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添付資料-1

関連諸機関との打合せメモ

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
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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	<p>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.</p> <p>(1) Petrobangla (2) BAPEX (3) BGFCL (4) SGFL (5) Niko (6) Chevron (7) Tullow (8) Santos (9) GTCL (10) JGTDCL (11) TGTDCL (12) BGSL (13) SGDCL (14) PGCL (15) KGDCL</p>	
7-3	Please fill the current implementation status of GSRR into relevant cells of " <u><i>the attached file</i></u> ".	
7-4	<p>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). "The gas sector master plan for 2005–2025 envisages investments of \$2.5 billion in exploration, field development, transmission, and distribution."</p> <p>Though we found the related description in Chapter 6.6 of the Gas Sector Strategy, the amount appears to be slightly different.</p>	

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
South Asia Sustainable 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

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.

**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:

$$\text{Average Cost of Capital} = \frac{[(\text{Equity Capital} \times \text{E}\%) + (\text{Debt Capital} \times \text{D}\%)]}{[(\text{Equity Capital} + \text{Debt Capital})]}$$

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.

Bangladesh Energy Regulatory Commission

- 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: NWPGL office

Participants: NWPGL : 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. NWPGL 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 Actual)
 - 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 bid 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
General Manager
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

No.	Inquiry	Answer
1. Organizaition/Institution		
1-1	Is the National Energy Policy 2004 available 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? - Outline Perspective Plan of Bangladesh 2010-2021 - National Strategy for Accelerated Poverty Reduction (revised) FY 2009-11 - National Energy Policy (NEP) - Gas Act 2010 - Gas Sector Reform Roadmap (GSRR) - Gas Evacuation Plan 2010-2015 (GEP) - Gas Sector Master Plan 2006 (GSRR)	NEP is the state policy. Gas Act shows the ways for distributors and consumers. GSRR is the policy roadmap approved by the government. GEP shows implementation plans. GSMP is now under review by Petrobangla. Petrobangla is not in a position to provide the latest GEP which is now renamed as "Gas Sector Strategic 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 until the gas production reaches to 2200mmcfd.

2. Natural Gas Demand		
2-1	Please provide the Annual Report of 2010 if it is already prepared. If it is not prepared, please provide the updated version of following tables shown in the Annual Report 2009. - GROWTH OF CUSTOMER BASE - 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. 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? - Rise of gas price - Gas supply deficiency - Import of LNG - Demand decrease due to restrictions (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. Holiday steggering is also being carried out in some field but not widely spread. 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 ; 1) Progress of LNG import plan (e.g. the construction of receiving terminal & necessary pipelines) 2) Information of LNG regasification terminal and associated infrastructure 3) When LNG gas available to flow to gas grid	Consultant service contract was just signed with USA consulting company. This consultant will finalize the type of regasification terminal. LNG supply will start from December 2013.
3-2	Do you plan to import the natural gas from neighboring countries ? If yes, please inform the followings; a. Importing country, b. When starts to import, c. Importing gas volume, d. Importing price, 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 ; 1) Bangladesh Gas Reserve Estimation by Gustavson Associates - Hydro Carbon Unit (HCU), MPERMR 2) Gas Evacuation Plan (2010-15)	Both documents cannot be provided because they are yet to be approved.
3-4	Please provide following information ; 1) Exploratory or development plans with CNPC 2) Exploratory or development plans with Gazprom 3) Exploratory or development plans with Sinopec For example: - Field name, duration of agreement - Terms of contract - Number of exploration or development wells drilled - Expecting production rate - Drill by their own rig or by BAPEX rig ?	No plans yet with CNPC and Sinopec. 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 ; 1) Detail of exploratory plan (Seismic work) of ConocoPhillips (DS-08-10 and DS-08-11 PSC Fields) 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. 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
 - Input/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 Sylhet 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: TGTDCCL : 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 TGTDCCL, JST directly visited TGTDCCL.
2. However managing director of TGTDCCL is out of the country, JST could not make interview to TGTDCCL.
3. The managing director will be back end of next week after JST will leave Bangladesh.
4. TGTDCCL stuff explained that all JST's required data are on the Annual Report on TGTDCCL'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
 - Input/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 200~300mmcf/d.
 - 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
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 be 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 Shinglemorning 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-UI-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 GustavsonEMRD 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 Petrobanglain 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	<p>Organization Please explain: - MoPEMR organization and the position of EMRD - EMRD's organization</p>	
2	<p>Organization Why does EMRD has several different name of organization, namely Unit, Bureau, Institute, etc. without department?</p>	
3	<p>Energy Balance Sheet Please provide us the data of Simplified Energy Balance Sheet of Bangladesh for past five years. We attached a blank table which introduced in Key World Energy Statistics by International Energy Agency.</p>	

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 Strategic 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	<u>National Energy Policy (NEP)</u> 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. Please provide us with the latest draft of the National Energy Policy. If the draft is not available please let us know the contents and the progress of updates in detail.	
Petrobangla	<u>Gas Sector Master Plan 2006 (GSMP)</u> During the last interview it was mentioned that GSMP is under review. 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	<u>Gas Sector Reform Roadmap (GSRR)</u> During the last interview we, the Survey team, requested the copy of GSRR, however we have not received it yet. 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	<u>Gas Demand</u> In recent years Bangladesh has been facing the gas supply shortage. 1) When did this shortage start? 2) How did this shortage increase? 3) How was each sector affected by this gas supply shortage? 4) What was done to restrain the demand increase so far?	
Petrobangla	<u>Energy Saving</u> 1) Why is the daylight saving time not adopted after 2009? 2) How are the actual states of the following energy saving activities mentioned in NSAPR II? - Adjusting shopping hours - Staggering holiday for industries - Creating awareness of CFL bulbs 3) Are there any other energy saving activities presently planned or already implemented?	
Petrobangla	<u>Demand & Supply Records</u> Please provide us with the past records of monthly average of gas demand and supply for last 10 years.	
Petrobangla	<u>Alternative Energy</u> 1) Coal Please provide us with the English version of Draft Coal Policy which is presently available in Petrobangla's web site. When will the Coal Policy be finalized?	
Petrobangla	<u>LNG import</u> Please explain the current plan in detail. Who is responsible for LNG import in the energy sector?	
Petrobangla	<u>Coal import</u> Who will be responsible for Coal import? (not for brick field, as alternative fuel to natural gas)	
Petrobangla	<u>Development Plan</u> Please let us know the development plans with CNPC, Gazprom and Sinopec.	
Petrobangla	<u>Offshore Bidding Round 2011</u> Please let us know the progress and timing.	
Petrobangla	<u>Organization</u> 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	<u>Management plan for the profit and loss</u> Please explain the management plan for the profit and loss during past period and future.	
Petrobangla	<u>Gas Meter</u> 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	<u>Privatization</u> Please explain about the privatization plan of Petrobangla and group enterprises.	
Petrobangla	<u>Bureau of Mineral Development</u> Why does not Bureau of Mineral Development (BMD) take responsibility of two mining enterprises?	
Petrobangla	<u>Subsidy</u> Please provide the governmental subsidy on natural gas sector by item for past five years in Table.	
Petrobangla	<u>"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)</u> Please explain the progress of the above TA and provide us with the related data if possible.	

ADB	<u>Gas Meter</u> Please let us know the present state of gas meter installation project.	
BPC	<u>Alternative Energy</u> 1) Petroleum Products Please let us know the concrete plans and actual progress of: - Increase of fuel oil import as an alternative to natural gas - Strengthening storage & distribution capacity of fuel oil 2) LPG Please let us know: - The present state of LPG import by BPC as well as private companies. - The concrete plan for the promotion of LPG usage and its progress.	
Power Div.	<u>Alternative Energy</u> 1) Renewable Energy 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	<u>Gas Supply to Siddhirganj Power Plant</u> What is the gas requirement and actual gas supply to Siddhirganj 2x120MW Power Plant?	
BPDB	<u>Power Generation Long Term Plan</u> 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	<u>Nuclear Power Plant</u> Please brief the plan for nuclear power plants by Russia at Rooppur.	
BAPEX	<u>GDF</u> How much GDF does BAPEX need for the development of natural gas meet with demand?	
BERC	<u>Organization</u> Please explain the exact position of BERC in the energy sector, such as the relationship with EMRD and Power Division.	
BERC	<u>Gas Tariff</u> How do you set the gas tariff for considering the governmental subsidy?	
EMRD	<u>Organization</u> Please explain: - MoPEMR organization and the position of EMRD - EMRD's organization	
EMRD	<u>Organization</u> Why does EMRD has several different name of organization, namely Unit, Bureau, Institute, etc. without department?	
EMRD	<u>Energy Balance Sheet</u> Please provide us the data of Simplified Energy Balance Sheet of Bangladesh for past five years. We attached a blank table which introduced in Key World Energy Statistics by International Energy Agency.	
HCU	<u>Reserve Estimation</u> 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 descriptions and figures, tables on material balance analysis and production simulation of the above fields. 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	<u>Energy Balance Sheet</u> Please provide us the data of Simplified Energy Balance Sheet of Bangladesh for past five years. We attached a blank table which introduced in Key World Energy Statistics by International Energy Agency.	
JETRO	Please let us know about: - Industrial condition in Bangladesh - Trend of local and foreign investment in Bangladesh - Trend of local and foreign investment especially in the gas sector	
BOI	Please let us know about: - Industrial condition in Bangladesh - Trend of local and foreign investment in Bangladesh - Trend of local and foreign investment especially in the gas sector - Companies who shows the interest in the natural gas transport and distribution projects, if any. - Companies who shows the interest in the LNG receiving terminal and regasification project, if any.	
BEPZA	Please let us know about: - Industrial condition in Bangladesh - Trend of local and foreign investment in Bangladesh - 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	<p>Gas Supply to Siddhirganj Power Plant What is the gas requirement and actual gas supply to Siddhirganj 2x120MW Power Plant?</p>	
2	<p>Power Generation Long Term Plan 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.</p>	
3	<p>Nuclear Power Plant Please brief the plan for nuclear power plants by Russia at Rooppur.</p>	

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 TGTDC, 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	<p>Alternative Energy 1) Petroleum Products Please let us know the concrete plans and actual progress of:</p> <ul style="list-style-type: none"> - Increase of fuel oil import as an alternative to natural gas - Strengthening storage & distribution capacity of fuel oil <p>2) LPG Please let us know:</p> <ul style="list-style-type: none"> - The present state of LPG import by BPC as well as private companies. - 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-officio, 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-officio, 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
- Director, 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
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1. Organaization/Institution

Not Applicable

2. Natural Gas Demand

Not Applicable

3. Natural Gas Exploration, Production and Import

3-1	<p>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 ;</p> <ol style="list-style-type: none"> 1) Moulavi Bazar 2) Jalalabad 3) Bibiyana 4) Anyother prospects <p>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.</p> <p>A2. To increase production of Bibiyana to more than 1,000 mmcf, Do you have any more bottlenecks even after install pipelines and compression station ?</p> <p>B. Please provide information for the gas augumentation plan for Short term (Up to 2013) and Mid Term (Up to 2015) as described on "GAS EVACUATION PLAN (2010-15)" - number of wells for new development, work-over, expected production rate, completion date, etc.</p> <p>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.</p>	
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4. Natural Gas Transmission

4-1	Please provide the latest GAS SUPPLY PROJECTION at each gas input points preferably up to 2030.	
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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: <ol style="list-style-type: none"> (1) Profit/income & expenditure long term plan (2) Operation & maintenance long term plan (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 signed 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.

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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

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Minutes of Meeting

Date: 20 November 2011

Time: 11:30~

Venue: WB office

Participants: WB : Mr. Md. Iqbal
Senior Energy Specialist
South Asia Sustainable Development
: Mr. Zahid Hussain
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.

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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.

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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

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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 TGTDCCL 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	<p>Gas Meter</p> <p>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.</p> <ul style="list-style-type: none"> - Remote sensing metering system for industrial consumers - Prepaid metering system for domestic consumers 	<p>The contract for consultancy service was signed on 14 Jun 2011. Bid documents for Turn-key contract is under preparation. Though there is no change for the scope of Project, the details/progress of Project must be confirmed to TGTDCCL. (Iwamoto wrote: This Project is explained as "Supply Efficiency Improvement project" in Page 39 of TGTDCCL annual report.)</p>
2	<p>Gas Pipeline</p> <p>Is there a plan to assist the construction of the following gas transmission pipelines?</p> <ul style="list-style-type: none"> - Dhanua to Elenga, 30-inch, approximately 52km - West Bank of Jamna Bridge to Naika, -inch, approximately km 	<p>So far, ADB has no plan to assist those gas pipelines. 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.</p>

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 Please explain the exact position of BERC in the energy sector, such as the relationship with EMRD and Power Division.	
2	Gas Tariff 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 Coats" 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)



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)

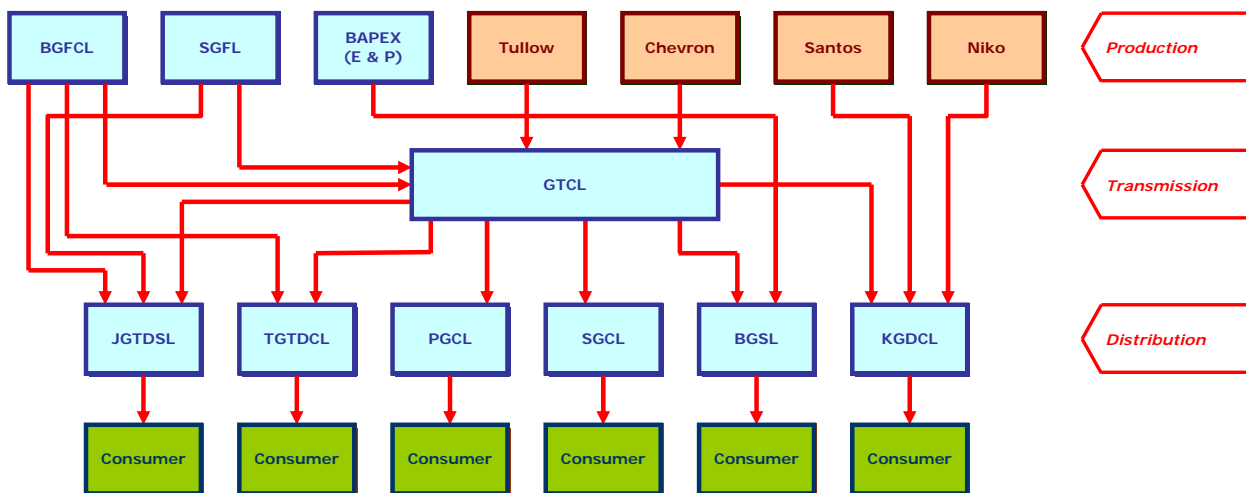
JST presented the list of upcoming pipelines for GTCL's confirmation (see Appendix 4) prepared according to the information collected during the 1st survey in Bangladesh, and GTCL made some corrections (see Appendix 5).

This minutes prepared by JST.

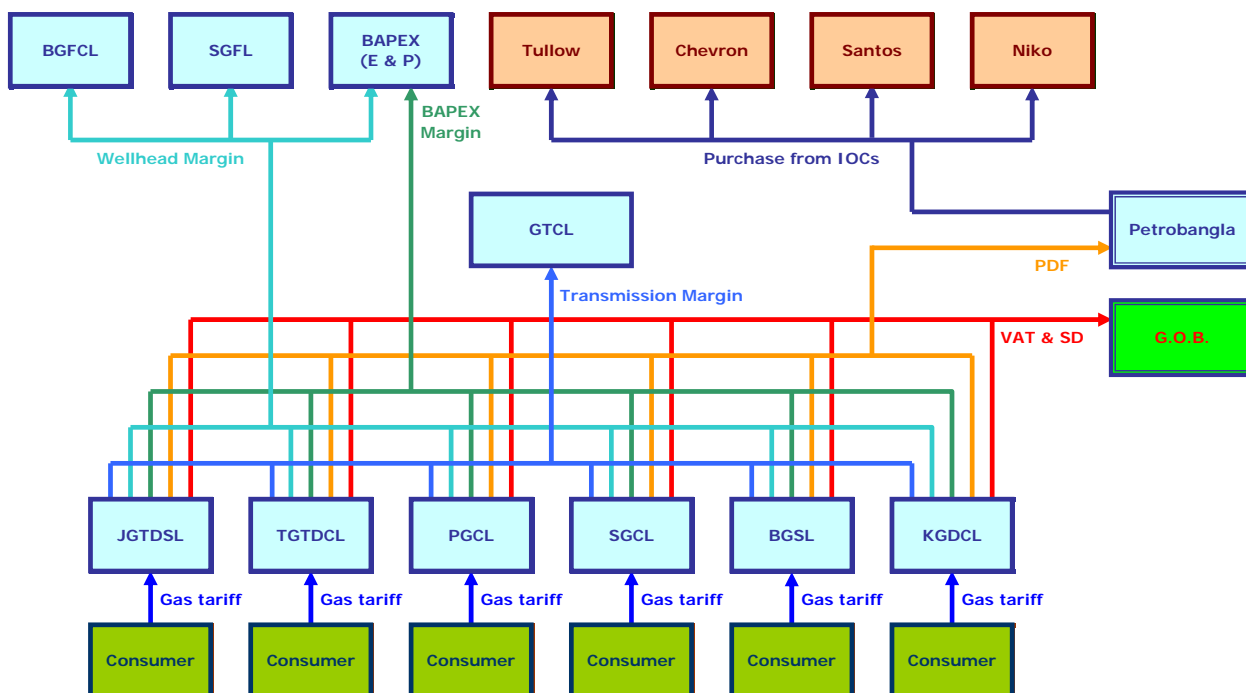
To be confirmed with GTCL

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)

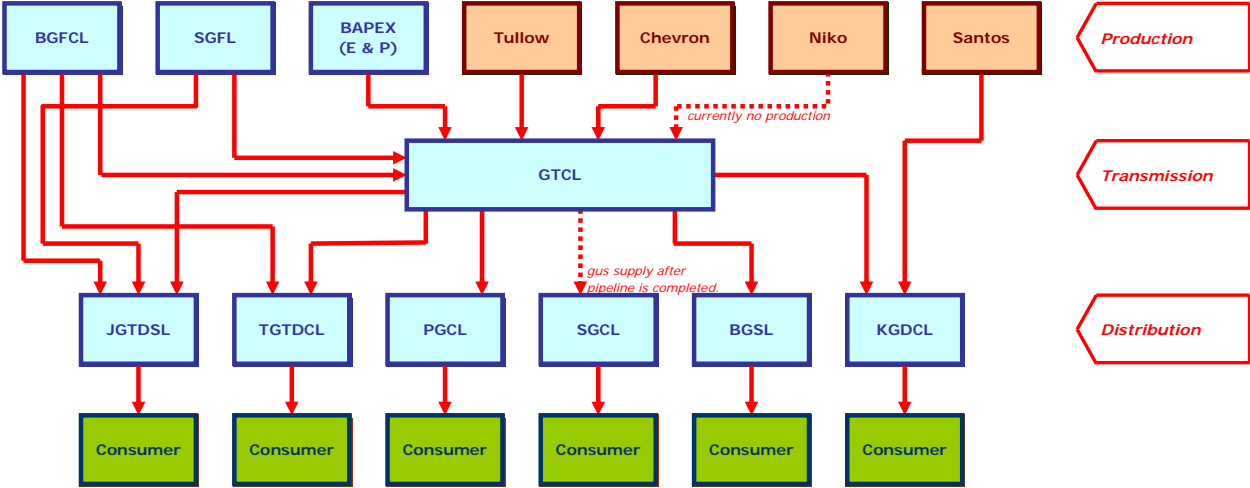
Gas Flow



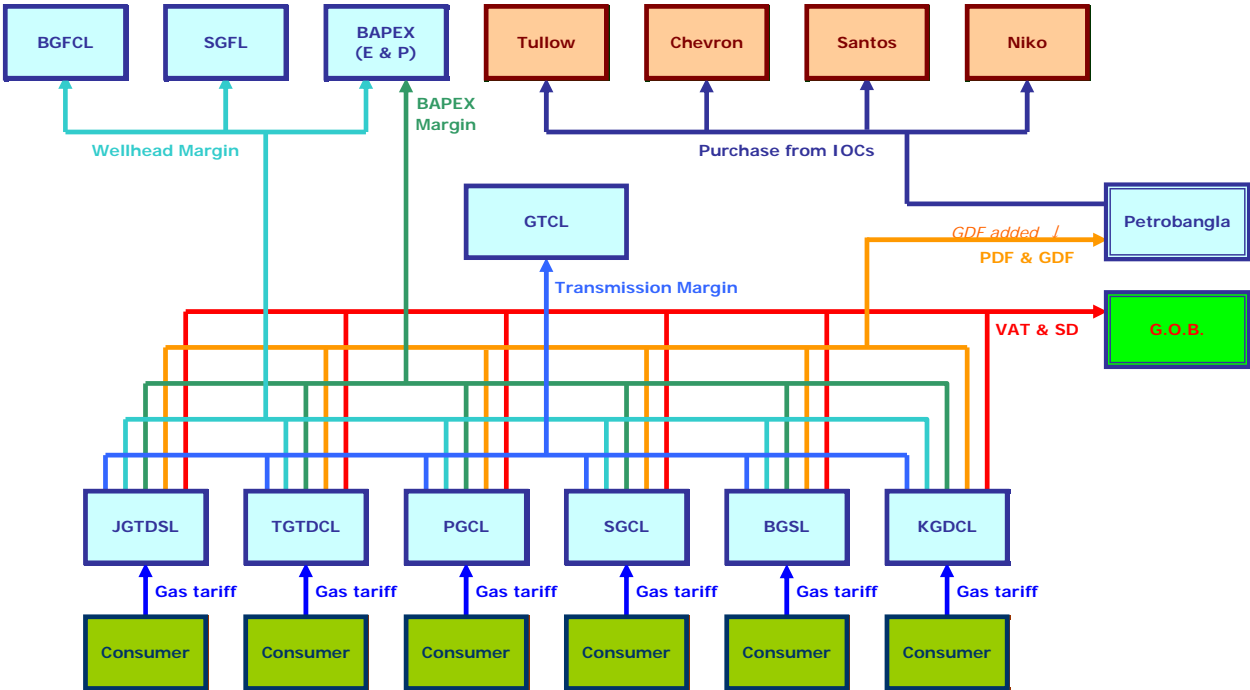
Financial Flow



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 - Bakhrabad 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 – Elega	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	Accroding 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 TGTDCCL. Mr. Molla advised JST to visit TGTDCCL office on the same day while he make a telephone call to TGTDCCL'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

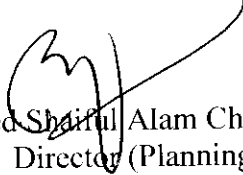
Subject: Answers to the JICA's Questionnaire during their 2nd Survey in
Bangladesh.

