 246 | 20 | 32 | 91 | 578 | 7% |
| -2029 | 207 | 268 | 10 | 35 | 99 | 620 | 7% |
| -2030 | 226 | 293 | 0 | 39 | 108 | 666 | 7% |



## Gas Demand Calculation

Area: SGCL

y = A * x ^B  y = Sales (Demand)
x = GDP

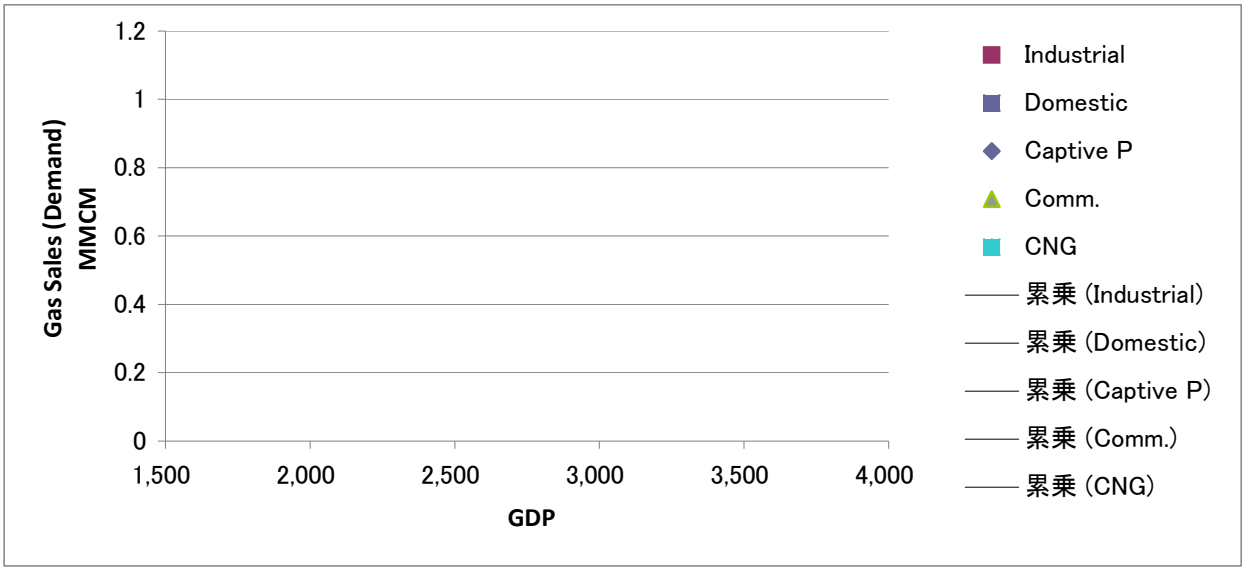
**Gas Sales & GDP (2000 to 2010)**

GDP: billion Taka

Gas: MMCFD

| | GDP | Industrial | Domestic | Captive P | Comm. | CNG |
|---|---|---|---|---|---|---|
| 2000 | 2,157.350 | | | | | |
| 2001 | 2,252.610 | | | | | |
| 2002 | 2,371.010 | | | | | |
| 2003 | 2,519.680 | | | | | |
| 2004 | 2,669.740 | | | | | |
| 2005 | 2,846.730 | | | | | |
| 2006 | 3,029.710 | | | | | |
| 2007 | 3,217.260 | | | | | |
| 2008 | 3,406.520 | | | | | |
| 2009 | 3,600.470 | | | | | |