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,

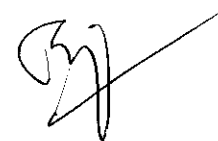
Yours Sincerely,


(Mohammed Shaiful Alam Chowdhury)
Director (Planning)

Enclosure: As above

1	National Energy Policy (NEP) 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. Please provide us with the latest draft of the National Energy Policy. 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) During the last interview it was mentioned that GSMP is under review. 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 Support, (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) During the last interview we, the Survey team, requested the copy of GSRR, however we have not received it yet. 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 In recent years Bangladesh has been facing the gas supply shortage. 1) When did this shortage start? 2) How did this shortage increase? 3) How was each sector affected by this gas supply shortage? 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 1) Why is the daylight saving time not adopted after 2009? 2) How are the actual states of the following energy saving activities mentioned in NSAPR II? - Adjusting shopping hours - Staggering holiday for industries - Creating awareness of CFL bulbs 3) Are there 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 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 1) Coal Please provide us with the English version of Draft Coal Policy which is presently available in Petrobangla's web site. 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 Please explain the current plan in detail. 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 Who will be responsible for Coal import? (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 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 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 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 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: - FY 2006-07 : 74,286.73 Lakh Taka - FY 2007-08 : 160,873.05 Lakh Taka - FY 2008-09 : 177,398.24 Lakh Taka - FY 2009-10 : 177,622.09 Lakh Taka - FY 2010-11 : 214,895.00 Lakh Taka
14	Gas Meter 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 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 Why does not Bureau of Mineral Development (BMD) take responsibility of two mining enterprises?	In concerns EMRD

17	<p>Subsidy Please provide the governmental subsidy on natural gas sector by item for past five years in Table.</p>	<p>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.</p>
18	<p>"TA to review the approach for increasing the efficiency of gas utilization in certain major users" with financial assistance from Japan Debt Cancellation Fund (JDCE) Please explain the progress of the above TA and provide us with the related data if possible.</p>	<p>Described in Annex-A</p>



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: TGTDC's office

Participants: TGTDC : 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 TGTDC and requested their answers.
3. TGTDC 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 Projectthat 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 upcoming 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	<p>Organization Please explain: -MoPEMR organization and the position of EMRD -EMRD's organization</p>	
2	<p>Organization Why does EMRD has several different name of organization, namely Unit, Bureau, Institute, etc. without department?</p>	
3	<p>Energy Balance Sheet Please provide us the data of Simplified Energy Balance Sheet of Bangladesh for past five years. We attached a blank table which introduced in Key World Energy Statistics by International Energy Agency.</p>	
4	<p>Energy Mix 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)</p>	<p>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.</p>
5	<p>National Energy Policy (NEP) 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. Please provide us with the latest draft of the National Energy Policy. If the draft is not available please let us know the contents and the progress of updates in detail.</p>	<p>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.</p>
6	<p>Alternative Energy 1) Coal Please provide us with the English version of Draft Coal Policy which is presently available in Petrobangla's web site. When will the Coal Policy be finalized?</p>	<p>Coal policy is not approved yet, therefore it cannot be provided.</p>
7	<p>Bureau of Mineral Development Why does not Bureau of Mineral Development (BMD) take responsibility of two mining enterprises?</p>	
8	<p>Current Status of ADB TA 7758 Please provide us with the current status of ADB Technical Assistance (TA 7758) named as "Tariff Reform and Inter-sectoral Allocation of Natural Gas".</p>	<p>No activity on this project so far.</p>
9	<p>Information of Ongoing and Planned Projects 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.</p>	<p>List of on going projects are shown in the Petrobangla's latest annual report. There is no list of planned project at this moment.</p>

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: TGDCL office
Participants: TGDCL : 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. TGDCL verbally answered to the questionnaire which was given to TGDCL at last meeting on 01/Dec as attached.
2. JST presented and outlined the Main points of Draft Final Report, and requested TGDCL to provide the written comments by 15/Dec. TGDCL agreed to send their comments to JST by the said date.

This minutes prepared by JST

Questionnaire to TGTDCCL for the 2nd Survey in Bangladesh

No.	Question	Answer
1	<p>Gas Meter</p> <p>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.</p> <ul style="list-style-type: none"> - Remote sensing metering system for industrial consumers - Prepaid metering system for domestic consumers 	<p>Latest status of the projects is mentioned in the new annual report 2010-2011.</p>
2	<p>Gas Stove</p> <p>"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.</p>	<p>There is no movement on this plan so far.</p>
3	<p>System Loss</p> <p>Please let us know:</p> <ul style="list-style-type: none"> - Detail of Gas System Loss Reduction Plan (GSLRP) - Present system loss 	<p>GSLRP is outlined in the annual report 2010-2011.</p> <p>Status of the present system loss is "System Gain" mainly due to following reasons:</p> <ul style="list-style-type: none"> - Low pressure situation causes less supply than billing volume - Less consumption than the minimum charge volume
4	<p>Annual Reports</p> <p>Please provide the previous annual reports since 2006.</p>	<p>Latest annual report 2010-2011 was provided to JST.</p>
5	<p>Gas-Price-Distribution</p> <p>Please provide us a table of detailed current "Gas-Price-Distribution-between Government and Petrobangla" including VAT, SD, PDF-Margin, BAPEX-Head Margin, etc..</p>	
6	<p>Redefining the franchise areas</p> <p>Please let us know the present state of the activity for the proposal to form three companies dividing TGTDCCL.</p>	<p>There is no movement on this plan so far.</p>
7	<p>Off-loaded shares</p> <p>How many percent of shares are off-loaded?</p>	<p>25% of the shares were already off-loaded, and another 10% will be off-loaded soon.</p>

添付資料-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. Strengthen the policy formulation and monitoring capacity of the Planning Cell of EMRD.	2006	EMRD	Notification on Planning Cell	Better management of gas sector policy
	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 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 2005	EMRD Government/ERC	Notification by EMRD	An environment conducive to private investment and a competitive market
Ensuring efficient and economic use of natural gas in safe and sustainable manner	Gas Transmission Company Limited (GTCL) will submit its proposal to ERC. ERC holds first hearing. Finalize and approve the Gas Act that would regulate transmission and distribution of natural gas, ensure private sector participation (PSP) including offloading shares.	2006 2005-2006	GTCL/ERC EMRD	Approved tariff Approved Gas Act	Market-oriented energy pricing Effective natural gas resource management and promotion of competitiveness
Access to gas infrastructure	EMRD to develop rules and regulations for PSP Identify facilities specifically for gas transmission and distribution that could be undertaken by PSP under different modalities.	2005-2006 2006-2007	EMRD EMRD	Relevant rules Investment guidelines	Reduction of market dominance 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. Obtain inputs from energy sector in a participatory manner.	2005-2008 2006-2009	PB EMRD	Private sector investment proposals Energy policy	Optimal development through private sector participation 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
Expanding natural gas access to more urban and rural areas	Expand natural gas network to cover less developed region. Develop a framework to expand the gas networks on an economically, financially, and socially acceptable manner.	2006-2010 2005-2007	Petrobangla /GTCL SGCs	Network plans Network expansion plans	Regional economic development Extending the gas network in a market-friendly manner
E. Corporate Governance					
Flexibility and commercial focus	Operate commercially and independently as per Companies' Act. Review the Government's dividend policy for gas sector companies.	2005-2006 2005	Petrobangla /SGCs EMRD/Ministry of Finance (MOF)	SGC board decisions New dividend guidelines	Enhanced management capabilities Efficient and financially sound gas companies Goal-oriented management
	Empower gas sector entities to adequately undertake all operational and financial activities, including decision making for investment budgets. Rationalize and limit participation of individuals in multiple boards to promote intercompany interactions in a commercial manner.	2007-2008 2005-2006	EMRD/ Petrobangla Petrobangla	Operational guidelines Board guidelines	Dynamic decision making in response to changing reforms in the market and the economy Sound financial management
Improving commercial operation	Establish board-level audit, compensation, and investment committees. The Government should gradually move toward providing independence to gas sector companies in determining compensation structures. Reduce accounts receivable from public and private consumers to no more than 3 months.	2006 2005 2006-2007	SGCs EMRD/MOF SGCs	Board guidelines Guidelines for benefits Financial statements	Improved management Improved performance and financial management
Reducing system loss	Establish cost centers for activities of BAPEX such as drilling, seismic surveys, gas development, and a promotion exploration. Develop and implement a comprehensive action plan to minimize system loss in distribution and transmission. Establish proper and transparent accounting for system losses.	2006 2005-2007	BAPEX Petrobangla /SGCs	Annual report System loss reduction plan	Improved operational efficiency 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 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 Establish into three and two separate companies TGTDCL and BGSL, respectively, to decrease system losses and improve management efficiency.	Ongoing basis 2006	Petrobangla /SGCs EMRD/ Petrobangla TGTDCL BGSL	Institutional structure Restructured companies	Improved sector efficiency Improved performance
G. Private Sector Participation Institutional reforms and creating a competitive market Promoting private sector involvement in gas sector development	Petrobangla to perform as a single buyer to buy gas from each field monthly, blend prices, and sell gas to distribution companies. 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. Develop and implement a time-bound action plan for off-loading shares of gas sector companies.	2007-2008 2005-2007 2005-2007	Petrobangla EMRD/ Petrobangla SGCs Petrobangla /GTCL and other SGCs	Gas pricing Private sector financing of gas projects Shareholding of SGCs	Transparency in gas costing, financial planning, and pricing policy formulation Reduced dependence on government funds 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. 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 2005-2007	EMRD/ERC BAPEX ERC	Pricing notifications Pricing notifications	Exploration activities through revenue earnings 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. Outline a time-bound plan for institutional restructuring of Petrobangla including reviewing the Petrobangla Act. Implement the institutional restructuring program for Petrobangla.	2005-2006 2005-2006 2007-2009	EMRD/ Petrobangla EMRD/ Petrobangla EMRD/ Petrobangla	Revised structure Restructured entities Restructured entities	Diversification of ownership and management Diversification of ownership and management Diversification of ownership and management

Source: Ministry of Power, Energy and Mineral Resources.

添付資料-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**

AS

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 TGTDCCL by TGTDCCL.

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. 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. 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 TGDCL, 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 TGTDCCL 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 TGTDCCL 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 (TGTDCCL) and Bakhrabad Gas Systems Limited (BGSL) for unbundling into three and two companies, respectively.	Establish TGTDCCL and BGSL into three and two companies respectively	2011	PB/SGCs EMRD/ TGTDCCL/ BGSL	Bifurcating BGSL (including a part of TGTDCCL franchise area) two companies namely KGDCL & BGDCL has been functioning. The other proposal to form three companies dividing TGTDCCL 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	<p>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 TGTDC). 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.</p> <p>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</p>

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Reform Area/Objective	Agenda	Time Frame	Responsible Authority	Status as on 16-02-2011
				<p>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.</p> <p>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.</p> <p>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.</p> <p>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.</p> <p>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.</p> <p>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</p>

Reform Area/Objective	Agenda	Time Frame	Responsible Authority	Status as on 16-02-2011
				<p>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:</p> <ul style="list-style-type: none"> 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. 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. 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. iv. Ensure Petrobangla dealing of PSC issues with effective delegations. v. Major human resource development need to be executed to equip Petrobangla effectively supervise and manage PSCs and its inter-companies co-ordination. <p>However, all the above issues need government's thorough review and decision, in principle.</p>

AKG

添付資料-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

1. Introduction :

1.1 This report has been prepared jointly by Petrobangla, GTCL and TGTDCI 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 TGTDCI 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.

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

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

(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 TGTDCCL 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 JGTDCCL 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. TGTDCCL	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. TGTDCCL	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
Sub-total (I) :			158			
II. Mid Term Programme (Up to Dec 2013)						
A. Petrobangla Companies						
1	Kapasias # 1	Mar-11	15	BAPEX	Exploration	
2	Srikait # 2	Feb-11	15	BAPEX	Exploration	
3	Mubarakpur # 1	Sep-11	15	BAPEX	Exploration	
4	Salda # 4	Mar-11	15	BAPEX	Appri/Dev	
5	Fenchuganj # 5	Aug-11	20	BAPEX	Appri/Dev	
6	Titas # 17	Jun-11	25	BGFCL	Appri/Dev	
7	Titas # 18	Nov-11	25	BGFCL	Appri/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, Kailashilla & 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.

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	Kapasias # 1	BAPEX	Mar-11	15
4	Mubarakpur # 1	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
Petrobarangia Fields:													
Titas	420	408	428	453	478	573	578	578	578	578	578	578	678
Halganj	240	240	260	260	260	260	260	260	260	260	260	260	260
Rashidpur	53	49	48	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	18	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
Saldia	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
Surdalpur	0	0	15	15	15	15	15	15	15	15	15	15	15
Shikail	0	0	0	15	15	15	15	15	15	15	15	15	15
Kapasala	0	0	0	15	15	15	15	15	15	15	15	15	15
Mubarakpur	0	0	0	15	15	15	15	15	15	15	15	15	15
Sub-total:	957	927	1055	1125	1185	1340	1340	1340	1340	1340	1360	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
Bihiyana	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	1058	1095	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	1985	2153	2253	2493	2738	3288	3338	3388	3638	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	578	578	678
Habiganj	240	240	200	200	200	200	200	200	200	200	200	200	200	200	200
Rashidpur	53	49	49	49	84	84	84	84	84	84	84	84	84	84	124
Fenchuganj	32	25	45	45	65	65	65	65	65	65	65	65	65	65	65
Kailashtila	74	74	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	33	33
Salda	11	8	23	38	38	38	38	38	38	38	38	38	38	38	38
Bakhrabad	34	36	36	36	36	56	56	56	56	56	56	56	56	56	56
Meghna	0	0	15	15	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	15	15
Srikail	0	0	0	15	15	15	15	15	15	15	15	15	15	15	15
Kapasia	0	0	0	15	15	15	15	15	15	15	15	15	15	15	15
Mubarakpur	0	0	0	0	15	15	15	15	15	15	15	15	15	15	15
Sub-total :	899	873	918	988	1048	1203	1203	1203	1203	1203	1203	1203	1203	1203	1373
IOC Fields:															
Jalalabad	230	130	130	130	230	230	230	230	230	230	230	230	230	230	380
Moulvibazar	75	60	60	90	120	160	160	160	160	160	160	160	160	160	360
Bibiyana	600	716	716	716	766	816	816	726	776	826	876	926	976	1026	1026
Bangura	100	120	120	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	2	2
Sangu (South)	0	0	30	30	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	0	0	200
Block-7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sub-total:	1008	1028	1058	1088	1268	1358	1318	1268	1318	1368	1518	1668	1818	2118	
LNG (Import)															
	0	0	0	0	0	0	0	500	500	500	500	500	500	500	500
Total :	1907	1901	1976	2076	2316	2561	2971	3021	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	

Table - 4 : GAS BASED POWER STATIONS -- TENTATIVE RETIREMENT SCHEDULE

Date : 20 June 2010
 Generation: MW
 Gas Cons.:MMSCFD

(Source: BRDD)

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)									
	Yr. Installed	2010									
	Installed Cap.	55									
	Current Gen.	55									
	Gas Cons.	15.5									
BGSJ+KGCL	Name										
	Yr. Installed										
	Installed Cap.										
	Current Gen.										
	Gas Cons.										
JGTDCL	Name	Kumargaon (Rental)									
		2008									
		48									
		12.5									
	Yr. Installed	Shahjibazar									
		1964									
		60									
		38									
	Installed Cap.	9									
Current Gen.	2010										
	50										
Gas Cons.	50										
	10										
Name	Shahjibazar (Rental)										
	2008										
	50										
	13										
Yr. Installed	Bogra(Rental)										
	2010										
	20										
	20										
Installed Cap.	4										
Current Gen.											
Gas Cons.											
Name	Bhola (Rental)										
	2009										
	35										
	35										
Yr. Installed	8										
Installed Cap.											
Current Gen.											
Gas Cons.											
Total Capacity to be retired	36										
	98										
Total Gas consumption to be	35										
	8										
	55										
	70										
	14										
	110										
	22										
	96										
	25										
	502										
	119										

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) TGTDCCL												
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
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(D) PG&L

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/SG&L

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/JGTCL/SGCL)

(Unit: MMSCFD)

	Existing met	Existing un-net	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	1205	1096	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	149	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
JGTDCCL															
Power (grid)	81	0	81	44	125	125	124	124	230	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
FGCL															
Power (grid)	43	29	70	0	69	69	69	101	101	104	150	150	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	19	63	66	66	136	136	136	136
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	137	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	1860	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 Directorate of BPDB.

2. Non-bulk load comprises demands of residential, commercial, industrial, captive power and CNG customers.

3. Non-bulk demands in TGTDCL, BGSL, JGTDCCL & FGCL 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)

	Dec-10	Jun-11	Dec-11	Jun-12	Dec-12	Jun-13	Dec-13	Jun-14	Dec-14	Jun-15	Dec-15
Production											
Existing Production											
Petrobranga	927	1055	1125	1185	1340	1340	1340	1340	1350	1350	1520
IOC	1068	1098	1128	1308	1448	1498	1548	1698	1848	1998	2298
Total Production	1995	2153	2253	2493	2788	2838	2888	3038	3198	3348	3818
Demand											
Power (grid)	945	1023	1023	1090	1265	1541	1733	1863	1841	1841	1841
Power (Pvt. Non-grid)	45	70	70	70	70	70	70	70	70	70	70
Fertilizer	283	283	283	283	283	283	283	283	283	283	283
Non-bulk	1098	1243	1299	1357	1421	1488	1565	1638	1716	1880	1968
Total Demand	2371	2619	2675	2800	3038	3382	3651	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	-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	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 / Etenga	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
Jhinaldah	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
Khuina	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

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
Cornilla	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

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
Cornilla	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

TABLE - B(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
VSA-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
JGTDCL										
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
Cornilla	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

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	3745
4. Supply-Demand gap	-466	-307	-94	-324	-292	156
(1) - (2) :	-204	-27	245	47	107	572
(1) - (3) :						
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.	<p>Khatihata to Bhadugar B Baria (Titus gas fields area) 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 Chabaria tie-in point) Consultancy None</p>		To evacuate gas from Titus 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.
2.	<p>Maheshkhali to Fouzdarhat Chittagong 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</p>		To evacuate gas from imported LNG receiving point at Maheshkhali 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.
3.	<p>Dhanua to Elenga Gazipur & Tangail 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</p>		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.
4.	<p>Bangabandhu Bridge West End to Naika Sirajganj 30 inch ND X 14 km Design Capacity 700 MMSCFD River Crossing None M & R Station None Consultancy None</p>		To ensure de-bottlenecking of the upstream and downstream capacities due to non-existence of Bangabandhu Bridge West End to Naika pipeline section in order to ensure unrestricted evacuation.	GTCL	Dec-13	133.00	63.20	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).

Sl No.	Description of Facilities to be developed		Objective	Executing Agency	Required Completion	Estimated Cost (Crore taka)			Financing	Project Status
						Total	LC	FC		
5.	<p>Langalband-Maowa-Jajira Narayanganj, Munshiganj & Shariatpur 30 inch ND X 60 km 3 nos. 30 inch X total length 2500 m HDD + Padma Bridge Section 30 inch ND X 9 km 2 nos (1 at Maowa and 1 at Jajira) Bridge section of the pipeline will be covered under the services of the project consultant of the main bridge to be engaged by BBA.</p>		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 project on a deposit work basis to be reimbursed by GTCL.	The project comprises three parts. Langalband 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).
6.	<p>Jalalabad GF to Kailashtila Sylhet 14 inch ND X 18 km 200 MMSCFD None None None</p>		The existing production capacity of 230 MMSCFD at Jalalabad GF will be fully evacuated after Murchal Compressor station is commissioned 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	35.00	54.00	Under PSC agreement	Envisaged from the simulation exercise. To be pursued under PSC Agreement.
7.	<p>Bibiyana GF to Dhanua Habiganj, Kishoreganj & Gazipur 30 inch ND X 150 km 700-800 MMSCFD 3 nos 30 inch ND X total length 2500 m HDD 1 no Required (Expatriate)</p>		Upto nearly 800 MMSCFD as against 730 MMSCFD current production at Bibiyana GF will be fully evacuated after Murchal, Ashuganj & Elega 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.