A
B

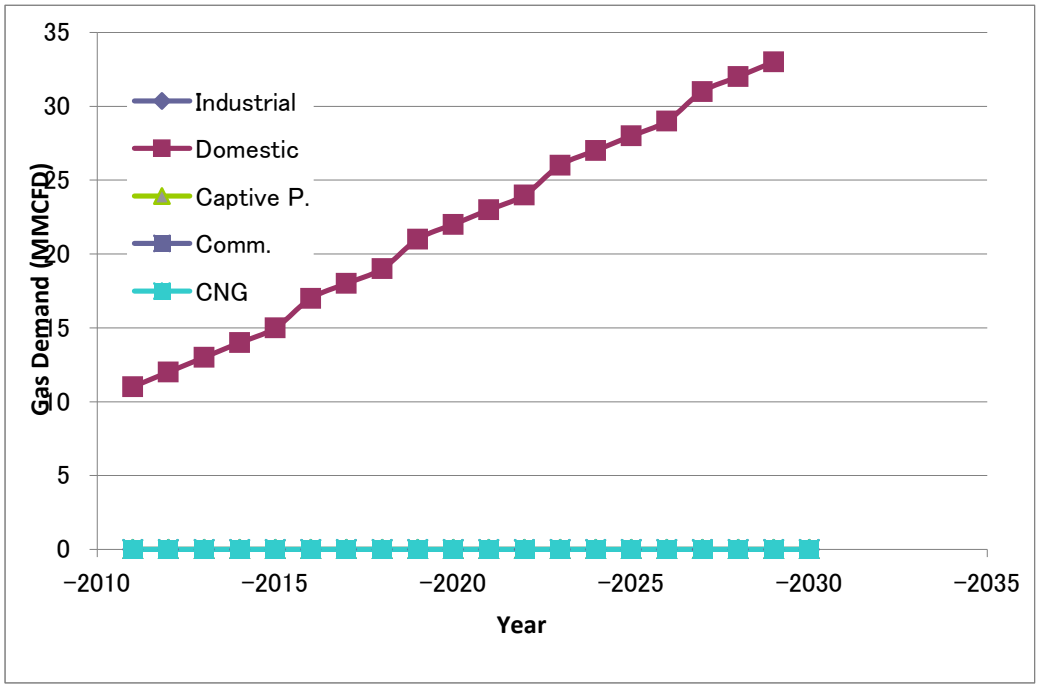


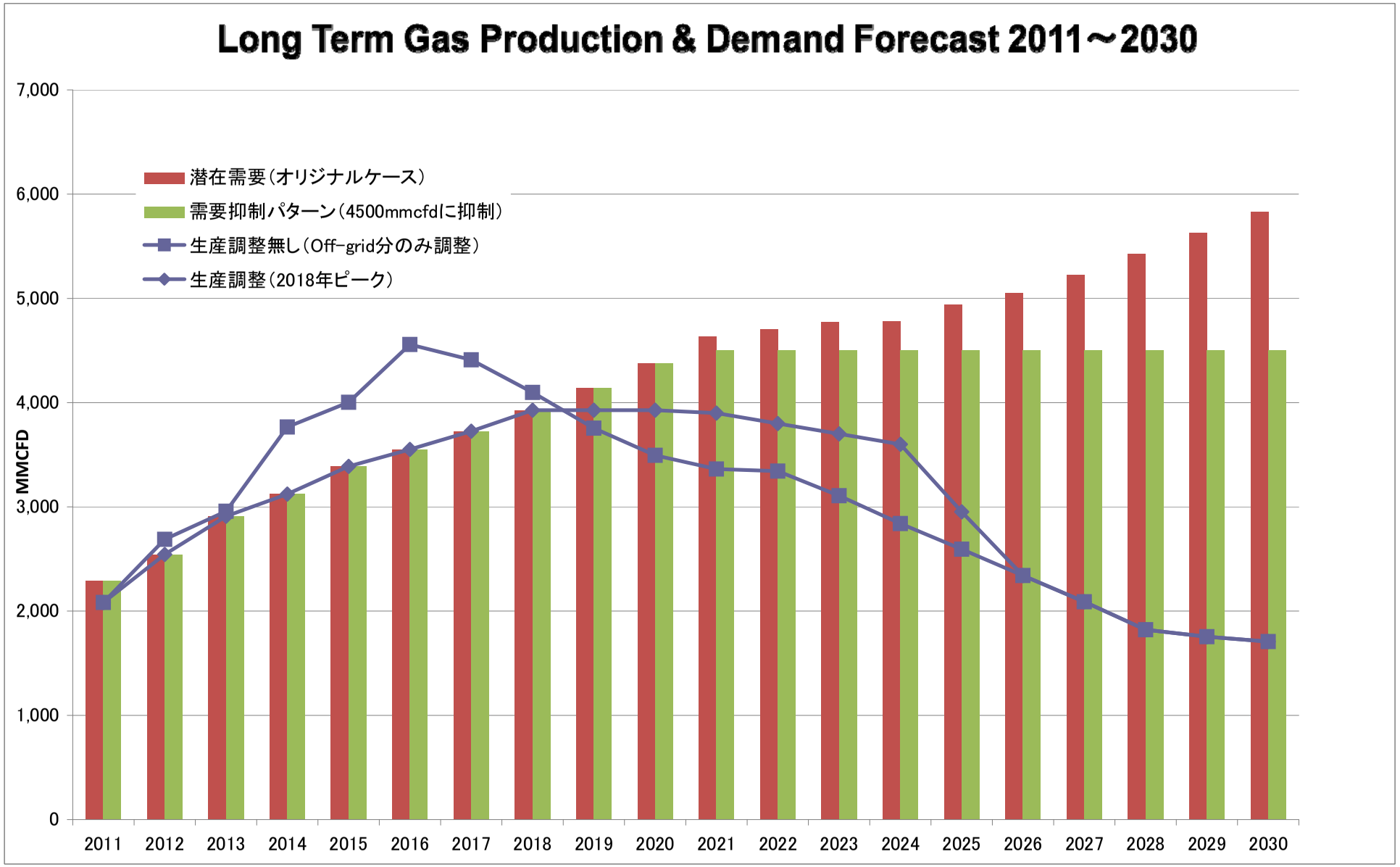
## Gas Demand Calculation Area: SGCL

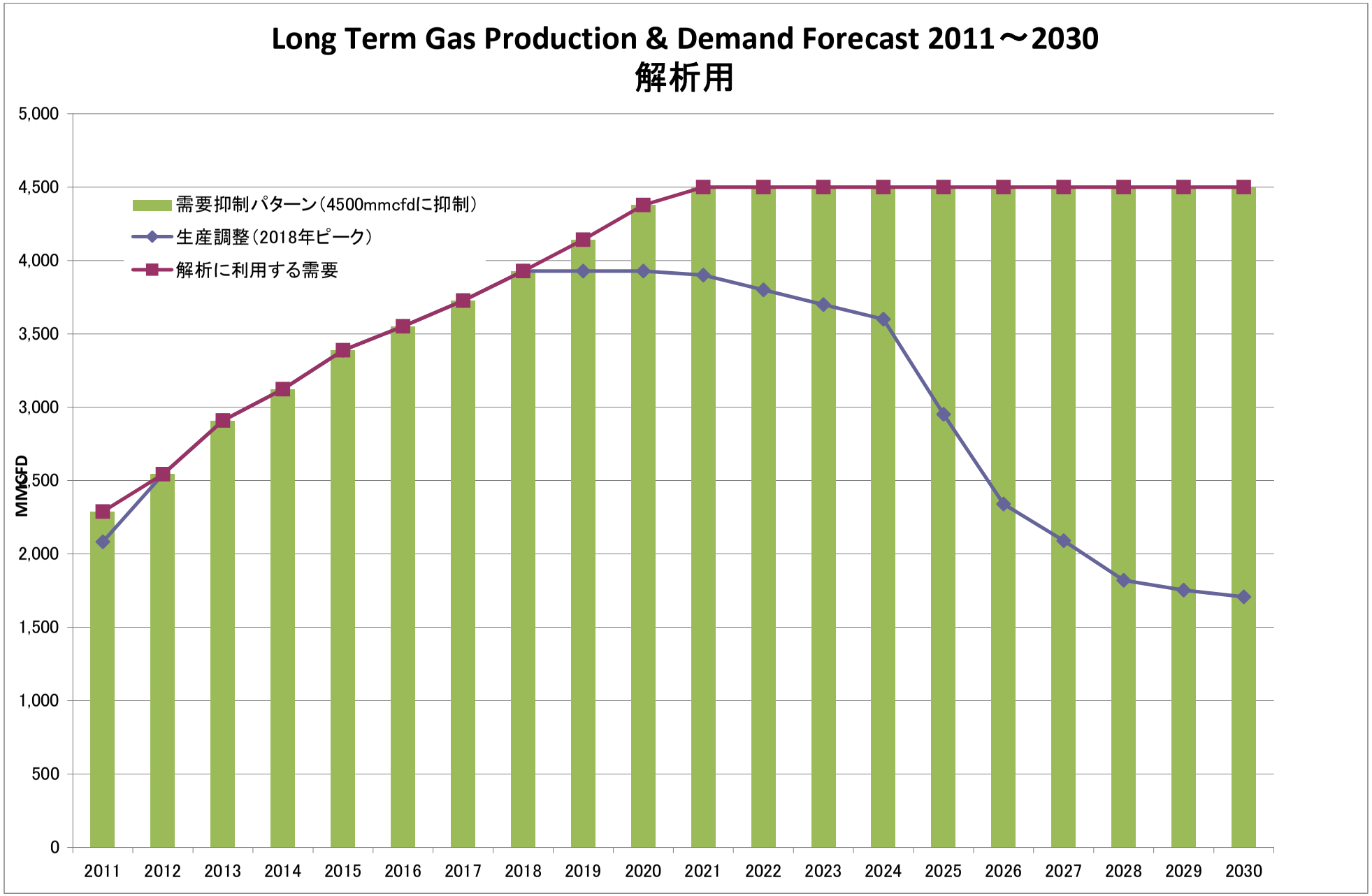
Since no data is available, Data in PSMP2010's is used.