Sl No.	Description of Facilities to be developed		Objective	Executing Agency	Required Completion	Estimated Cost (Crore taka)			Financing	Project Status
						Total	LC	FC		
8.	Mubarakpur GF to Baghabari Pabna & Sirajganj 12 inch ND X 30 km 100 MMSCFD 1 no 12 inch ND X 500 m HDD 1 no M & R Station Consultancy None		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 preparation of PDPP will be completed within September 2010.
9.	Kapasia GF to Anraid Gazipur 12 inch ND X 4 km 100 MMSCFD None 1 no M & R Station Consultancy None		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 preparation of PDPP will be completed within September 2010.
10.	Sundaipur GF to Feni Feni & Noakhali 12 inch ND X 30 km 100 MMSCFD None 1 no M & R Station Consultancy None		To create connectivity for the evacuation of 15 MMSCFD gas production from Sundaipur GF (under exploration) with Bakhrabad-Chittagong pipeline.	GTCL	Dec-10	135.00	54.00	81.00	Not yet decided	Preliminary survey and preparation of PDPP will be completed within September 2010.
11.	Monohordi to Joydevpur Narsingdi & Gazipur 20 inch ND X 52 km 300 MMSCFD 3 nos. 20 inch ND X total length 150 1 nos M & R Station Consultancy None		To ensure increase gas supply towards Gazipur, Tongi, Savar & Kallakoir industrial belts under TGTDCI 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 preparation of PDPP will be completed within December 2010.
12.	Moulvibazar GF to Muchai Moulvibazar 14 inch ND X 22 km 200 MMSCFD None None None Consultancy None		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.
Total						6315.00	2633.40	3681.60		

添付資料-5

需要予測根拠資料

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 TGTDCCL

(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

$$y = A * x ^B$$

$y = \text{Sales (Demand)}$
 $x = \text{GDP}$

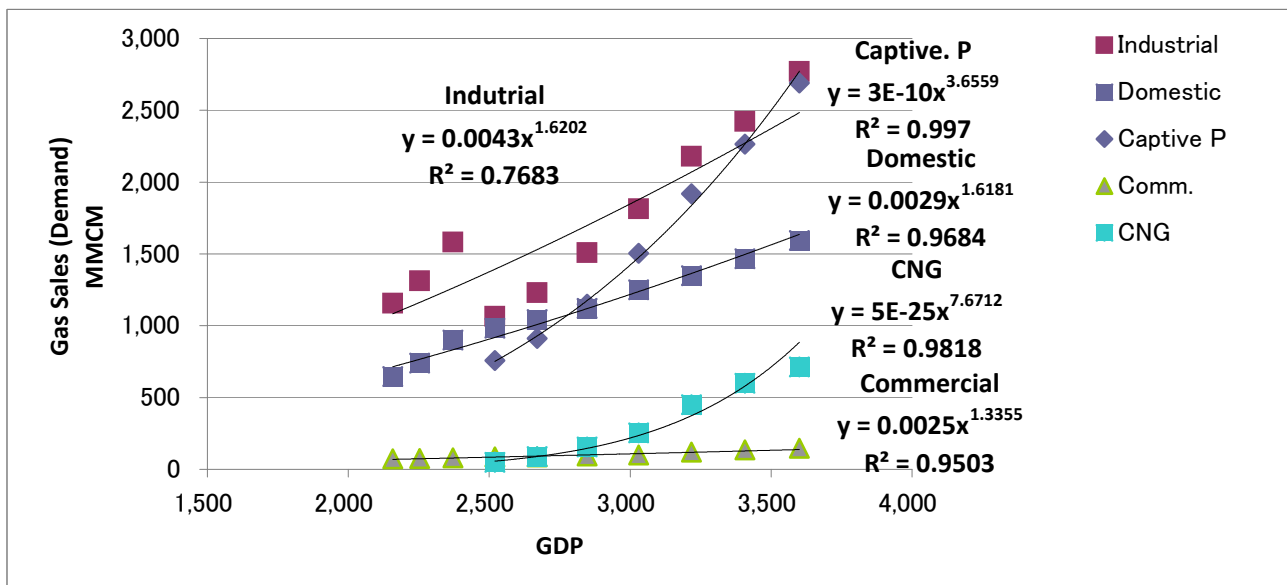
Gas Sales & GDP (2000 to 2010)

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

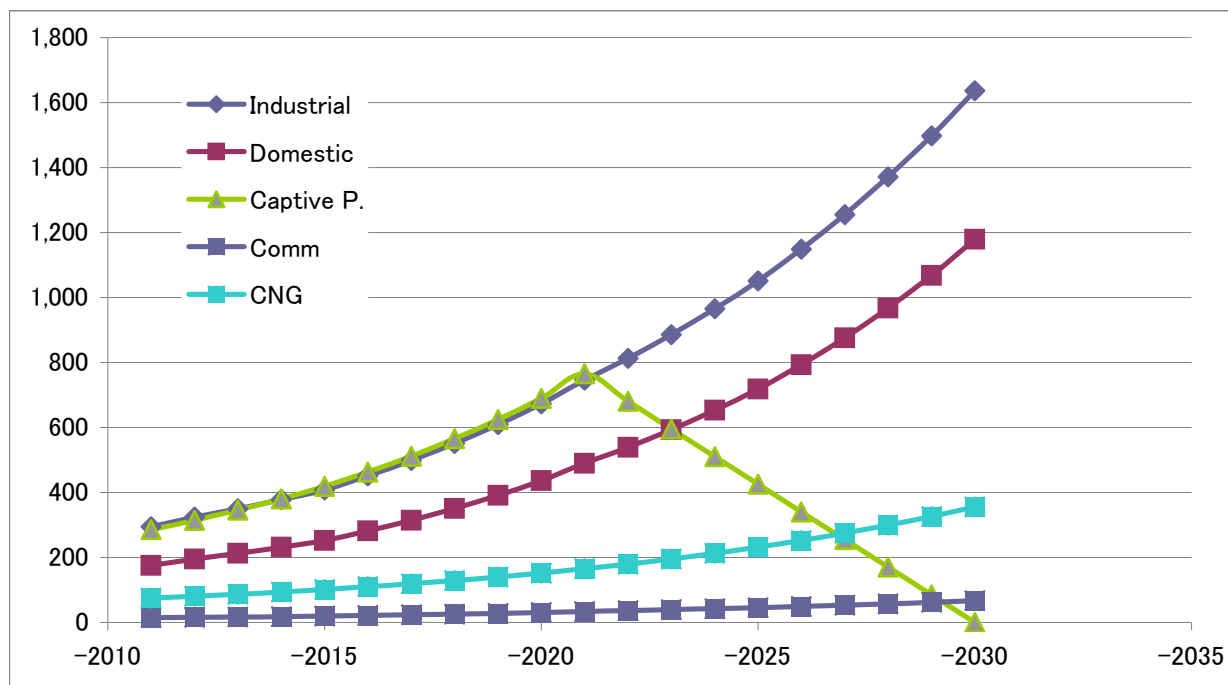


Gas Demand Calculation

Area: TGTDCCL

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

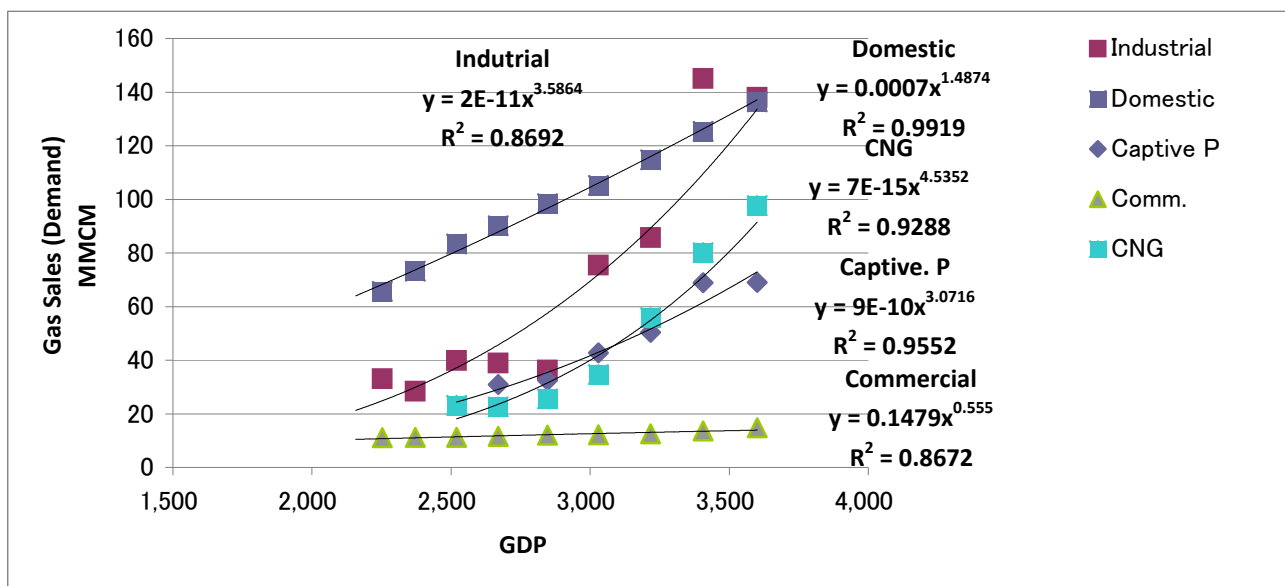
$$y = A * x ^ B$$

$y = \text{Sales (Demand)}$
 $x = \text{GDP}$

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

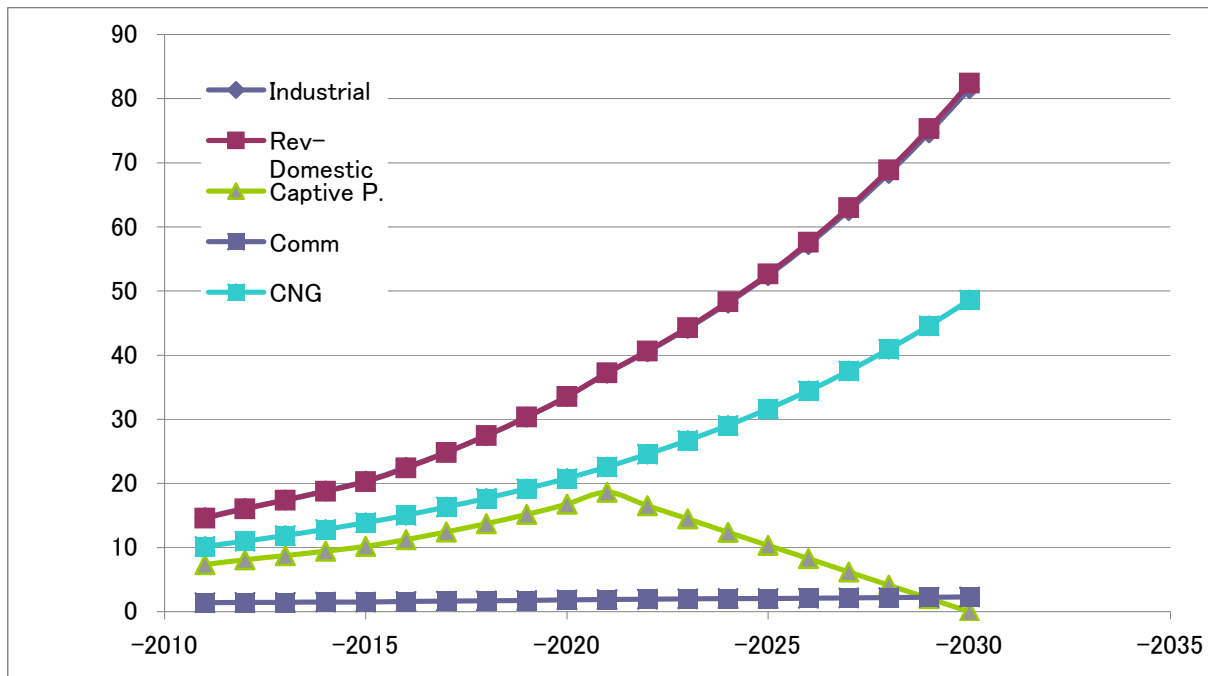


Gas Demand Calculation

Area: JGTDSL

Demand in MMCFD

Year	Industrial	Rev-Domestic Captive P.	Comm	CNG	Total	Demand Growth Rate
-2011	15	15	7	1	48	9%
-2012	16	16	8	1	53	9%
-2013	17	17	9	1	57	8%
-2014	19	19	9	1	61	8%
-2015	20	20	10	2	66	8%
-2016	22	22	11	2	73	10%
-2017	25	25	12	2	80	10%
-2018	27	27	14	2	88	10%
-2019	30	30	15	2	97	10%
-2020	34	34	17	2	106	10%
-2021	37	37	19	2	118	10%
-2022	41	41	17	2	124	6%
-2023	44	44	14	2	132	6%
-2024	48	48	12	2	140	6%
-2025	52	53	10	2	149	7%
-2026	57	58	8	2	160	7%
-2027	63	63	6	2	171	7%
-2028	68	69	4	2	184	8%
-2029	75	75	2	2	199	8%
-2030	82	82	0	2	215	8%



Gas Demand Calculation

Area: PGCL

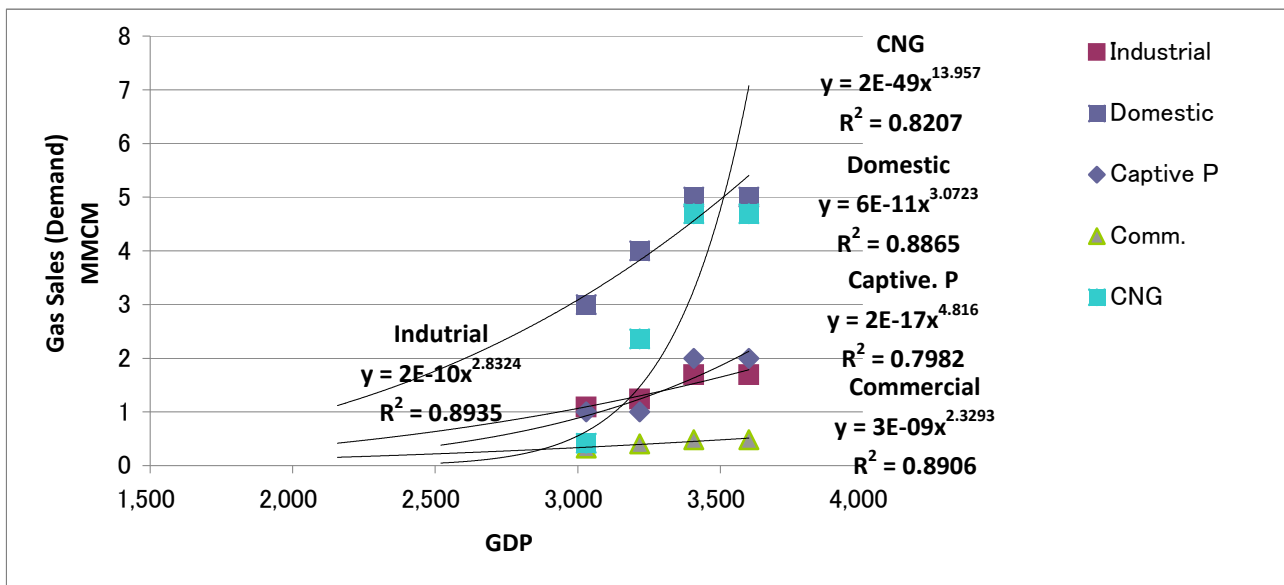
$$y = A * x ^ B$$

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

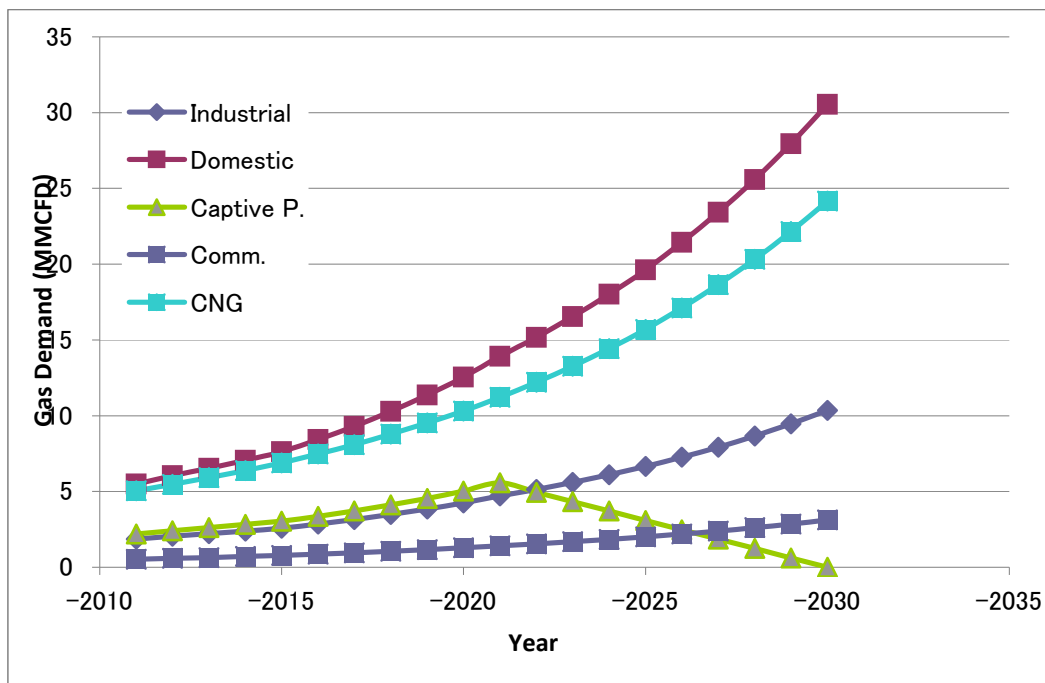
Area: PGCL

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

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

$$y = A * x ^ B$$

$y = \text{Sales (Demand)}$
 $x = \text{GDP}$

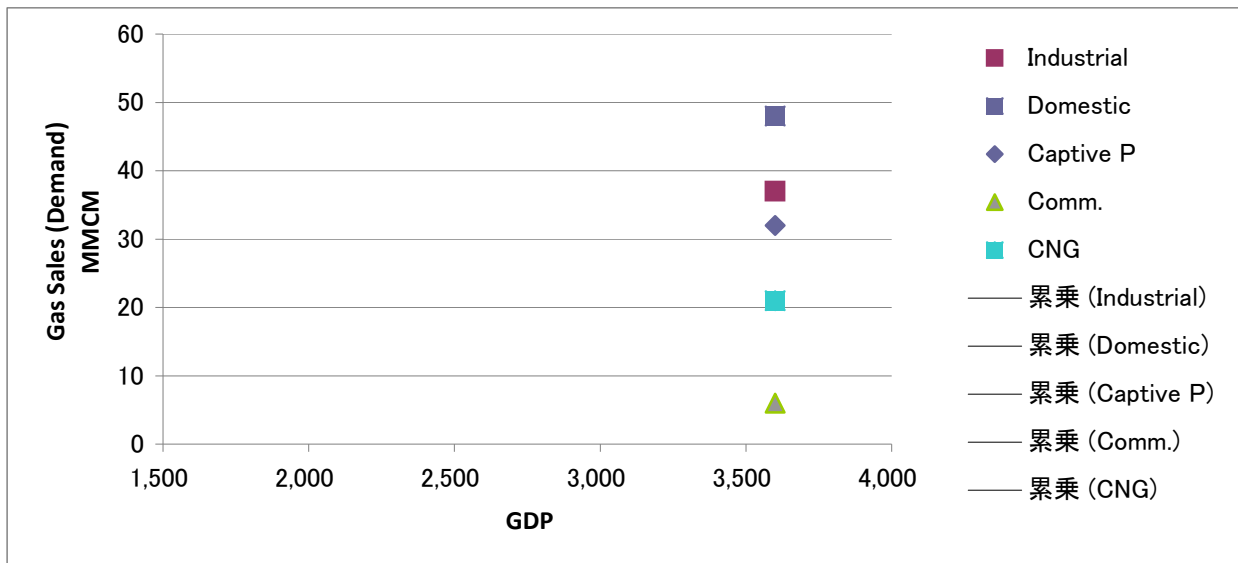
Gas Sales & GDP (2000 to 2010)

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

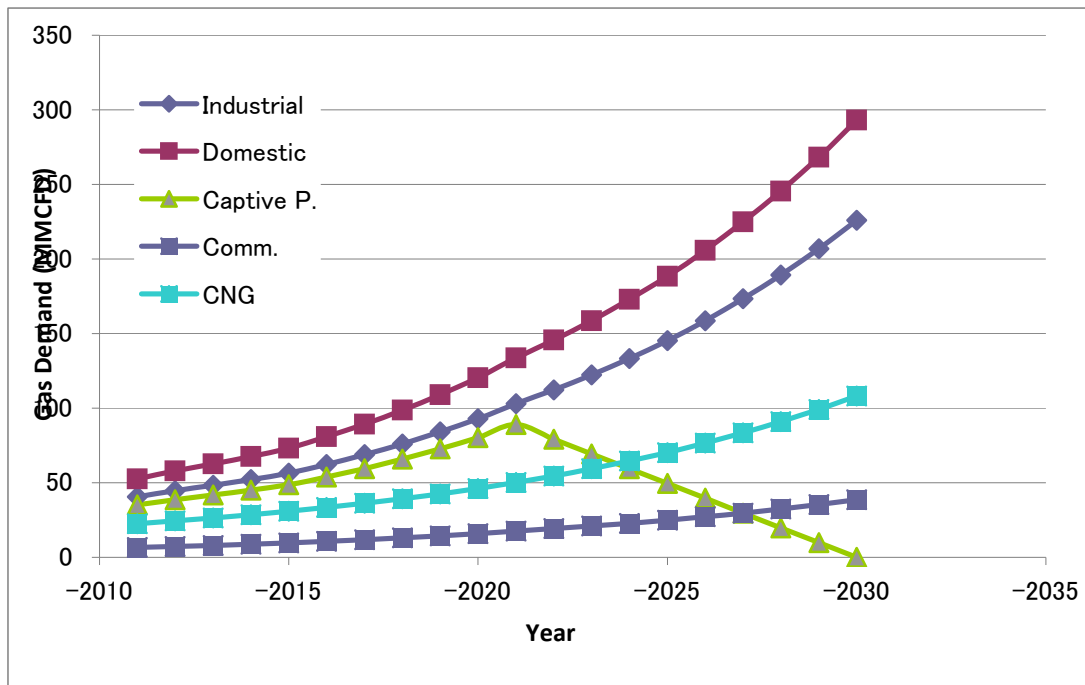
220.57002
39.8675

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

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

$$y = A * x ^ B$$

$y = \text{Sales (Demand)}$
 $x = \text{GDP}$

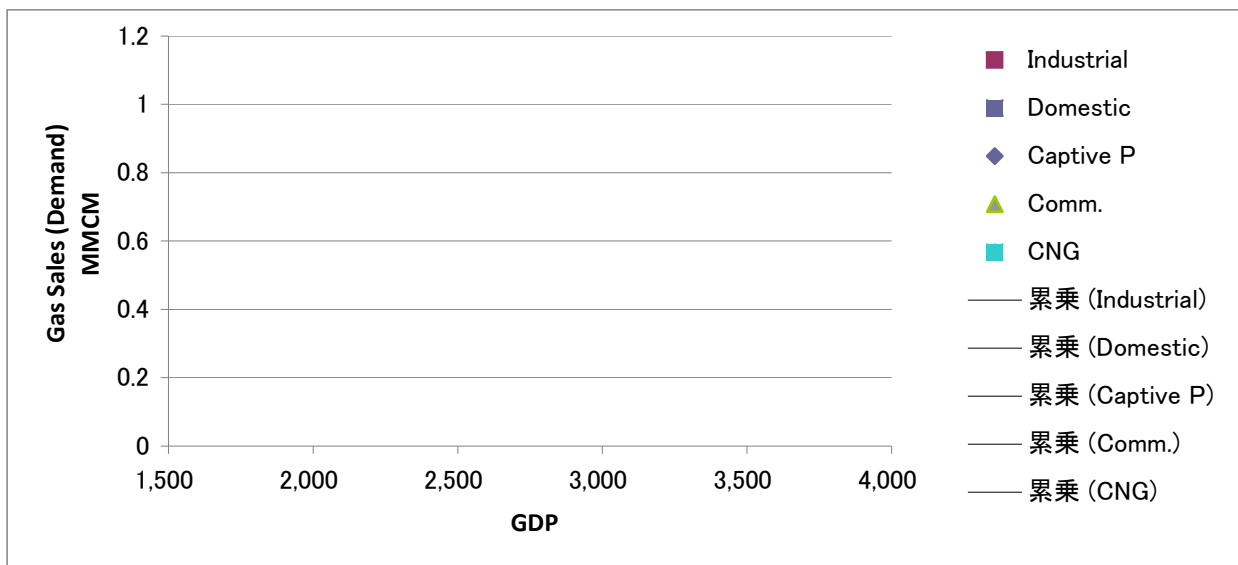
Gas Sales & GDP (2000 to 2010)

	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					

GDP: billion Taka

Gas: MMCFD

A
B



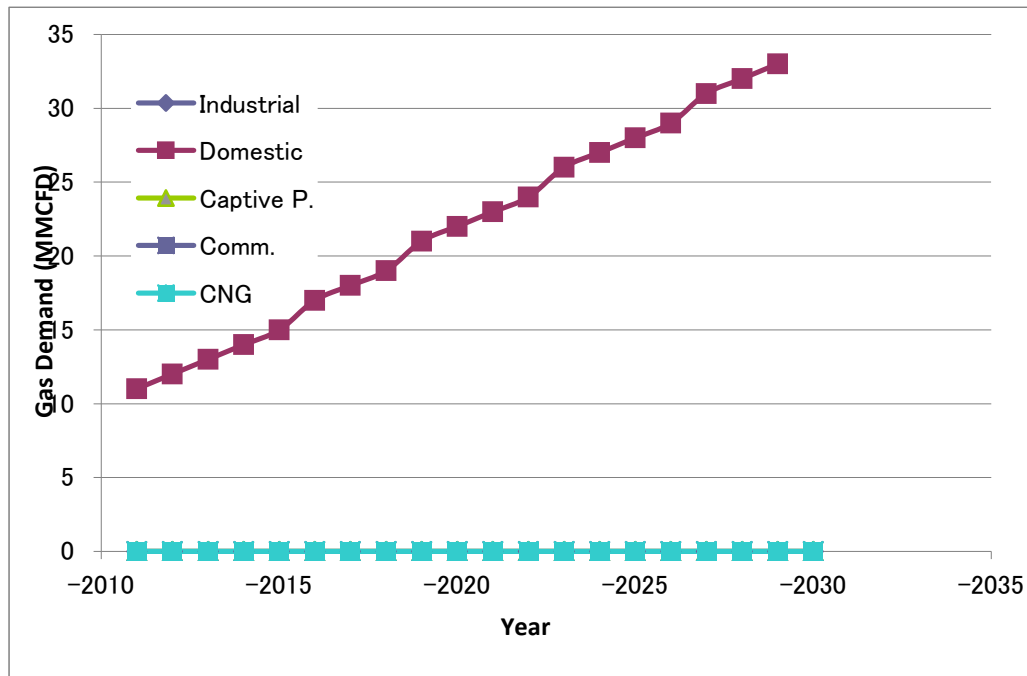
Gas Demand Calculation

Area: SGCL

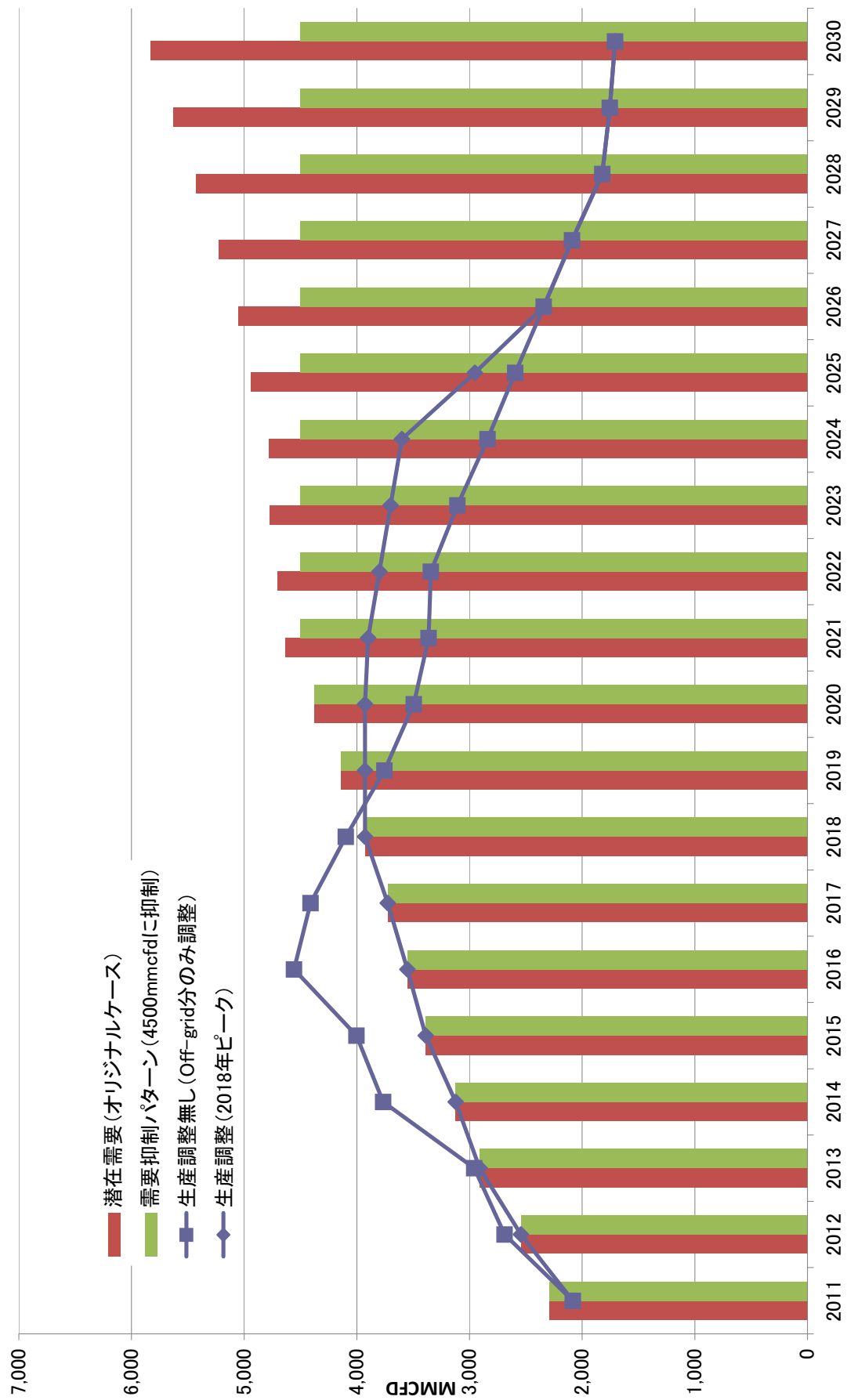
Since no data is available, Data in PSMP2010's is used.

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%

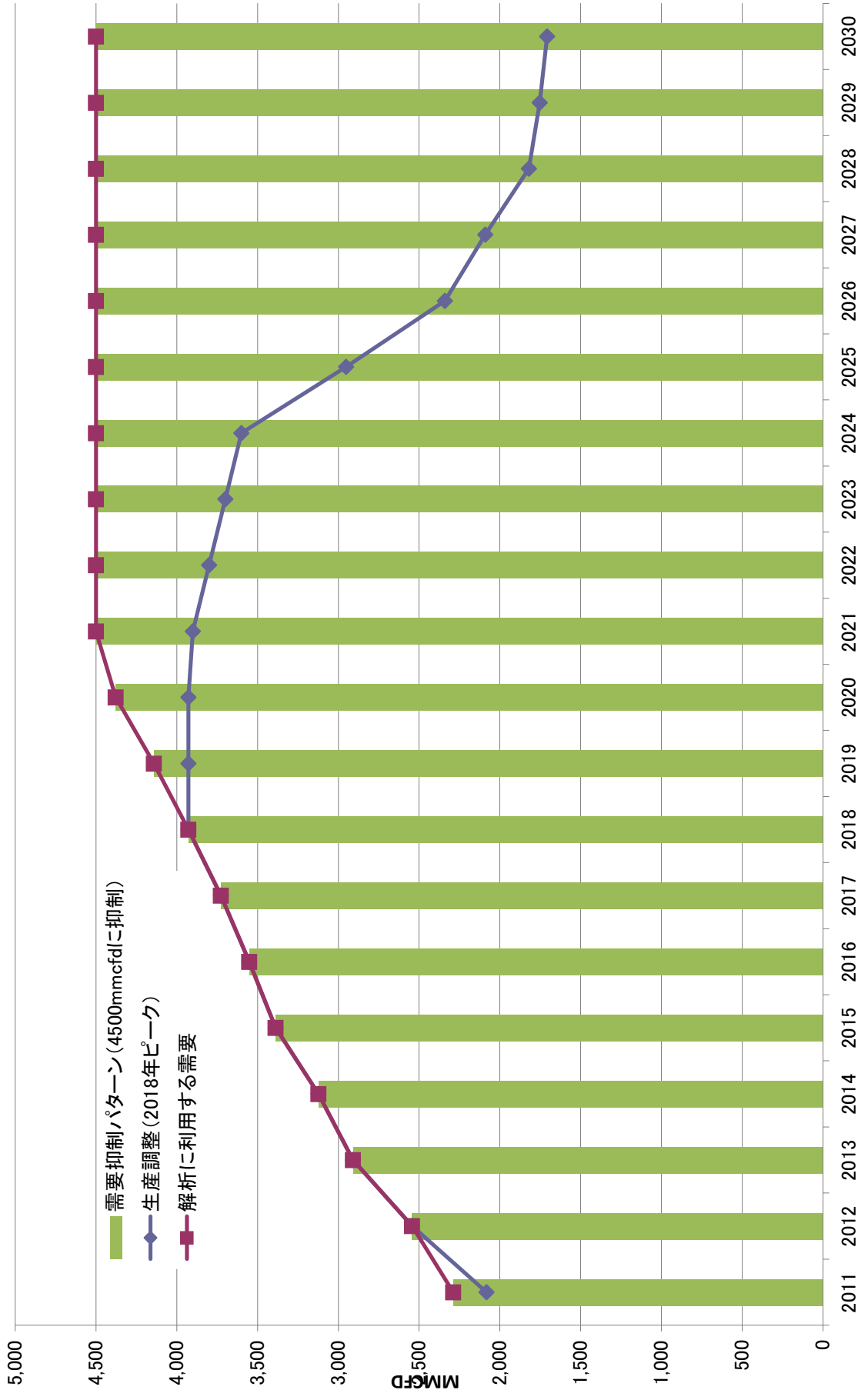


Long Term Gas Production & Demand Forecast 2011~2030



Long Term Gas Production & Demand Forecast 2011~2030

解析用



添付資料-6

導管網解析結果

Gas Pipeline Network Analysis

Gas pipeline network analysis has been carried out to evaluate the transport capacity of the pipeline network in Bangladesh in fiscal year 2015, 2020, 2025, and 2030. This is to report the results.

1. Methods and Preconditions

(1) Numerical Calculations

VB linked Excel program is used. It is the same program used for “The Study for Master Plan on Coal Power Development in the Peoples Republic of Bangladesh, June 2010、 JICA/TEPCO”

(a) Equation

The equation to express the relation between flow and pressures, Panhandle (A) with upper-limit, is widely used in pipeline analysis. It is expressed as follows,

$$Q = K ((P_1^2 - P_2^2) \times D^5 / s L)^{1/2} \quad (1)$$

$$\text{Where } K = 3.83 (T_0 / ZT)^{1/2} \times (1 / f)^{1/2} \quad (2)$$

$$(1 / f)^{1/2} = \text{Min} [6.872 E \cdot \text{Re}^{0.07305} , 4 E \log_{10} (3.7 D / \varepsilon)] \quad (3)$$

Q: flow rate [Nm³/h]

K: flow coefficient

P₁, P₂ : pressure at each end of a pipeline [kg / cm²abs]

D: inner diameter of a pipeline

s : specific gravity [air = 1.0]

L: length of a pipeline

Z: compression factor

T: temperature [K]

T₀: 273.5 [K]

f: friction factor

ε: roughness of a pipe wall [μm]

$$\text{Re: Reynolds number } \text{Re} = (4.662 \times 10^5) \times (sQ / \mu D) \quad (4)$$

μ: Viscosity [kg · sec / m²]

E: efficiency factor

Equation (3) gives a friction factor. It is a selection of smaller value between $6.872E \times \text{Re}^{0.07305}$ (valid for medium range turbulent flow) and $4E \log_{10}(3.7D/\varepsilon)$ (valid for fully developed turbulent flow).

It is well known that, in a fully developed turbulent flow, the friction factor converges with a constant value, which is a function of the roughness of the wall. It is also known that many pipeline flows are in the range of medium turbulence.

E is a factor to correct the deviations resulting from curved pipes, fittings like valves, diameter changes, inaccurate data of sizes, and scaffolds etc. 0.93 or so is widely used for E in Japan. This factor is used usually for a medium range turbulent flow in order to conform to the calculated results to measured data. Instead, in case of a fully developed turbulent flow, ϵ is used for this purpose. In the calculation here, however, we applied E to both the turbulent regions for convenience and used standard value for ϵ .

The compression factor Z is defined as $PV = ZRT$. It is a factor utilized to count the deviation from an ideal state of a gas. It is calculated in accordance with the AGA manual (AGA Report No.8, Compressibility Factor of Natural Gas and Related Hydrocarbon Gases 1994). The gas composition data in Table 1, which is considered to be a typical representation of the gas composition in Bangladesh, is used for the calculation.

Table 1 Typical gas composition data

CH4	C2H6	C3H8	C4H10	C5H12	other
96.76	1.80	0.39	0.17	0.06	0.82

Source: Annual Report 2008, Petrobangla

(b) Procedures

Basically, the solution means to solve the relations satisfying Kirchhoff's law (i.e. Sum of inflows into a node equals zero. Summation of pressure drops around a loop is zero.). The Hardy-Cross method is used here. One can avoid large scale matrix calculations by using the method.

First, we did a calibration of the program in preparation by adjusting the aforementioned efficiency factors of each pipeline in the network. Then, we set the predicted loads at respective nodes and calculated the pressure losses throughout the network. If necessary pressures are secured at the respective load nodes, it means that there is no trouble in the supply. Necessary pressure would be, for example, 250 psi (1.7MPa) in order to drive a gas turbine of large capacity yet low pressure ratio without any gas compressor. The pressure can be much lower in other cases.

(2) Network

Fig. 1 is a schematic drawing of the current network. Figures with prefix 'N' are tag numbers of the nodes. Networks under plan are shown in Fig.2 to Fig.5. Blue rectangles in Figs mean gas fields. Other rectangles mean gas consuming points. Pipe sizes are shown by colors in Figs. They are also shown in Table 2 and Table 3. Data were given by concerned agents in Bangladesh.

(3) Input Data

Data necessary to run the program were presented by JICA study team.

They are as follows

(a) Actual Measurement Value

The same data of actual measurement value which were used in "The Study for Master Plan on

Coal Power Development in the Peoples Republic of Bangladesh, June 2010, JICA/TEPCO” were used for the calibration.

Table 4 and Table 5 show the measured data of gas consumption, supply (gas field), and pressure at respective nodes at 8:00, 24th Oct., 2009.

(4) Gas Consumptions

Assumed average and peak (average \times 1.1) gas consumptions at respective nodes in each fiscal year are shown in Table 6 and Table 7. The sign ‘OUT’ in the tables means places where gas is consumed. Peak gas consumptions are assigned to respective nodes to evaluate the transport capacity.

(5) Gas Fields

Locations of the gas fields are shown in above mentioned pipeline network diagrams. The total production is assumed sufficient to feed the demands. Matching analysis between supply and consumption is not done here. In principle, gas fields are dealt as pressure designated nodes. The outlet pressures of gas fields are shown in Table 8. In following cases, gas supply rates are assigned instead of pressure.

(a) Nodes where outlet pressure is unknown

As to many newly born gas fields under plan, due to the lack of pressure information, supply rate is assigned at each node to be connected.

(b) Nodes where both gas field and gas consuming area overlap, with gas demand exceeding gas supply

As the gas fields can no more supply gas to other nodes, those are dealt as gas consuming nodes. Subtraction of the latter from the former is assigned.

(c) Nodes of which outlet pressure is too low

Although it is a particular case, if the pressure at a certain gas field is smaller than the network pressure, the field can not supply gas to the network; reverse flow occurs in the calculation.

In such a case, gas compressors are needed to elevate the pressure level. Gas supply rate should be assigned in the calculation instead of gas pressure.

Gas supply rates from gas fields are shown in Table 6 and Table 7, where the sign ‘IN’ means gas supply. 1.1 times of average supply rates are used in the analysis.

In case of a network with one inlet and one outlet, the inlet node is usually set as a pressure-designated node. In this case, it is obvious from the law of conservation of mass that setting a flow rate at the outlet automatically gives the same flow rate at the inlet. In case of a network with a multi-inlet and multi-outlet, some inlets can be dealt as flow designated nodes. In this case, other inlet nodes work as pressure designated nodes, at which flows are adjusted in the calculation process so that the total outflow matches the total inflow. Looking from another point, a pressure designated node (gas field) keeps the constant pressure despite demand fluctuations and can

supply endlessly as much natural gas as the demand requires; the supply is controlled only by a pressure gradient of the network. Contrarily, a flow designated node can not supply a larger flow than the set flow, resulting in a situation where other gas fields must cover the discrepancy between demand and supply. In this analysis, gas fields are dealt as pressure-designated nodes in principle.