Demand in MMCFD

| Year | Industrial | Domestic | Captive P. | Comm. | CNG | Total | Demand Growth Rate |
|---|---|---|---|---|---|---|---|
| -2011 | 0 | 11 | 0 | 0 | 0 | 11 | |
| -2012 | 0 | 12 | 0 | 0 | 0 | 12 | 9% |
| -2013 | 0 | 13 | 0 | 0 | 0 | 13 | 8% |
| -2014 | 0 | 14 | 0 | 0 | 0 | 14 | 8% |
| -2015 | 0 | 15 | 0 | 0 | 0 | 15 | 7% |
| -2016 | 0 | 17 | 0 | 0 | 0 | 17 | 13% |
| -2017 | 0 | 18 | 0 | 0 | 0 | 18 | 6% |
| -2018 | 0 | 19 | 0 | 0 | 0 | 19 | 6% |
| -2019 | 0 | 21 | 0 | 0 | 0 | 21 | 11% |
| -2020 | 0 | 22 | 0 | 0 | 0 | 22 | 5% |
| -2021 | 0 | 23 | 0 | 0 | 0 | 23 | 5% |
| -2022 | 0 | 24 | 0 | 0 | 0 | 24 | 4% |
| -2023 | 0 | 26 | 0 | 0 | 0 | 26 | 8% |
| -2024 | 0 | 27 | 0 | 0 | 0 | 27 | 4% |
| -2025 | 0 | 28 | 0 | 0 | 0 | 28 | 4% |
| -2026 | 0 | 29 | 0 | 0 | 0 | 29 | 4% |
| -2027 | 0 | 31 | 0 | 0 | 0 | 31 | 7% |
| -2028 | 0 | 32 | 0 | 0 | 0 | 32 | 3% |
| -2029 | 0 | 33 | 0 | 0 | 0 | 33 | 3% |
| -2030 | 0 | 34 | 0 | 0 | 0 | 34 | 3% |




Long Term Gas Production & Demand Forecast 2011～2030
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
MMCFD
潜在需要（オリジナルケース）
需要抑制パターン（4500mmcfdに抑制）
生産調整無し（Off-grid分のみ調整）
生産調整（2018年ピーク）
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
2026
2027
2028
2029
2030


Long Term Gas Production & Demand Forecast 2011～2030
解析用
需要抑制パターン（4500mmcfdに抑制）
生産調整（2018年ピーク）
解析に利用する需要
MMCFD
5,000
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
2026
2027
2028
2029
2030