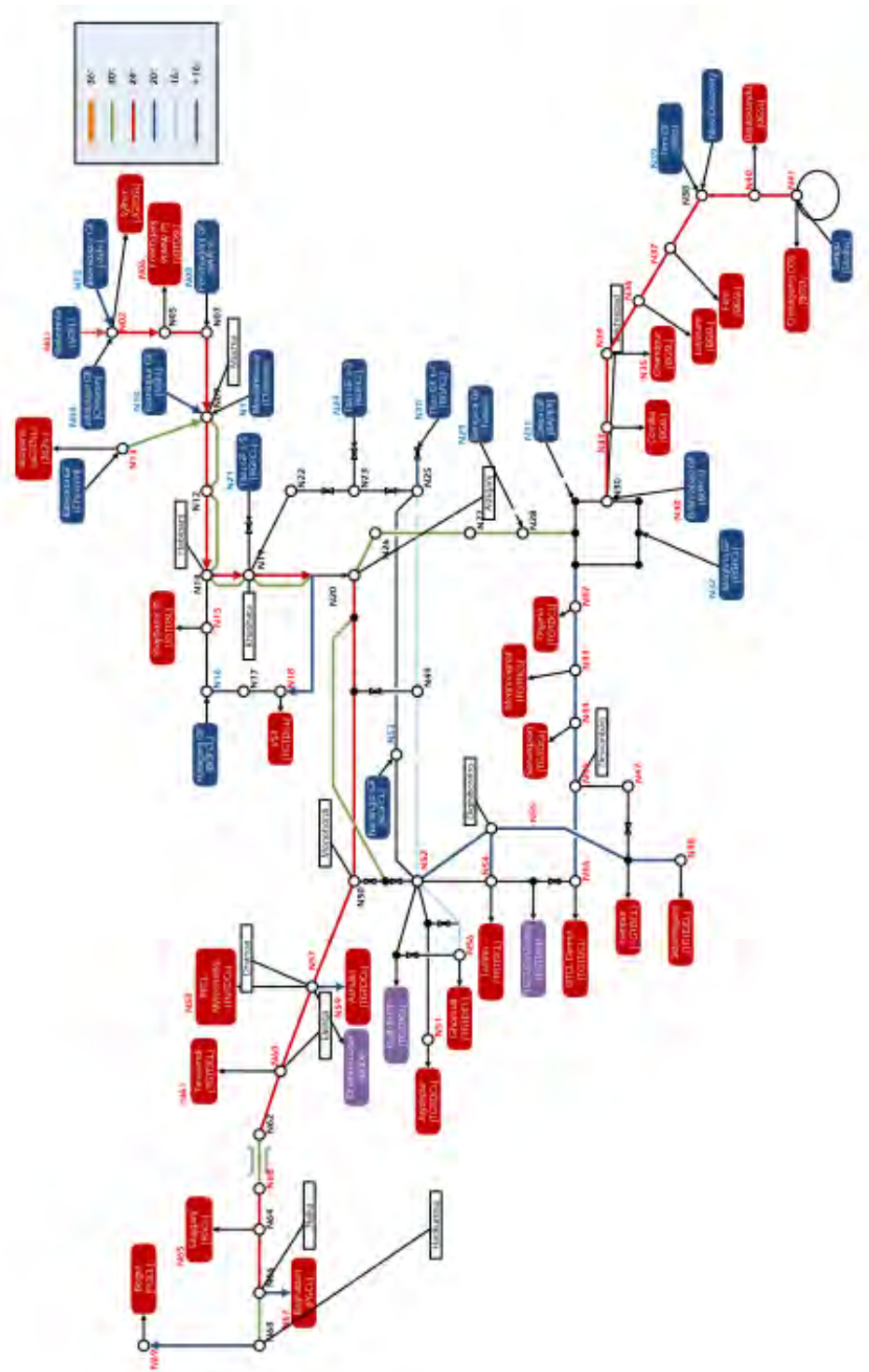


Fig.1 Schematic Flow Diagram of Network (FY 2011)

Table 2 Length and Pipe Diameter btwn. Nodes

No.	Node end	Node end	Dia (mm)	Length (m)	exist at year	P/L Name
1	1	2	600	500	2011	
2	2	3	500	1,800	2011	
3	2	4	350	1,500	2011	
4	2	5	600	1,500	2011	
5	5	6	300	1,500	2011	
6	5	7	600	5,000	2011	
7	7	8	300	7,500	2011	
8	7	9	600	73,000	2011	
9	9	10	500	1,700	2011	
10	9	11	350	2,200	2011	
11	9	12	600	2,800	2011	
12	9	12	750	2,800	2011	
13	9	13	750	42,000	2011	
14	12	14	600	41,000	2011	
15	12	14	750	41,000	2011	
16	14	15	300	500	2011	
17	14	19	600	3,000	2011	
18	14	19	750	3,000	2011	
19	15	16	300	500	2011	
20	16	17	300	40,000	2011	
21	17	18	300	13,500	2011	
22	18	20	500	2,000	2011	
23	19	20	600	10,000	2011	
24	19	20	750	10,000	2011	
25	19	21	300	540	2011	
26	19	22	300	500	2011	
27	20	26	750	40,000	2011	
28	20	49	600	4,000	2011	
29	22	23	300	5,000	2011	
30	23	24	300	500	2011	
31	23	25	300	3,000	2011	
32	25	70	500	1,000	2011	
33	25	49	400	13,920	2011	
34	25	53	350	43,770	2011	
35	26	27	750	1,500	2011	
36	27	28	750	600	2011	
37	28	29	250	1,000	2011	
38	28	30	750	17,900	2011	
39	30	31	250	35,000	2011	
40	30	32	200	28,000	2011	
41	30	33	600	16,000	2011	
42	30	42	500	49,000	2011	
43	33	34	600	28,000	2011	
44	34	35	200	46,000	2011	
45	34	36	600	22,000	2011	
46	36	37	600	24,000	2011	
47	37	38	600	7,000	2011	
48	38	39	200	7,100	2011	
49	38	40	600	54,000	2011	
50	40	41	600	26,000	2011	
51	42	43	500	4,000	2011	
52	43	44	500	4,000	2011	
53	44	45	500	4,000	2011	
54	45	46	500	3,000	2011	
55	45	47	350	1,580	2011	
56	46	54	350	1,000	2011	
57	47	48	500	4,000	2011	
58	47	55	500	5,000	2011	
59	49	50	600	3,300	2011	
60	49	52	400	32,390	2011	
61	20	50	750	37,000	2011	

Table 3 Length and Pipe Diameter btwn. Nodes

Cont.

No.	Node end	Node end	Dia (mm)	Length (m)	exist at yeat	P/L Name
62	50	57	600	37,000	2011	
63	50	52	500	25,000	2011	
64	52	53	350	5,620	2011	
65	52	54	350	31,410	2011	
66	52	55	500	32,000	2011	
67	52	56	350	12,000	2011	
68	52	56	350	12,000	2011	
69	52	56	400	12,000	2011	
70	54	55	500	3,000	2011	
71	56	51	350	24,000	2011	
72	57	58	300	40,000	2011	
73	57	59	500	47,000	2011	
74	57	60	600	52,000	2011	
75	60	61	300	43,000	2011	
76	60	62	600	14,000	2011	
77	62	63	750	9,000	2011	
78	63	64	600	10,000	2011	
79	64	65	200	500	2011	
80	64	66	600	5,000	2011	
81	66	67	500	35,000	2011	
82	66	68	750	6,000	2011	
83	68	69	500	54,000	2011	
84	30	71	750	47,000	2015	Bakhrabad - Siddhriganj
85	71	86	750	5,800	2015	Bakhrabad - Siddhriganj
86	86	72	750	5,200	2015	Bakhrabad - Siddhriganj
87	72	73	750	2,000	2015	Bakhrabad - Siddhriganj
88	68	74	750	36,000	2015	Hatikumrul - Bheramara
89	74	76	750	36,000	2015	Hatikumrul - Bheramara
90	76	77	750	15,000	2015	Hatikumrul - Bheramara
91	74	75	400	53,000	2015	Bonpara - Rajshahi
92	77	78	750	22,000	2015	Bheramara - Khulna
93	78	79	750	43,000	2015	Bheramara - Khulna
94	79	80	750	15,000	2015	Bheramara - Khulna
95	80	81	750	30,000	2015	Bheramara - Khulna
96	81	82	750	28,000	2015	Bheramara - Khulna
97	82	83	750	2,700	2015	Bheramara - Khulna
98	50	57	750	37,000	2015	Monohordi - Dhanua
99	60	62	750	14,000	2015	Elenga - East of Jamuna Bridge
100	20	26	750	40,000	2015	Ashuganj - Bakhrabad
101	26	27	750	1,500	2015	Ashuganj - Bakhrabad
102	27	28	750	600	2015	Ashuganj - Bakhrabad
103	28	30	750	17,900	2015	Ashuganj - Bakhrabad
104	13	57	900	135,000	2015	Bibiyana - Dhanua
105	84	26	300	8,000	2015	Titas G.F. Loc7 - A-B Pipeline
106	86	87	750	40,000	2015	Langalband - Maowa
107	87	88	750	20,000	2015	Along Padma Bridge (Maowa - Zajira)
108	85	41	750	91,000	2015	Maheshkhali - Anowara (Chittagong)
109	30	33	750	16,000	2020	Bakhrabad - Feni
110	33	34	750	28,000	2020	Bakhrabad - Feni
111	34	36	750	22,000	2020	Bakhrabad - Feni
112	36	37	750	24,000	2020	Bakhrabad - Feni
113	69	89	500	100,000	2020	Bogra - Rangpur
114	88	91	750	55,000	2020	Zajira - Khulna
115	91	83	750	55,000	2020	Zajira - Khulna
116	37	38	750	7,000	2025	Feni - Chittagong
117	38	40	750	54,000	2025	Feni - Chittagong
118	40	41	750	26,000	2025	Feni - Chittagong
119	57	60	750	52,000	2025	Dhanua - Elenga
120	63	66	750	15,000	2025	West of Jamuna Bridge - Nalka
121	51	90	300	19,000	2030	Kamta - Joydepur
122	91	92	750	60,000	2030	Block 7

Table 4 Gas Consumption, Supply, and Pressure at Respective Nodes (8:00 A.M. 24th Oct. 2009)

Area	node	Gas demand mmcf/h	Gas supply mmcf/h	Pressure psig	
TGTDC	18	1.5230		846	
	19				
	20			846	
	21		2.9960	920	
	22				
	23				
	24		4.2940	900	
	25				
	26				
	27				
	28				
	29			5.0180	984
	42	0.6250			
	43	2.8148		446	
	44	0.1670			
	45	0.0000			
	46	5.6540		460	
	47	3.4603		440	
	48	6.2790		430	
	49				
	50			800	
	51	4.2910		430	
	52	0.5420			
	53		1.4140		
	54	2.6338			
	55	0.5525			
	56	5.8780		588	
	57	3.3250		620	
	58	2.6460		490	
	59	4.6750		568	
60	1.7460		600		
70			8.0440	900	
BGSL	30		1.5000	688	
	31		8.1160	780	
	32				
	33	1.2500			
	34				
	35	0.1440			
	36	0.0640			
	37	0.4640			
	38				
	39		0.0920		
	40	0.7900			
	41	6.3600		435	
	71				
	72				
73					

Table 5 Gas Consumption, Supply, and Pressure at Respective Nodes Cont.

Area	node	Gas demand mmcf/h	Gas supply mmcf/h	Pressure psig
JGTDSL	1		1.9860	1,130
	2	1.1350		
	3			
	4		7.1010	1,127
	5			
	6	1.0350		1,066
	7			
	8		1.0050	1,086
	9			
	10		1.9840	1,063
	11		2.1780	1,072
	12			
	13		23.0800	1,143
	14			
	15	1.7983		
	16		9.4580	990
	17			
PGCL	61	1.7380		490
	62			
	63			
	64			
	65	0.1250		
	66			
	67	1.3740		560
	68			
	69	0.3330		558
SGCL	74			
	75			
	76			
	77			
	78			
	79			
	80			
	81			
	82			
	83			
	1(*2)			
Total		63.4227	78.2660	

Table 6 Assumed Average and Peak Gas Yields/Consumption at Respective Nodes

IN:Gas field,OUT:Consuming node

No		Name of place	2015 mmcf/d	2020 mmcf/d	2025 mmcf/d	2030 mmcf/d	2015 mmcf/d	2020 mmcf/d	2025 mmcf/d	2030 mmcf/d
1	IN	Kailashtila Gas Field	39.22	239.78	154.74	34.06	43.137	263.75	170.21	37.471
2	OUT	Sylhet	50.80	72.80	71.20	71.20	55.88	80.08	78.32	78.32
3	IN	Beanibazar Gas Field	16.00	16.00	0.00	0.00	17.6	17.6	0	0
4	IN	Jalalabad Gas Field	280.00	155.65	51.00	0.00	308	171.21	56.103	0
5	-	VS-E Fenchuganj					0	0	0	0
6	OUT	Fenchganj PS	86.48	88.52	91.20	99.60	95.126	97.367	100.31	109.56
7	OUT	Uttarbag	5.32	8.56	10.33	11.83	5.8537	9.4113	11.36	13.018
8	IN	Fenchganj Gas Field	85.00	30.00	0.00	0.00	93.5	33	0	0
9	-	-					0	0	0	0
10	IN	Rashidpur Gas Field	46.29	483.26	463.67	101.77	50.915	531.58	510.04	111.95
11	IN	Moulabibazar Gas Field	360.00	207.46	0.00	0.00	396	228.2	0	0
12	-	Muchai					0	0	0	0
13	IN	Bibiyana Gas Field	1,124.07	931.30	456.86	289.93	1236.5	1024.4	502.55	318.93
13	OUT	Bibiyana	160.80	160.80	225.40	211.80	176.88	176.88	247.94	232.98
14	-	Hobiganj					0	0	0	0
15	OUT	Shahjibazar PS	116.80	135.77	105.35	114.19	128.48	149.34	115.89	125.61
16	IN	Hobiganj Gas Field	83.57	206.73	72.70	15.00	91.931	227.4	79.975	16.498
17	-	-					0	0	0	0
18	OUT	VS3	351.16	468.19	349.65	509.74	386.27	515	384.61	560.71
19	-	Khatihata					0	0	0	0
20	-	Ashuganj					0	0	0	0
21	IN	Titas Gas Field Location 5	185.79	552.65	350.24	83.94	204.37	607.91	385.27	92.336
22	-	-					0	0	0	0
23	-	-					0	0	0	0
24	IN	Titas Gas Field Location 3	0.00	0.00	0.00	0.00	0	0	0	0
25	-	Ghatura					0	0	0	0
26	-	Adampur MLV-1					0	0	0	0
27	-	-					0	0	0	0
28	-	-					0	0	0	0
29	IN	Bangora Gas Field	120.00	64.00	20.97	6.87	132	70.4	23.069	7.5591
30	IN	Bakhrabad Gas Field	56.00	100.00	100.00	0.00	61.6	110	110	0
31	IN	Salda Gas Field	53.00	30.00	5.00	0.00	58.3	33	5.5	0
32	IN	Meghna Gas Field	10.00	10.00	3.28	0.00	11	11	3.6045	0
33	IN	Srikail	15.00	15.00	4.92	1.61	16.5	16.5	5.4067	1.7717
33	OUT	Comilla	19.20	19.20	0.00	0.00	21.12	21.12	0	0
34	OUT	Bijra	18.40	18.40	18.40	18.40	20.24	20.24	20.24	20.24
35	OUT	Chandpur	0.00	0.00	0.00	0.00	0	0	0	0
36	OUT	Laksham	0.00	0.00	0.00	0.00	0	0	0	0
37	IN	Feni	30.00	40.00	19.83	13.22	33	44	21.813	14.543
37	OUT	Feni	20.81	29.83	27.14	30.05	22.889	32.813	29.853	33.056
38	-	-					0	0	0	0
39	IN	Feni Gas Field	2.00	2.00	0.00	0.00	2.2	2.2	0	0
40	OUT	Barabkundu	208.36	336.32	384.93	426.23	229.19	369.95	423.42	468.85
41	IN	Chittagon City Gate Station	185.00	185.00	158.62	108.95	203.5	203.5	174.48	119.84
41	OUT	Chittagon City Gate Station	239.80	239.80	229.40	143.00	263.78	263.78	252.34	157.3
42	OUT	Gojaria	0.00	0.00	0.00	0.00	0	0	0	0
43	OUT	Meghnaghat	147.49	199.20	259.02	248.90	162.24	219.12	284.93	273.79
44	OUT	Sonargaon	0.00	0.00	0.00	0.00	0	0	0	0
45	OUT	Dewanbag	50.40	50.40	50.40	0.00	55.44	55.44	55.44	0
46	OUT	GTCL Demra	171.98	283.87	305.13	317.84	189.18	312.26	335.64	349.62

Table 7 Assumed Average and Peak Gas Yields/Consumption at Respective Nodes Cont.

IN:Gas field,OUT:Consuming node		2015	2020	2025	2030	2015	2020	2025	2030
No	Name of place	mmcf/d	mmcf/d	mmcf/d	mmcf/d	mmcf/d	mmcf/d	mmcf/d	mmcf/d
47	OUT Haripur	298.50	492.69	529.58	551.64	328.34	541.96	582.54	606.81
48	OUT Siddhiriganj	31.20	31.20	31.20	35.00	34.32	34.32	34.32	38.5
49	- Doulatkandi					0	0	0	0
50	OUT Monohordi	4.80	4.80	0.00	0.00	5.28	5.28	0	0
51	OUT Joydepur	0.00	0.00	0.00	0.00	0	0	0	0
52	OUT -	15.02	24.80	26.65	27.76	16.525	27.276	29.318	30.539
53	IN Narsingdi Gas Field	48.00	41.73	20.70	10.93	52.8	45.903	22.769	12.024
54	OUT Tarabo	8.29	9.52	3.36	3.50	9.1216	10.476	3.6932	3.8471
55	OUT Dighiborabo	0.00	0.00	0.00	0.00	0	0	0	0
56	OUT Ghorasal	356.64	405.78	417.77	252.94	392.31	446.35	459.55	278.24
57	OUT Dhanua	51.40	6.40	0.00	0.00	56.54	7.04	0	0
58	OUT RPCL Mymensing	26.40	26.40	26.40	0.00	29.04	29.04	29.04	0
59	OUT Ashulia	486.37	773.13	827.61	860.18	535.01	850.45	910.37	946.2
60	OUT Elenga	4.00	4.00	0.00	0.00	4.4	4.4	0	0
61	OUT Tarakandi	45.00	45.00	45.00	45.00	49.5	49.5	49.5	49.5
62	- East Bank of Jamuna Bridge					0	0	0	0
63	OUT West Bank of Jamuna Bridge	36.43	83.55	85.34	137.87	40.072	91.91	93.873	151.66
64	- Kodda					0	0	0	0
65	OUT Sirajganj	5.23	8.35	55.14	56.67	5.7519	9.1902	60.653	62.342
66	- Nalka					0	0	0	0
67	OUT Baghabari	66.83	35.55	10.14	11.67	73.512	39.11	11.153	12.842
68	- Hatikumrul					0	0	0	0
69	OUT Bogra	10.03	13.15	10.14	11.67	11.032	14.47	11.153	12.842
70	IN Titas Gas Field Location 1	0.00	0.00	0.00	0.00	0	0	0	0
71	OUT Meghnaghat (future)	45.60	45.60	45.60	45.60	50.16	50.16	50.16	50.16
72	OUT Haripur (future)	54.40	54.40	54.40	54.40	59.84	59.84	59.84	59.84
73	OUT Siddhiriganj (future)	125.60	125.60	125.60	125.60	138.16	138.16	138.16	138.16
74	- Bonpara					0	0	0	0
75	OUT Rajshahi					0	0	0	0
76	OUT Ishwardi					0	0	0	0
77	OUT Bheramara	61.90	65.40	66.46	66.05	68.09	71.94	73.111	72.653
78	OUT Kushtia					0	0	0	0
79	OUT Jhinaidah					0	0	0	0
80	OUT Kaliganj					0	0	0	0
81	OUT Jessore					0	0	0	0
82	OUT Noapara					0	0	0	0
83	OUT Khulna	7.50	11.00	12.06	11.65	8.25	12.1	13.271	12.813
83	IN Khulna	0.00	0.00	0.00	0.00	0	0	0	0
84	IN Titas Gas Field Location 7	150.00	117.45	69.35	40.95	165	129.2	76.288	45.048
85	IN Maheshkhali	500.00	500.00	500.00	500.00	550	550	550	550
86	- Langalband					0	0	0	0
87	- Maowa					0	0	0	0
88	- Zajira					0	0	0	0
89	- Rangpur					0	0	0	0
90	IN Kamta	0.00	0.00	0.00	0.00	0	0	0	0
91	-					0	0	0	0
92	IN Block 7	0.00	0.00	0.00	0.00	0	0	0	0
	Total								
	IN	3,389	3,978	2,452	1,207				
	OUT	3,389	4,378	4,500	4,500				

Table 8 Outlet pressures of Gas Fields

NO		Name	Company	psig	Remarks
1	IN	Kailashtila Gas Field	SGFL	1,125	
3	IN	Beanibazar Gas Field	SGFL		
4	IN	Jalalabad Gas Field	-	1,123	
8	IN	Fenchganj Gas Field	BAPEX	1,094	
10	IN	Rashidpur Gas Field	SGFL	1,077	
11	IN	Moulabibazar Gas Field	Chevron	1,082	
13	IN	Bibiyana Gas Field	-	1,223	
16	IN	Hobiganj Gas Field	BGFCL	990	
21	IN	Titas Gas Field Location 5	BGFCL	950	
24	IN	Titas Gas Field Location 3	BGFCL	950	
29	IN	Bangora Gas Field	Tullow	904	
30	IN	Bakhrabad Gas Field	BGFCL	678	
31	IN	Salda Gas Field	BAPEX	732	
32	IN	Meghna Gas Field	BGFCL		
39	IN	Feni Gas Field	Niko		
41	IN	Chittagon City Gate Station Semtang	-		
53	IN	Narsingdi Gas Field	BGFCL		
70	IN	Titas Gas Field Location 1	BGFCL		
83	IN	Khulna	-		
84	IN	Titas Gas Field Location 7	BGFCL	950	
85	IN	Maheshkhali	BGFCL		
90	IN	Kamta	BGFCL		
91	IN	Block 7	-		

2. Calculation Results and Considerations

Transportation capacity of a network can be judged by checking if required pressure is secured at each gas consumption node. In case gas is supplied to a gas turbine without fuel gas compressor, the supply pressure should be higher than 1.7MPa (250psi) or so. In conventional cases, say 0.5 MPa (about 70psi) would be enough.

(1) Calibration

As mentioned previously, the efficiency factor of each pipeline was adjusted so as to match the actually measured flow and pressure distribution to the calculated results. The actually measured data are shown in Table 4 and Table 5. It should be noted that the total supply to the network is not consistent with the total consumption from the network. It is perhaps due to errors in measurement, leakage, and/or the unsteady local behavior. Whatever the reason is, it contradicts the law of conservation of mass. Therefore, complete conformance between the measured and the calculated is impossible.

In this report, some nodes of gas supply from gas fields were identified as pressure designated nodes, at which the calculated gas supplies may differ from the measured data. Fig.6 shows measured /calculated gas pressures at major nodes and measured /calculated gas supplies at supply nodes.

Generally speaking, the efficiency factor of a pipeline in Japan is about 0.93. However, many factors are below 0.8 in the study. There is a possibility that the pipelines are acting up. Sediment deposits may have accumulated inside.

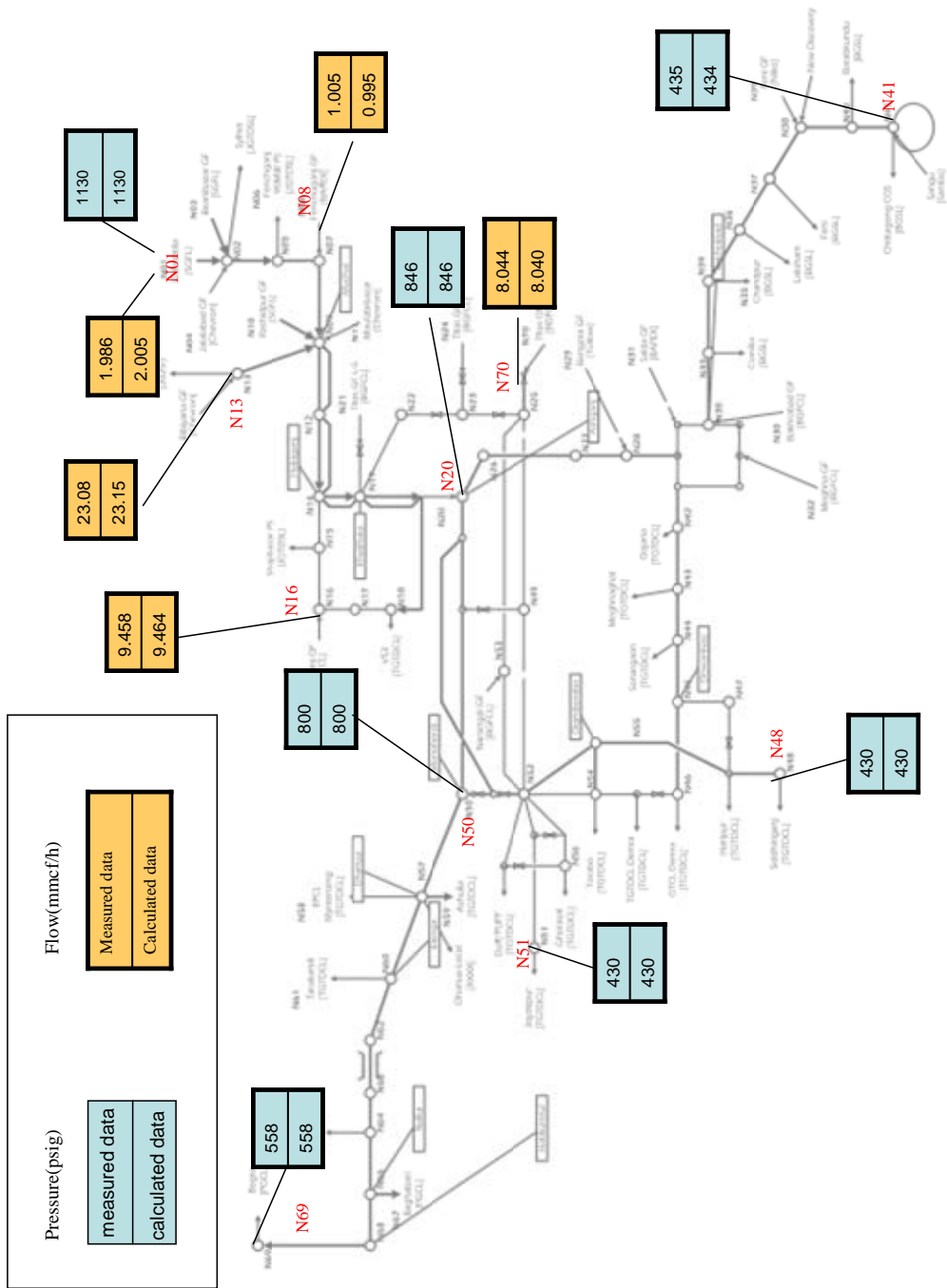


Fig.6 Gas Pressure at Measure Nodes and Supply from Gas Fields (Calibration)

(2) The study results on FY 2015

As there are compressors installed in the network and discontinuous pressure boosts occur at those points, the network was divided into 4 regions, which are Region1(down stream of N60), Region2 (between N20 and N60), Region3(between N12 and N20), and Region4(upstream of N12). The calculation was performed step by step from downstream region to upstream region. Calculation on Region3 and Region4 can not avoid some inaccuracy, because due to inability of supply occurred at one node in Region2 (will explain later), the flow rate through N20 can not be confirmed.

The results of numerical calculation, i.e. flow rates, gas demands, supplies, and pressure distribution in each region are shown in Tables 9 to 14. Some pressures in Table 9, 11 and 14 are also shown in Fig.7. Each pipeline can be identified by the node number of both edges. A positive figure in the column of the gas flow rate means that the gas flows from the node of left number to the node of the right number and a negative number means “in reverse”. In the above mentioned Tables or Figs, ‘Unable’ means being unable to supply gas, and red figure means insufficient pressure (<250psi).

Situations in each region are as follows.

- Region 1(Table9)

This is the downstream region from the compressor at N60

Discharging pressure of 1000 psi at N60 decreases gradually toward the end of Bheramara-Khulna line, but all pressures exceed 780 psi. The transportation ability is sufficient.

- Region 2(Table 10 and Table 11)

This is the region between two compressors, N20 and N60.

Table 10 is the result of the first calculation and Table 11 is that of second calculation.

A valve on the pipeline between N22 and N23 is assumed to be closed, as it is necessary to avoid the return flow through the pipelines from the outlet to the inlet of the compressor at N20.

The reason why we calculated twice is that, in the first run, a reverse flow appears at Bakhrabad GF (N30. See the right column of Table 10.). It is because we dealt gas fields near Bakhrabad (N29, N30, and N31) as pressure designated nodes. If the pressure in the network is larger than the pressure at a gas field, a reverse flow occurs. It may be a phenomenon in the virtual world of calculation; the reverse flow will not occur if the hypogeal pressure of a gas field should be higher enough than the outlet pressure. Several ‘Unable’ appears between N41 and N48 in the first run. These are also due to the low pressures assigned at N29 to 31. As nodes between N41 and N48 are situated downstream from N30, pressures are calculated by subtracting the pressure losses from the fixed pressure at N30, of which procedure results in the quite low pressures in the downstream area; N29 or N31 undertakes the same role if N30 is assigned supply rate.

So, whatever the actual phenomena will be, it is necessary to assign flow rate (supply rate) to those

nodes to circumvent this problem.

The second run was performed by setting the flow rates to those gas fields. As already mentioned, the flow rates are 1.1 times of gas yields. In Table 11, calculated pressures at N29, N30, and N31 mean the necessary pressure to deliver assumed amount of gas to the network.. They must be secured by introducing compressors.

'Unable' appears only at N59, which is connected to N57 by a 2-inch pipeline. A parallel pipeline would be necessary.

- Region 3(Table 12)

This is the region between the compressor at N12 and the compressor at N20.

Pressure of 1000 psi at N12 gradually decreases toward 579psi at the inlet of N20.

- Region 4(Table 13)

This is the upstream region from N12.

All pressures are above 1000psi except N06. The compressor inlet pressure at N12 is 1012psi, which is higher than the outlet pressure at N12 (1000 psi. See Table 12.). The result means we do not need a compressor at N12 if other kind of problems, such as pressure drops at some gas fields, do not occur.

- Region 3&4(Table 14)

We did a calculation for two regions combined. It is assumed we have no compressor at N12.

The result shows that pressures are secured without any compressor.

Table 9 Flow Rates, Gas Demands, Supplies, and Pressure Distribution (FY 2015, Region1)

Flow rate in each pipeline			Demand/supply and pressure distribution				
Left number	Right number	Flow rate mmcf/d	Node	Demand mmcf/d	P/S	Supply mmcf/d	Pressure psi
60	62	23.74	60		CO	206.71	1000.02
62	63	206.71	62	0.00			996.58
63	64	166.63	63	40.07			954.31
64	65	5.75	64	0.00			854.20
64	66	160.88	65	5.75			852.07
66	67	73.51	66	0.00			803.18
66	68	87.37	67	73.51			787.27
68	69	11.03	68	0.00			796.87
68	74	76.34	69	11.03			788.04
74	76	76.34	74	0.00			794.70
76	77	76.34	75	0.00			794.70
74	75	0.00	76	0.00			792.54
77	78	8.25	77	68.09			791.64
78	79	8.25	78	0.00			791.62
79	80	8.25	79	0.00			791.58
80	81	8.25	80	0.00			791.57
81	82	8.25	81	0.00			791.54
82	83	8.25	82	0.00			791.51
60	62	182.97	83	8.25			791.51

P/S:P=Pressure set point S=Supply rate set point
 CO=Compressor outlet CI=Compressor inlet

Table 10 Flow Rates, Gas Demands, Supplies, and Pressure Distribution (FY 2015, Region2,first)

Flow rate in each pipeline			Demand/supply and pressure distribution				
Left number	Right number	Flow rate mmcf/d	Node	Demand mmcf/d	P/S	Supply mmcf/d	Pressure psig
20	26	484.91	13		P	943.12	1223.04
20	49	327.09	20		CO	1997.03	1000.02
23	24	0.00	23	0.00			908.23
23	25	0.00	24	0.00			908.23
25	70	0.00	25	0.00			908.23
25	49	-130.55	26	0.00			818.54
25	53	130.55	27	0.00			809.32
26	27	540.09	28	0.00			805.95
27	28	586.17	29		P	49.50	904.02
28	29	-49.50	30	1154.22	P		678.01
28	30	558.09	31		P	24.53	731.92
30	31	-24.53	32		S	11.00	710.53
30	32	-11.00	33	4.62			716.56
30	33	-247.98	34	20.24			780.97
30	42	405.54	35	0.00			780.97
33	34	-252.60	36	0.00			834.97
34	35	0.00	37		S	10.11	890.08
34	36	-272.84	38	0.00			904.46
36	37	-272.84	39		S	2.20	904.88
37	38	-262.73	40	229.19			1006.93
38	39	-2.20	41	60.28			1147.83
38	40	-260.53	42	0.00			UNABLE
40	41	-489.72	43	162.24			UNABLE
42	43	405.54	44	0.00			UNABLE
43	44	243.30	45	55.44			UNABLE
44	45	243.30	46	189.18			UNABLE
45	46	48.76	47	328.34			UNABLE
45	47	139.11	48	34.32			UNABLE
46	54	-140.42	49	0.00			953.86
47	48	34.32	50	5.28			960.39
47	55	-223.56	51	0.00			348.17
49	50	-125.07	52	16.52			489.61
49	52	321.61	53		S	52.80	563.40
20	50	345.41	54	9.12			UNABLE
50	57	-19.59	55	0.00			UNABLE
50	52	276.98	56	392.31			348.17
52	53	-183.35	57	56.54			961.01
52	54	106.10	58	29.04			940.66
52	55	267.00	59	535.01			UNABLE
52	56	114.76	60	211.11	CI		906.58
52	56	114.76	61	49.50			802.73
52	56	162.78	70	0.00			908.23
54	55	-43.44	71	50.16			647.86
56	51	0.00	72	59.84			643.33
57	58	29.04	73	138.16			642.91
57	59	535.01	84		P	150.38	949.96
57	60	260.61	85		S	550.00	1284.83
60	61	49.50	86	0.00			645.44
30	71	248.16	87	0.00			645.44
71	86	198.00	88	0.00			645.44
86	72	198.00					
72	73	138.16					
50	57	-42.33					
20	26	839.62					
26	27	934.82					
27	28	888.74					
28	30	966.32					
13	57	943.12					
84	26	150.38					
86	87	0.00					
87	88	0.00					
85	41	550.00					

P/S:P=Pressure set point S=Supply rate set point
CO=Compressor outlet CI=Compressor inlet

Table 11 Flow Rates, Gas Demands, Supplies, and Pressure Distribution
(FY 2015, Region2,second)

Flow rate in each pipeline			Demand/supply and pressure distribution				
Left number	Right number	Flow rate mmcf/d	Node	Demand mmcf/d	P/S	Supply mmcf/d	Pressure psig
20	26	109.74	13		P	932.61	1223.04
20	49	295.70	20		CO	1068.49	1000.02
23	24	0.00	23	0.00			925.21
23	25	0.00	24	0.00			925.21
25	70	0.00	25	0.00			925.21
25	49	-116.86	26	0.00			989.45
25	53	116.86	27	0.00			989.23
26	27	79.51	28	0.00			989.15
27	28	79.51	29		S	132.00	1418.34
28	29	-132.00	30		S	61.60	982.88
28	30	127.84	31		S	58.30	1158.26
30	31	-58.30	32		S	11.00	1005.58
30	32	-11.00	33	4.62			1009.85
30	33	-247.98	34	20.24			1056.77
30	42	479.91	35	0.00			1056.77
33	34	-252.60	36	0.00			1097.46
34	35	0.00	37		S	10.11	1140.11
34	36	-272.84	38	0.00			1151.41
36	37	-272.84	39		S	2.20	1151.74
37	38	-262.73	40	229.19			1233.77
38	39	-2.20	41	60.28			1351.48
38	40	-260.53	42	0.00			487.04
40	41	-489.72	43	162.24			423.19
42	43	479.91	44	0.00			390.53
43	44	317.68	45	55.44			355.07
44	45	317.68	46	189.18			351.29
45	46	108.25	47	328.34			281.70
45	47	153.98	48	34.32			280.62
46	54	-80.93	49	0.00			961.89
47	48	34.32	50	5.28			967.01
47	55	-208.68	51	0.00			504.97
49	50	-110.21	52	16.52			611.97
49	52	289.05	53		S	52.80	664.93
20	50	313.51	54	9.12			360.98
50	57	-16.09	55	0.00			361.03
50	52	248.85	56	392.31			504.97
52	53	-169.66	57	56.54			967.44
52	54	84.90	58	29.04			947.23
52	55	213.83	59	535.01			UNABLE
52	56	114.76	60	211.11	CI		913.39
52	56	114.76	61	49.50			810.39
52	56	162.78	70	0.00			925.21
54	55	-5.15	71	50.16			962.32
56	51	0.00	72	59.84			959.25
57	58	29.04	73	138.16			958.97
57	59	535.01	84	82.56	P		949.96
57	60	260.61	85		S	550.00	1469.80
60	61	49.50	86	0.00			960.68
30	71	248.16	87	0.00			960.68
71	86	198.00	88	0.00			960.68
86	72	198.00					
72	73	138.16					
50	57	-34.73					
20	26	190.02					
26	27	137.68					
27	28	137.68					
28	30	221.36					
13	57	932.02					
84	26	-82.56					
86	87	0.00					
87	88	0.00					
85	41	550.00					

P/S:P=Pressure set point S=Supply rate set point
CO=Compressor outlet CI=Compressor inlet

Table 12 Flow Rates, Gas Demands, Supplies, and Pressure Distribution (FY 2015, Region3.)

Flow rate in each pipeline			Demand/supply and pressure distribution				
Left number	Right number	Flow rate mmcf/d	Node	Demand mmcf/d	P/S	Supply mmcf/d	Pressure psig
12	14	312.63	12		CO	873.39	1000.02
12	14	560.76	14	0.00			655.29
14	15	-146.99	15	128.48			748.72
14	19	365.54	16		P	378.93	989.92
14	19	654.84	17	0.00			697.36
15	16	-275.47	18	386.27			566.86
16	17	103.46	19	0.00			641.85
17	18	103.46	20	908.97	CI		578.83
18	20	-282.82	21		P	171.41	949.96
19	20	426.61	22	0.00			641.85
19	20	765.18					
19	21	-171.41					
19	22	0.00					

P/S:P=Pressure set point S=Supply rate set point
 CO=Compressor outlet CI=Compressor inlet

Table 13 Flow Rates, Gas Demands, Supplies, and Pressure Distribution (FY 2015, Region4)

Flow rate in each pipeline			Demand/supply and pressure distribution				
Left number	Right number	Flow rate mmcf	Node	Demand mmcf	P/S	Supply mmcf	Pressure psig
1	2	59.65	1		P	59.65	1125.04
2	3	-17.60	2	55.88			1024.80
2	4	-11.86	3		S	17.60	1024.88
2	5	33.23	4		P	11.86	1122.91
5	6	95.13	5	0.00			1023.55
5	7	-61.90	6	95.13			843.76
7	8	-60.05	7	5.85			1032.17
7	9	-7.70	8		P	60.05	1094.04
9	10	-71.38	9	0.00			1030.40
9	11	-63.47	10		P	71.38	1076.97
9	12	315.06	11		P	63.47	1081.95
9	12	565.11	12	880.17	CI		1011.78
9	13	-753.02	13		P	1861.92	1223.04

P/S:P=Pressure set point S=Supply rate set point
 CO=Compressor outlet CI=Compressor inlet

Table 14 Flow Rates, Gas Demands, Supplies, and Pressure Distribution (FY 2015, Region3&4)

Flow rate in each pipeline			Demand/supply and pressure distribution				
Left number	Right number	Flow rate mmcf/d	Node	Demand mmcf/d	P/S	Supply mmcf/d	Pressure psig
1	2	60.20	1		P	60.20	1125.04
2	3	-17.60	2	55.88			1035.76
2	4	-11.97	3		S	17.60	1035.84
2	5	33.89	4		P	11.97	1122.91
5	6	95.13	5	0.00			1034.78
5	7	-61.23	6	95.13			857.31
7	8	-61.22	7	5.85			1044.61
7	9	-5.87	8		P	61.22	1094.04
9	10	-75.03	9	0.00			1046.15
9	11	-66.24	10		P	75.03	1076.97
9	12	320.14	11		P	66.24	1081.95
9	12	574.21	12	0.00			1030.44
9	13	-758.96	13		P	1867.86	1223.04
12	14	320.15	14	0.00			690.09
12	14	574.21	15	128.48			768.20
14	15	-137.71	16		P	366.17	989.92
14	19	369.75	17	0.00			721.86
14	19	662.32	18	386.27			607.55
15	16	-266.20	19	0.00			677.36
16	17	99.97	20	908.97	CI		618.77
17	18	99.97	21		P	163.20	949.96
18	20	-286.30	22	0.00			677.36
19	20	427.85					
19	20	767.42					
19	21	-163.20					
19	22	0.00					

P/S:P=Pressure set point S=Supply rate set point
CO=Compressor outlet CI=Compressor inlet

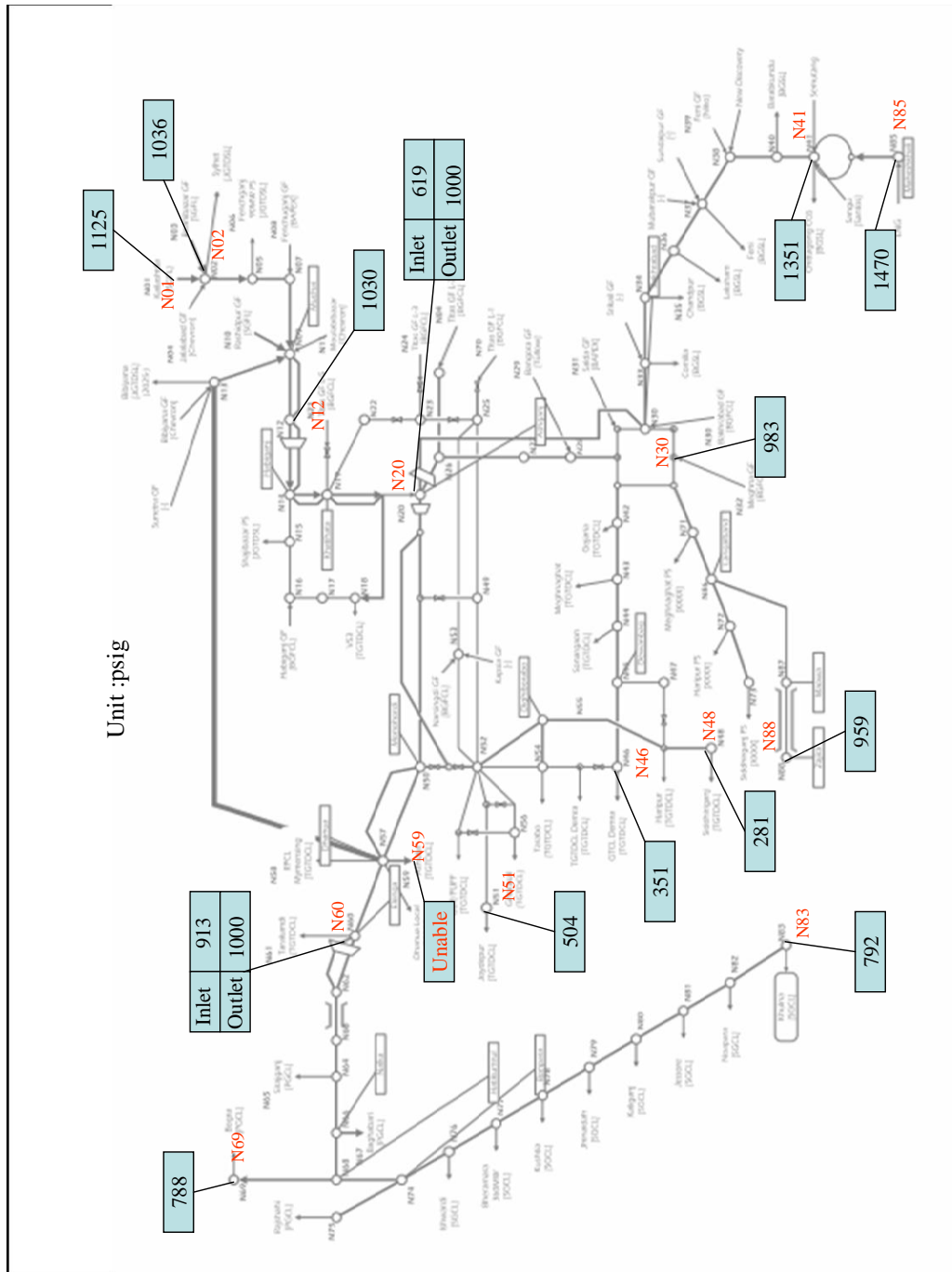


Fig.7 Pressure Distribution in Pipeline Network(FY 2015)

(3) The study results on FY 2020

- Region 1 and Region 2

It is assumed that Zajira (N88) and Khulna(Node83) have been connected by then. As loop lines from the outlet of the compressor at N60 to the inlet of the same compressor are formed, Region 1 and Region 2 must be calculated simultaneously. The results are shown in Table 15 and 16. The pressure distribution is also shown in Fig.8. In Table 15, new 'Unable' appears along the lines from Bakhrabad through Dewanbag to Monohordi (See N42 to N48, N51 to N56 in Table 15). They are the circular lines around Dhaka. The transportation trouble is partly due to the assumption of supply and consumption. In FY 2020, 2025, and 2030, Total gas consumption exceeds the total gas supply from gas fields, and the discrepancy is very large (See the bottom of Table 7). As many newly developed gas fields are dealt as supply designated nodes and hence pressure designated gas fields are concentrated in Region3 and Region 4, most part of gas supply including the above mentioned discrepancy comes from north east. This phenomenon inevitably brings down large pressure loss between north east area and areas around the west part of the circular lines. Those pipelines must be reinforced. Direct introduction of LNG into those lines would be helpful.

Pressures in south-west area (N64 to N83) are high enough. Gas transport to the area will be secured as long as the pipelines are well maintained. The pressure difference between N83 and N88 is very small. It is almost balanced. This connection line does not contribute to the supply so much at this time stage. The pressure level can be secured without it (It has been checked by other simulation). Gas can flow to any direction on situations.

Pressures around Chittagong(N41,N85) are quite high. The concerned staff should deliberately check the design pressure of the pipelines if the plans are to be realized as it is.

As to the compressor at N60, the pressure ratio is 1.14($1015/894=1.14$). It is relatively low, which means no problem in installing the compressor.

- Region 3 and Region4

Calculation can not be performed because failure of transport takes place in the downstream region and the flow through the compressor at N20 can not be confirmed. However, as there are lots of gas fields in these areas and their pressures are high, the possibility of transport failure will be small.

Table 15 Flow Rates, Gas Demands, Supplies, and Pressure Distribution (FY 2020, Region1&2)

Flow rate in each pipeline			Demand/supply and pressure distribution				
Left number	Right number	Flow rate mmcf/d	Node	Demand mmcf/d	P/S	Supply mmcf/d	Pressure psig
20	26	238.72	13		P	990.82	1223.04
20	49	386.52	20		CO	1485.08	1000.02
23	24	0.00	23	0.00			947.31
23	25	0.00	24	0.00			947.31
25	70	-240.85	25	0.00			947.31
25	49	60.80	26	0.00			954.59
25	53	180.05	27	0.00			952.97
26	27	229.31	28	0.00			952.33
27	28	229.31	29		S	70.40	1108.36
28	29	-70.40	30		S	110.00	928.71
28	30	255.08	31		S	33.00	996.52
30	31	-33.00	32		S	11.00	952.68
30	32	-11.00	33	4.62			929.47
30	33	-34.96	34	20.24			930.91
30	42	682.30	35	0.00			930.91
33	34	-36.45	36	0.00			932.43
34	35	0.00	37		S	11.19	934.09
34	36	-42.98	38	0.00			937.42
36	37	-42.98	39		S	2.20	937.83
37	38	-121.97	40	369.95			961.83
38	39	-2.20	41	60.28			1108.41
38	40	-119.77	42	0.00			UNABLE
40	41	-489.72	43	219.12			UNABLE
42	43	682.30	44	0.00			UNABLE
43	44	463.18	45	55.44			UNABLE
44	45	463.18	46	312.26			UNABLE
45	46	166.21	47	541.96			UNABLE
45	47	241.53	48	34.32			UNABLE
46	54	-146.05	49	0.00			936.56
47	48	34.32	50	5.28			935.42
47	55	-334.75	51	0.00			UNABLE
49	50	48.26	52	27.28			UNABLE
49	52	399.06	53		S	45.90	34.59
20	50	446.50	54	10.48			UNABLE
50	57	47.23	55	0.00			UNABLE
50	52	339.90	56	446.35			UNABLE
52	53	-225.95	57	7.04			932.12
52	54	139.63	58	29.04			911.13
52	55	351.65	59	850.45			UNABLE
52	56	130.57	60in	204.38	CI		878.66
52	56	130.57	60out		CO	199.97607	1000.0232
52	56	185.21	61	49.50			771.13
54	55	-16.90	62	0.00			996.97
56	51	0.00	63	91.91			960.88

60in=Inlet Side of Comp. 60out=Outlet Side of Comp.

P/S:P=Pressure set point S=Supply rate set point

CO=Compressor outlet CI=Compressor inlet

Table 16 Flow Rates, Gas Demands, Supplies, and Pressure Distribution (FY 2020, Region1&2)

Cont.

Flow rate in each pipeline			Demand/supply and pressure distribution				
Left number	Right number	Flow rate mmcf/d	Node	Demand mmcf/d	P/S	Supply mmcf/d	Pressure psig
57	58	29.04	64	0.00			920.54
57	59	850.45	65	9.19			916.11
57	60	253.87522	66	0.00			902.99
60	61	49.499647	67	39.11			898.92
93	62	22.962179	68	0.00			900.41
62	63	199.97607	69	14.47			899.17
63	64	108.06571	70		P	240.85	999.88
64	65	9.1900189	71	50.16			901.99
64	66	98.875695	72	59.84			898.27
66	67	39.11034	73	138.16			897.98
66	68	59.765354	74	0.00			899.42
68	69	4.3040374	75	0.00			899.42
30	71	276.73799	76	0.00			898.44
71	86	226.5781	77	71.94			898.03
86	72	197.99944	78	0.00			898.09
72	73	138.15964	79	0.00			898.22
68	74	55.461317	80	0.00			898.26
74	76	55.461317	81	0.00			898.34
76	77	55.461317	82	0.00			898.42
74	75	0	83	12.10			898.43
77	78	-16.47899	84	25.72	P		949.96
78	79	-16.47899	85		S	550.00	1249.68
79	80	-16.47899	86	0.00			899.76
80	81	-16.47899	87	0.00			899.44
81	82	-16.47899	88	0.00			899.29
82	83	-16.47899	89		P	10.17	900.04
50	57	102.35248	91	0.00			898.86
93	62	177.01389					
20	26	413.33944					
26	27	397.03686					
27	28	397.03686					
28	30	441.66336					
13	57	990.82075					
84	26	-25.71805					
86	87	28.578664					
87	88	28.578664					
85	41	550.00013					
30	33	-73.33727					
33	34	-76.466					
34	36	-90.17308					
36	37	-90.17308					
69	89	-10.16624					
88	91	28.578664					
83	91	-28.57866					

P/S:P=Pressure set point S=Supply rate set point
CO=Compressor outlet CI=Compressor inlet

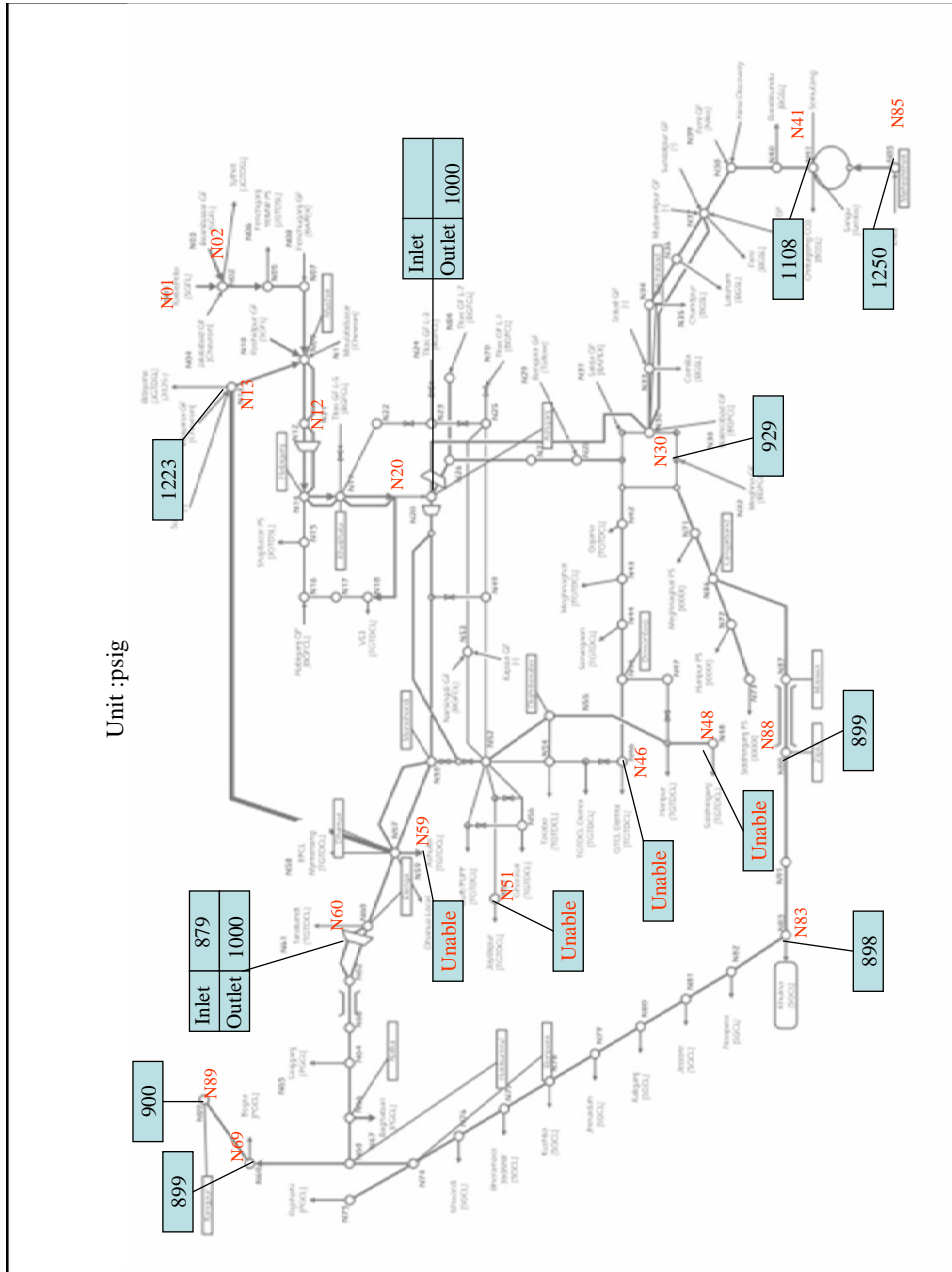


Fig.8 Pressure Distribution in Pipeline Network(FY 2020)

(4) The study results on FY 2025

- Region 1 & Region 2

The calculation results are shown in Table 17 and Table 18. The pressure distribution is also shown in Fig.9.

The situation does not change from FY 2020. 'Unable' appears along the circular lines from Bakhrabad to Monohordi. About 40 mmcf/d of gas is supplied from Khulna toward Zajira through the connection line (N83-N91).

Table 17 Flow Rates, Gas Demands, Supplies, and Pressure Distribution (FY 2025, Region1&2)

Flow rate in each pipeline			Demand/supply and pressure distribution				
Left number	Right number	Flow rate mmcf	Node	Demand mmcf	P/S	Supply mmcf	Pressure psig
20	26	279.63	13		P	1088.91	1223.04
20	49	559.50	20		CO	1058.77	1000.02
23	24	0.00	23	0.00			773.80
23	25	0.00	24	0.00			773.80
25	70	0.00	25	0.00			773.80
25	49	-182.28	26	0.00			938.61
25	53	182.28	27	0.00			936.00
26	27	294.83	28	0.00			934.95
27	28	294.83	29		S	23.07	956.41
28	29	-23.07	30		S	110.00	901.62
28	30	303.28	31		S	5.50	904.22
30	31	-5.50	32		S	3.60	904.77
30	32	-3.60	33		S	5.41	901.67
30	33	-8.34	34	20.24			901.73
30	42	765.69	35	0.00			901.73
33	34	-6.60	36	0.00			901.91
34	35	0.00	37	8.04			902.10
34	36	-13.13	38	0.00			902.18
36	37	-13.13	39	0.00			902.18
37	38	-15.73	40	423.42			902.77
38	39	0.00	41	77.86			921.83
38	40	-15.73	42	0.00			UNABLE
40	41	-152.39	43	284.93			UNABLE
42	43	765.69	44	0.00			UNABLE
43	44	480.76	45	55.44			UNABLE
44	45	480.76	46	335.64			UNABLE
45	46	169.01	47	582.54			UNABLE
45	47	256.32	48	34.32			UNABLE
46	54	-166.63	49	0.00			869.59
47	48	34.32	50	0.00			871.56
47	55	-360.55	51	0.00			UNABLE
49	50	-62.19	52	29.32			UNABLE
49	52	439.41	53		S	22.77	UNABLE
20	50	635.48	54	3.69			UNABLE
50	57	62.50	55	0.00			UNABLE
50	52	375.28	56	459.55			UNABLE
52	53	-205.04	57	0.00			865.59
52	54	150.88	58	29.04			842.98
52	55	379.99	59	910.37			UNABLE
52	56	134.43	60in	298.01	CI		847.18
52	56	134.43	60out		CO	298.01	1000.02
52	56	190.68	61	49.50			735.14
54	55	-19.45	62	0.00			993.62
56	51	0.00	63	93.87			916.13

60in=Inlet Side of Comp. 60out=Outlet Side of Comp.

P/S:P=Pressure set point S=Supply rate set point

CO=Compressor outlet CI=Compressor inlet

Table 18 Flow Rates, Gas Demands, Supplies, and Pressure Distribution (FY 2025, Region1&2)

Cont.

Flow rate in each pipeline		
Left number	Right number	Flow rate mmcf/d
57	58	29.04
57	59	910.37
57	60	138.71906
60	61	49.499647
93	62	34.216204
62	63	298.01232
63	64	33.865483
64	65	60.652599
64	66	-26.78712
66	67	11.152952
66	68	132.33347
68	69	5.4551062
30	71	207.66358
71	86	157.50369
86	72	197.99944
72	73	138.15964
68	74	126.87837
74	76	126.87837
76	77	126.87837
74	75	0
77	78	53.766738
78	79	53.766738
79	80	53.766738
80	81	53.766738
81	82	53.766738
82	83	53.766738
50	57	135.51484
93	62	263.79611
20	26	484.16481
26	27	510.5032
27	28	510.5032
28	30	525.12637
13	57	1088.9091
84	26	41.544884
86	87	-40.49575
87	88	-40.49575
85	41	550.00013
30	33	-17.5022
33	34	-13.83721
34	36	-27.5479
36	37	-27.5479
69	89	-5.697846
88	91	-40.49575
83	91	40.49575
37	38	-32.99262
38	40	-32.99262
40	41	-319.7465
57	60	208.79299
63	66	170.27354

Demand/supply and pressure distribution				
Node	Demand mmcf/d	P/S	Supply mmcf/d	Pressure psig
64	0.00			911.30
65	60.65			749.85
66	0.00			912.86
67	11.15			912.47
68	0.00			901.67
69	11.15			899.74
70	0.00			773.80
71	50.16			885.55
72	59.84			882.88
73	138.16			882.58
74	0.00			897.08
75	0.00			897.08
76	0.00			892.49
77	73.11			890.59
78	0.00			890.02
79	0.00			888.91
80	0.00			888.52
81	0.00			887.75
82	0.00			887.03
83	13.27			886.96
84		P	41.54	949.96
85		S	550.00	1087.29
86	0.00			884.39
87	0.00			885.01
88	0.00			885.31
89		P	5.70	900.04
91	0.00			886.14

P/S:P=Pressure set point S=Supply rate set point
 CO=Compressor outlet CI=Compressor inlet

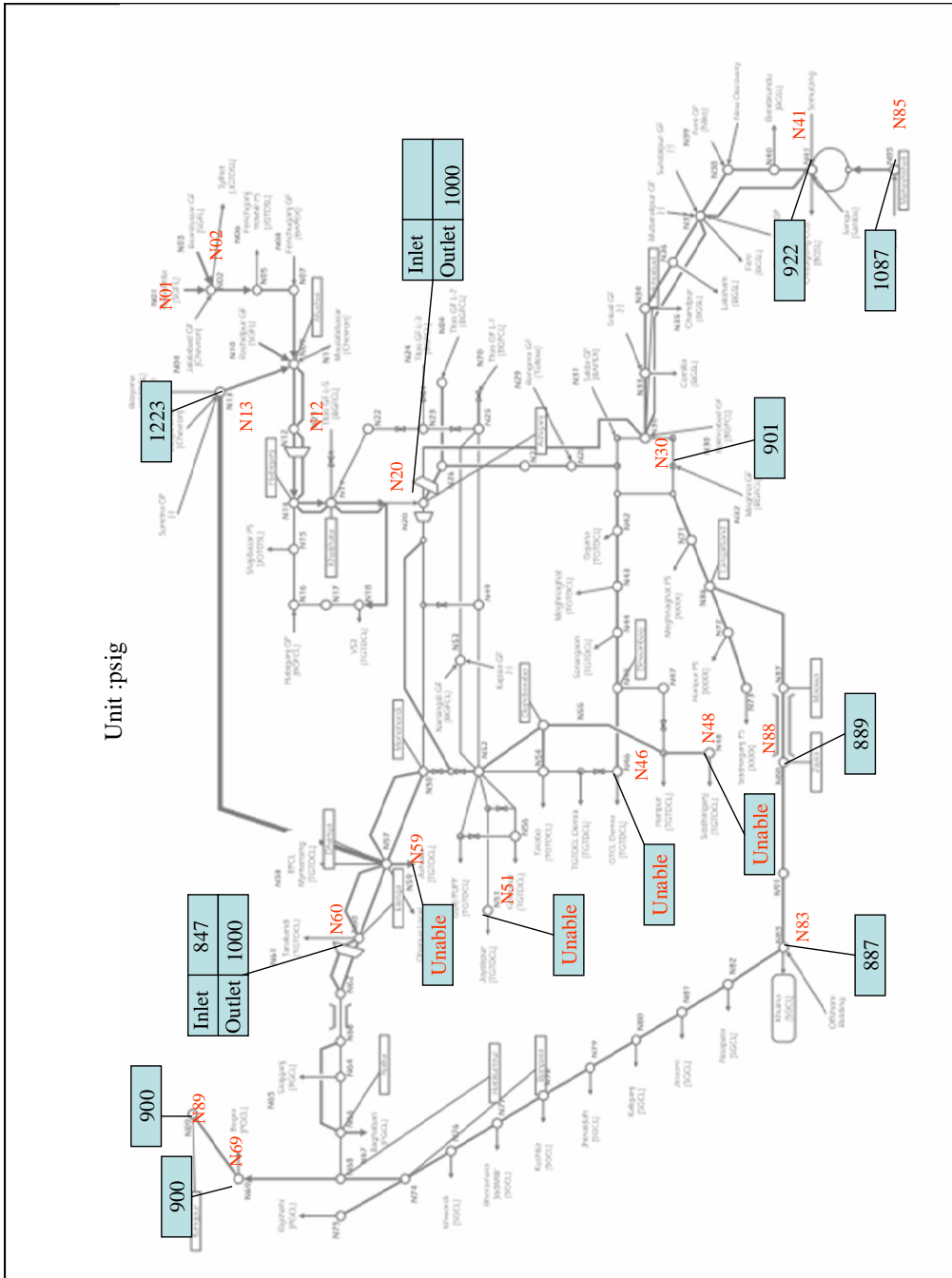


Fig.9 Pressure Distribution in Pipeline Network(FY 2025)

(5) The study results on FY 2030

- Region 1 & Region 2

The calculation results are shown in Table 19 and Table 20. The pressure distribution is also shown in Fig.10.

The situation does not change from FY 2020. 'Unable' appears along the circular lines from Bakhrabad to Monohordi.

Table 19 Flow Rates, Gas Demands, Supplies, and Pressure Distribution (FY 2030, Region1&2)

Flow rate in each pipeline			Demand/supply and pressure distribution				
Left number	Right number	Flow rate mmcf	Node	Demand mmcf	P/S	Supply mmcf	Pressure psig
20	26	305.45	13		P	1072.83	1223.04
20	49	521.25	20		CO	1951.76	1000.02
23	24	0.00	23	0.00			815.95
23	25	0.00	24	0.00			815.95
25	70	0.00	25	0.00			815.95
25	49	-157.67	26	0.00			927.26
25	53	157.67	27	0.00			924.05
26	27	327.48	28	0.00			922.77
27	28	327.48	29		S	7.56	925.54
28	29	-7.56	30	0.00			883.07
28	30	330.25	31	0.00			883.07
30	31	0.00	32	0.00			883.07
30	32	0.00	33		S	1.77	883.07
30	33	-2.17	34	20.24			883.08
30	42	709.83	35	0.00			883.08
33	34	-1.60	36	0.00			883.15
34	35	0.00	37	18.51			883.23
34	36	-8.13	38	0.00			883.30
36	37	-8.13	39	0.00			883.30
37	38	-14.10	40	468.85			883.79
38	39	0.00	41	37.46			906.41
38	40	-14.10	42	0.00			UNABLE
40	41	-165.44	43			273.79	UNABLE
42	43	709.83	44	0.00			UNABLE
43	44	436.04	45	0.00			UNABLE
44	45	436.04	46			349.62	UNABLE
45	46	169.35	47			606.81	UNABLE
45	47	266.69	48			38.50	UNABLE
46	54	-180.27	49	0.00			886.66
47	48	38.50	50	0.00			886.80
47	55	-378.62	51	0.00			UNABLE
49	50	-15.20	52			30.54	UNABLE
49	52	378.78	53		S	12.02	UNABLE
20	50	596.19	54			3.85	UNABLE
50	57	81.42	55			0.00	UNABLE
50	52	323.04	56			278.24	UNABLE
52	53	-169.69	57	0.00			877.21
52	54	159.94	58	0.00			877.21
52	55	402.80	59			946.20	UNABLE
52	56	81.39	60in	335.08	CI		855.24
52	56	81.40	60out		CO	335.08	1000.02
52	56	115.45	61	49.50			744.40
54	55	-24.18	62	0.00			992.07
56	51	0.00	63	151.66			894.79

60in=Inlet Side of Comp. 60out=Outlet Side of Comp.

P/S:P=Pressure set point S=Supply rate set point

CO=Compressor outlet CI=Compressor inlet

Table 20 Flow Rates, Gas Demands, Supplies, and Pressure Distribution (FY 2030, Region1&2)

Cont

Flow rate in each pipeline		
Left number	Right number	Flow rate mmcf/d
57	58	0.00
57	59	946.20
57	60	153.51399
60	61	49.499647
93	62	38.480079
62	63	335.07614
63	64	32.624381
64	65	62.341772
64	66	-29.71739
66	67	12.841278
66	68	108.23108
68	69	-13.63095
30	71	198.9504
71	86	148.79051
86	72	197.99944
72	73	138.15964
68	74	121.86203
74	76	121.86203
76	77	121.86203
74	75	0
77	78	49.208929
78	79	49.208929
79	80	49.208929
80	81	49.208929
81	82	49.208929
82	83	49.208929
50	57	176.53061
93	62	296.59607
20	26	528.87626
26	27	567.03069
27	28	567.03069
28	30	571.82252
13	57	1072.8328
84	26	60.185072
86	87	-49.20893
87	88	-49.20893
85	41	550.00013
30	33	-4.544119
33	34	-3.344825
34	36	-17.05278
36	37	-17.05278
69	89	-26.47223
88	91	-49.20893
83	91	49.208929
37	38	-29.58952
38	40	-29.58952
40	41	-347.1067
57	60	231.06156
63	66	150.78975
51	90	0
91	92	0

Demand/supply and pressure distribution				
Node	Demand mmcf/d	P/S	Supply mmcf/d	Pressure psig
64	0.00			890.17
65	62.34			714.41
66	0.00			892.11
67	12.84			891.59
68	0.00			884.24
69	12.84			894.91
70	0.00			815.95
71	50.16			867.93
72	59.84			865.33
73	138.16			865.02
74	0.00			879.90
75	0.00			879.90
76	0.00			875.56
77	72.65			873.76
78	0.00			873.27
79	0.00			872.31
80	0.00			871.97
81	0.00			871.30
82	0.00			870.68
83	0.00			870.62
84		P	60.19	949.96
85		S	550.00	1074.21
86	0.00			866.87
87	0.00			867.77
88	0.00			868.21
89		P	26.47	900.04
90	0.00			UNABLE
91	0.00			869.42
92	0.00			869.42

P/S:P=Pressure set point S=Supply rate set point
CO=Compressor outlet CI=Compressor inlet

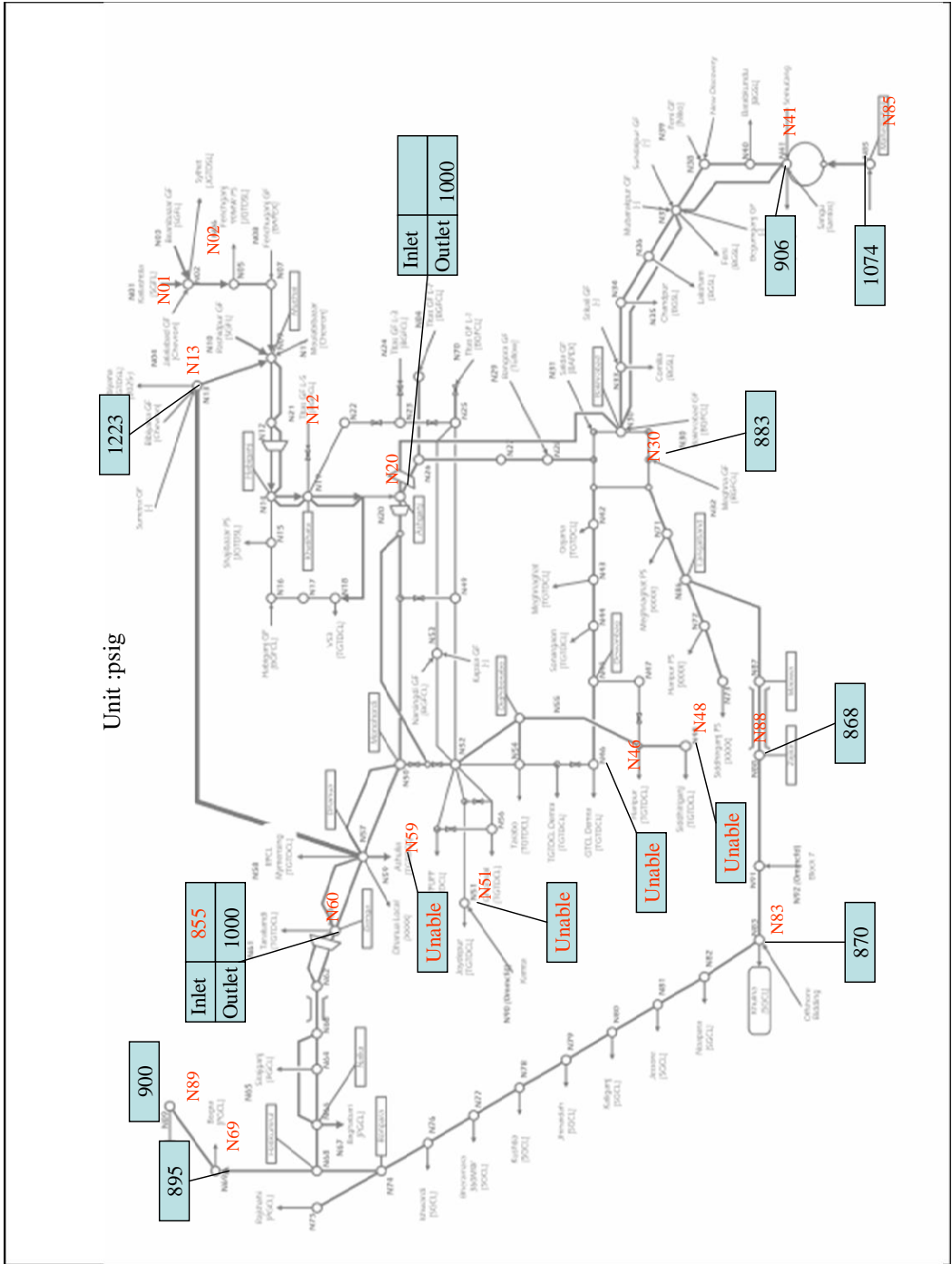


Fig.10 Pressure Distribution in Pipeline Network(FY 2030)

3. Conclusions

Numerical Simulations were carried out to evaluate the capacity of the pipeline network in Bangladesh.

The results show,

- (1) In FY 2015, almost all areas except Ashulia(N59) can secure gas supply, on condition that compressors are installed at the outlets of Bangora GF(N29), Salda GF(N31), and Bakhrabat GF(N30). The discharging pressures should be higher than 1,000 psi.
- (2) In FY 2020 and onward, supply trouble appears along the lines from Bakhrabad through Dewanbag to Monohordi.
- (3) To ensure the supply to the area around Chittagong, the pipeline pressure in the area must be very high. Design pressure should be checked.
- (4) South west lines from Hatikumrul(N69) to Khurna can maintain necessary pressure.

添付資料-7

ガスセクター補助金予測根拠

Production

Volume	(BCF)				(MMCFD)			
	2009-2010 Actual	2015 Supply	2015 Demand	2020 Supply	2009-2010 Actual	2015 Supply	2015 Demand	2020 Supply
SGC	330	589	589	672	903	1615	1,615	1841
IOC	373	821	707	528	1,023	2,248	1,936	1,446
LNG	0	183	0	183	0	500	0	500
Total	703	1,592	1,296	1,382	1,926	4,363	3,551	3,787

Cost

	(LTk)	
	2009-2010	2015(Adj) 2020
SGC	139,900	250,200 285,200
IOC	908,400	1,719,400 1,284,400
LNG	0	0 2,328,400
Total	1,048,300	1,969,600 3,898,000

Production Unit Cost (US\$/MCF)

0.59 Sales Price (1.31US\$/MCF) x 45%

3.38 IOCs Gas Price(2.66US\$/MCF) + Delivery Cost (0.72US\$/MCF)

17.72 LNG Spot Price (17US\$/MCF) + Delivery Cost (0.72US\$/MCF)

Sales

Sales Volume

Year	(BCF)								
	(Actual)	Power	Captive P.	Fertilizer	Industrial	Comm.	Domestic	CNG,Tea	Total
2009		393		65	119	8	80	39	703
2015	(Demand)	572	194	111	197	13	150	61	1,296
2020	(Supply)		262	96	266	16	208	74	1,382

Sales Prices (based on the present unit prices)

Year	(LTk)							
	Power	Captive P.	Fertilizer	Industrial	Comm.	Domestic	CNG,Tea	Total
2009	313,600	0	47,300	197,100	21,700	117,200	253,400	950,300
2015	456,800	229,600	80,800	326,300	33,600	218,900	394,400	1,740,400
2020	366,700	310,400	70,200	441,200	43,600	303,900	484,100	2,020,100
Unit Price (Tk/mcf)	79.85	118.36	73.06	165.94	268.16	146.11	651.29	

Assumption:

- 1) Exchange Rate: 1.0US\$ = 72.0Tk
- 2) The production unit cost (constant) is assumed with using the following Petrobangla Data.
 - Gas sales price: 1.31US\$/MCF, - IOCs gas price: 2.66US\$/MCF
 - LNG spot price: 17US\$/MCF
- 3) The gas delivery cost of 0.72US\$/MCF as calculated in the next page is added to the IOC gas and LNG.
- 4) The present gas unit price is used for calculating the sales prices in 2009, 2015 and 2020.

Calculation of Gas Delivery Cost excluding Bapex, DWMB & Wellhead Margin

Year	Power	Captive P.	Fertilizer	Industrial	Comm.	Domestic	CNG, Tea	Total	US\$/MCF
2009 (Actual)	106,300	0	16,400	78,200	9,100	45,600	107,300	362,900	0.72
2015 (Demand)	154,900	86,100	28,100	129,400	14,000	85,200	167,000	664,700	0.71
2020 (Supply)	124,300	116,400	24,400	175,000	18,200	118,300	205,000	781,600	0.79

Delivery Cost

1OM=35.3CF

35.3146667

1MCF=28.32CM

28.3168466

	Power	Captive P.	Fertilizer	Industrial	Comm.	Domestic	CNG, Tea	Tk/CM
PDF Margin	0.317	0.456	0.268	0.766	1.3355	0.709	6.1	
Bapex Margin	0.048	0.048	0.048	0.048	0.048	0.048	0.11	
DWMB	0.04	0.04	0.04	0.04	0.04	0.04	0.2	
Wellhead Margin	0.225	0.225	0.225	0.225	0.225	0.225	0.3	
Trans Margin	0.32	0.32	0.32	0.32	0.32	0.32	0.32	
Distr Margin	0.225	0.591	0.155	0.955	1.735	0.725	0.156	
GDF	0.094	0.201	0.153	0.283	0.558	0.255	3.164	
Total	1.269	1.881	1.161	2.637	4.2615	2.322	10.35	
Total exc. Bapex, DWMB & Wellhead Margin	0.956	1.568	0.896	2.324	3.9485	2.009	9.74	

	Power	Captive P.	Fertilizer	Industrial	Comm.	Domestic	CNG, Tea	Tk/mcf
Current Unit Price	79.85	118.36	73.06	165.94	268.16	146.11	651.29	
Current Unit Price exc. Bapex, DWMB &	60.16	98.67	56.38	146.24	248.46	126.42	612.90	

添付資料-8

ガスセクター各社財務諸表

1. 探鉱・生産部門

1) BAPEX: Bangladesh Petroleum Exploration and Production Company

BAPEX Financial Outlook

(Unit: Taka million)

No.	Items	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11
1	Gas Production (mmcm)			322.00	391.00	412.00	
2	Gas Sales (mmcm)						
3	Revenues from Gas & Condensate	169.54	155.85	104.39	455.42	483.90	
4	Gas Exploration Surcharge	361.08	384.99	371.68	375.88	400.43	
5	Other Income	146.33	241.75	181.18	59.16	533.04	
6	Total	676.95	782.59	657.25	890.46	1,417.37	
7	% of exploration surcharge	53.34	49.19	56.55	42.21	28.25	
8	Total Capital & Reserves	6,594.99	6,813.64	7,040.29	7,510.14	11,217.50	
9	Total Long Term Borrowings	750.64	712.37	1,139.80	1,261.62	1,290.46	
10	Total Other Long Term Liabilities	134.05	134.05	134.05	134.05	134.05	
11	Total Capital Employed	7,479.68	7,660.06	8,314.14	8,905.81	12,642.01	
12	Total Fixed Assets	3,697.35	3,639.38	3,620.33	3,875.98	4,198.36	
13	Return on Net Fixed Assets (%)	18.31	21.50	18.15	22.97	33.76	
14	Debt Service Ratio (times)	0.77	0.92	0.52	0.64	0.99	
15	Self Financing Ratio (%)	974.22	870.65	1,071.17	843.40	791.43	
16	Debt Financing (%)	23.93	23.26	35.19	36.01	33.93	

Note: Mmcm means million cubic meter.

Source: Petrobangla & its affiliated companies Annual Report

2) BGFL: Bangladesh Gas Field Company Limited

BGFL Financial Outlook

(Unit: Taka million)

No.	Items	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11
1	Gas Production (mmcf)					258,314.99	
2	Gas Sales (mmcf)					257,881.64	
3	Gas Sales - Inter Group				16,139.57	17,872.08	
4	Sales Oil & Other Products				1,510.14	1,404.52	
5	Payment to GOB - SD & VAT				-14,538.70	-16,320.12	
6	Other Income				0.00	0.00	
7	Total				3,111.01	2,956.48	
8	Per Cent of Revenue				567.33	652.01	
9	Total Capital & Reserves				13,098.46	14,062.26	
10	Total Long Term Borrowings				2,314.75	2,206.91	
11	Total Other Long Term Liabilities				8,858.07	9,540.99	
12	Total Capital Employed				24,271.28	25,810.16	
13	Total Fixed Assets				13,993.22	15,180.29	
14	Return on Net Fixed Assets (%)				22.23	19.48	
15	Debt Service Ratio (times)				0.28	0.25	
16	Self Financing Ratio (%)				421.04	475.64	
17	Debt Financing (%)				79.84	77.39	

Note: Mmcm means million cubic meter.

Source: Petrobangla & BGFL Annual Reports

3) SGFL: Sylhet Gas Field Limited

SGFL Financial Outlook

(Unit: Taka million)

No.	Items	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11
1	Gas Production (mmcm)	1,717.39	1,848.57	1,741.36	1,627.52	1,621.60	
2	Gas Sales (mmcm)	1,678.04	1,809.82	1,825.36	1,624.90	1,619.12	
3	Gas Sales - Inter Group	3,345.33	3,660.44	3,837.56	3,872.75	4,227.30	
4	Sales Oil & Other Products	1,317.99	2,228.94	2,981.36	4,102.91	6,437.49	
5	Payment to GOB - SD & VAT	-3,049.90	-3,488.01	-3,770.09	-3,994.12	-4,672.11	
6	Other Income	0.00	0.00	0.00	0.00	0.00	
7	Total	3,291.46	4,211.19	4,874.19	5,606.44	5,992.68	
8	Per Cent of Revenue	141.68	139.85	139.90	142.26	177.96	
9	Total Capital & Reserves	7,971.57	8,905.14	10,526.58	12,915.23	15,373.99	
10	Total Long Term Borrowings	1,414.55	1,130.61	1,006.14	901.49	821.57	
11	Total Other Long Term Liabilities	35.93	27.13	56.53	34.29	11.09	
12	Total Capital Employed	9,422.05	10,062.88	11,589.25	13,851.01	16,206.65	
13	Total Fixed Assets	4,489.15	4,825.36	5,053.63	5,190.88	5,666.75	
14	Return on Net Fixed Assets (%)	73.32	87.27	96.45	108.01	105.75	
15	Debt Service Ratio (times)	2.27	3.64	4.59	5.99	7.20	
16	Self Financing Ratio (%)	242.19	211.46	215.97	230.36	256.55	
17	Debt Financing (%)	32.31	23.99	21.03	18.03	14.69	

Note: Mmcm means million cubic meter.

Source: Petrobangla & SGFL Annual Reports

2. 搬送部門

1) GTCL: Gas Transmission Company Limited

GTCL Financial Outlook

(Unit: Taka million)

No.	Items	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11
1	Gas Transmission (mmcm)						
2	Transmission Charges including Line Rent	2,948.07	3,533.04	4,178.08	4,186.09	4,525.67	
3	Other Income	0.00	0.00	0.00	0.00	0.00	
4	Total	2,948.07	3,533.04	4,178.08	4,186.09	4,525.67	
5	% of transmission charge	100.00	100.00	100.00	100.00	100.00	
6	Total Capital & Reserves	12,638.52	14,545.92	17,509.90	19,969.36	24,932.69	
7	Total Long Term Borrowings	9,605.68	8,666.60	8,268.74	8,232.21	13,347.86	
8	Total Other Long Term Liabilities	0.00	0.00	0.00	0.00	0.00	
9	Total Capital Employed	22,244.20	23,212.52	25,778.64	28,201.57	38,280.55	
10	Total Fixed Assets	20,300.88	20,014.44	20,065.32	19,154.73	29,111.74	
11	Return on Net Fixed Assets (%)	14.52	17.65	20.82	21.85	15.55	
12	Debt Service Ratio (times)	0.31	0.41	0.51	0.51	0.34	
13	Self Financing Ratio (%)	428.70	411.71	419.09	477.04	550.92	
14	Debt Financing (%)	47.32	43.30	41.21	42.98	45.85	

Note: Mmcm means million cubic meter.

Source: Petrobangla & GTCL Annual Reports

3. 販売部門

1) TGTDC: Titas Gas Transmission and Distribution Company Limited

TGTDC Financial Outlook

(Unit: Taka million)

No.	Items	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11
1	Gas Sales (mmcm)	10,165.00	11,205.00	12,244.00	13,446.00	14,963.00	
2	Gas Sales - End Customers				52,305.98	63,794.89	67,813.68
3	Other Income				597.15	762.19	737.55
4	Total				52,903.13	64,557.08	68,551.23
5	% of exploration surcharge				98.87	98.82	98.92
6	Total Capital & Reserves				16,638.64	20,997.82	28,246.37
7	Total Long Term Borrowings				2,548.50	2,148.72	2,088.80
8	Total Other Long Term Liabilities				7,463.81	7,965.09	8,095.81
9	Total Capital Employed				26,650.95	31,111.63	38,430.98
10	Total Fixed Assets				11,744.62	11,407.87	11,588.96
11	Return on Net Fixed Assets (%)				450.45	565.90	591.52
12	Debt Service Ratio (times)				5.28	6.38	6.73
13	Self Financing Ratio (%)				31.45	32.53	41.20
14	Debt Financing (%)				85.25	88.66	87.88

Note: Mmcm means million cubic meter.

Source: Petrobangla & TITAS Annual Reports

2) BGSL: Bakhrabad Gas System Limited

BGSL Financial Outlook

(Unit: Taka million)

No.	Items	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11
1	Gas Sales (mmcm)	2,664.00	2,798.00	2,827.00	2,881.00	3,009.00	
2	Gas Sales - End Customers		11,921.82	14,600.25	17,925.15	16,000.66	
3	Other Income		160.25	163.14	169.39	197.07	
4	Total		12,082.07	14,763.39	18,094.54	16,197.73	
5	% of exploration surcharge		98.67	98.89	99.06	98.78	
6	Total Capital & Reserves		7,459.55	8,256.82	9,210.55	10,069.07	
7	Total Long Term Borrowings		290.76	258.11	189.21	120.84	
8	Total Other Long Term Liabilities		1,939.74	2,541.21	3,030.39	3,810.37	
9	Total Capital Employed		9,690.05	11,056.14	12,430.15	14,000.28	
10	Total Fixed Assets		2,883.30	2,841.06	2,817.76	2,784.14	
11	Return on Net Fixed Assets (%)		419.04	519.64	642.16	581.79	
12	Debt Service Ratio (times)		5.42	5.27	5.62	4.12	
13	Self Financing Ratio (%)		61.74	55.93	50.90	62.16	
14	Debt Financing (%)		77.36	98.53	114.26	141.20	

Note: Mmcm means million cubic meter.

Source: Petrobangla & BGSL Annual Reports

3) JGTDSL: Jalalabad Gas Transmission and Distribution System Limited

JGTDSL Financial Outlook

(Unit: Taka million)

No.	Items	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11
1	Gas Sales (mmcm)	719.00	727.00	907.00	1,254.00	1,445.00	
2	Gas Sales - End Customers	2,205.60	2,357.12	2,945.34	4,431.23	5,470.63	
3	Other Income	35.48	116.25	39.47	85.32	136.51	
4	Total	2,241.08	2,473.37	2,984.81	4,516.55	5,607.14	
5	% of exploration surcharge	98.42	95.30	98.68	98.11	97.57	
6	Total Capital & Reserves	2,250.77	2,429.12	2,625.66	3,039.84	3,328.39	
7	Total Long Term Borrowings	473.39	395.70	326.19	386.91	324.18	
8	Total Other Long Term Liabilities	286.78	300.84	552.55	596.47	721.37	
9	Total Capital Employed	3,010.94	3,125.66	3,504.40	4,023.22	4,373.94	
10	Total Fixed Assets	1,533.20	1,530.54	1,509.49	1,659.47	1,618.65	
11	Return on Net Fixed Assets (%)	146.17	161.60	197.74	272.17	346.41	
12	Debt Service Ratio (times)	2.95	3.55	3.40	4.59	5.36	
13	Self Financing Ratio (%)	100.43	98.21	87.97	67.30	59.36	
14	Debt Financing (%)	49.58	45.51	58.21	59.26	64.59	

Note: Mmcm means million cubic meter.

Source: Petrobangla & JGTDSL Annual Reports

4. CNG 部門

1) RPGCL: Rupantarita Prakritik Company Limited)

RPGCL Financial Outlook

(Unit: Taka million)

No.	Items	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11
1	Gas Sales (mmcm)						
2	Gas Sales - End Customers				357.29	206.75	
3	Sales Oil & Other Products				2,909.51	2,344.64	
4	Payment to GOB - SD & VAT				-360.97	-295.75	
5	Other Income				46.74	31.68	
6	Total				3,266.80	2,287.32	
7	Per Cent of Revenue				100.00	111.54	
8	Total Capital & Reserves				1,841.31	2,184.22	
9	Total Long Term Borrowings				1,687.77	1,847.54	
10	Total Other Long Term Liabilities				700.98	817.03	
11	Total Capital Employed				4,230.06	4,848.79	
12	Total Fixed Assets				1,886.25	2,610.55	
13	Return on Net Fixed Assets (%)				173.19	87.62	
14	Debt Service Ratio (times)				1.37	0.86	
15	Self Financing Ratio (%)				56.36	95.49	
16	Debt Financing (%)				126.64	102.07	

Note: Mmcm means million cubic meter.

Source: Petrobangla & RPGCL Annual Reports