



# Report and Recommendation of the President to the Board of Directors

---

Project Number: 45203-006  
October 2016

## Proposed Loans and Administration of Loan People's Republic of Bangladesh: Natural Gas Infrastructure and Efficiency Improvement Project

Distribution of this document is restricted until it has been approved by the Board of Directors. Following such approval, ADB will disclose the document to the public in accordance with ADB's Public Communications Policy 2011 after excluding information that is subject to exceptions to disclosure set forth in the policy.

Asian Development Bank

## CURRENCY EQUIVALENTS

(as of 9 October 2016)

Currency unit	–	taka (Tk)
Tk1.00	=	\$0.012755
\$1.00	=	Tk78.40

## ABBREVIATIONS

ADB	–	Asian Development Bank
AIB	–	Asian Infrastructure Investment Bank
BAPEX	–	Bangladesh Petroleum Exploration and Production Company Limited
BGFCL	–	Bangladesh Gas Fields Company Limited
FIRR	–	financial internal rate of return
GTCL	–	Gas Transmission Company Limited
IEE	–	initial environmental examination
LNG	–	liquefied natural gas

## WEIGHTS AND MEASURES

in	–	inch
km	–	kilometer
MMCFD	–	million cubic feet per day
MW	–	megawatt
psig	–	pounds per square inch gauge
TCF	–	trillion cubic feet

## NOTES

- (i) The fiscal year (FY) of the Government of Bangladesh and its agencies ends on 30 June. “FY” before a calendar year denotes the year in which the fiscal year ends, e.g., FY2016 ends on 30 June 2016.
- (ii) In this report, “\$” refers to US dollars.

<b>Vice-President</b>	W. Zhang, Operations 1
<b>Director General</b>	H. Kim, South Asia Department (SARD)
<b>Director</b>	A. Jude, Energy Division, SARD
<b>Team leader</b>	H. Zhang, Finance Specialist (Energy), SARD
<b>Team members</b>	M. Ahmed, Associate Project Analyst, SARD
	K. Emzita, Principal Counsel, Office of the General Counsel
	A. K. M. Firoz, Senior Procurement Officer, SARD
	Y. Jang, Social Development Specialist, SARD
	M. C. Santos, Associate Project Analyst, SARD
	R. Shaheen, Senior Procurement Specialist, Operations Services and Financial Management Department
	S. Shafiq, Financial Management Specialist, SARD
	S. Vikram, Senior Financial Management Specialist, SARD
	Y. Zhou, Environment Specialist, SARD
<b>Peer reviewer</b>	P. Wijayatunga, Principal Energy Specialist, Sustainable Development and Climate Change Department

In preparing any country program or strategy, financing any project, or by making any designation of or reference to a particular territory or geographic area in this document, the Asian Development Bank does not intend to make any judgments as to the legal or other status of any territory or area.

## CONTENTS

	<b>Page</b>
PROJECT AT A GLANCE	
I. THE PROPOSAL	1
II. The PROJECT	1
A. Rationale	1
B. Impact and Outcome	4
C. Outputs	4
D. Investment and Financing Plans	5
E. Implementation Arrangements	6
III. DUE DILIGENCE	7
A. Technical	7
B. Economic and Financial	7
C. Governance	8
D. Poverty and Social	8
E. Safeguards	8
F. Risks and Mitigating Measures	9
IV. ASSURANCES AND CONDITIONS	10
V. RECOMMENDATION	10
APPENDIXES	
1. Design and Monitoring Framework	11
2. List of Linked Documents	13

## PROJECT AT A GLANCE

<b>1. Basic Data</b>		<b>Project Number:</b> 45203-006	
<b>Project Name</b>	Natural Gas Infrastructure and Efficiency Improvement Project	<b>Department /Division</b>	SARD/SAEN
<b>Country</b>	Bangladesh	<b>Executing Agency</b>	Bangladesh Gas Fields Company Ltd., Gas Transmission Company Ltd.
<b>Borrower</b>	Bangladesh		
<b>2. Sector</b>	<b>Subsector(s)</b>	<b>ADB Financing (\$ million)</b>	
✓ <b>Energy</b>	Oil and gas transmission and distribution		167.00
		<b>Total</b>	<b>167.00</b>
<b>3. Strategic Agenda</b>	<b>Subcomponents</b>	<b>Climate Change Information</b>	
Inclusive economic growth (IEG)	Pillar 1: Economic opportunities, including jobs, created and expanded	Adaptation (\$ million)	20.00
Environmentally sustainable growth (ESG)	Global and regional transboundary environmental concerns	Climate Change impact on the Project	Medium
<b>4. Drivers of Change</b>	<b>Components</b>	<b>Gender Equity and Mainstreaming</b>	
Partnerships (PAR)	International finance institutions (IFI) Official cofinancing	No gender elements (NGE)	✓
<b>5. Poverty and SDG Targeting</b>		<b>Location Impact</b>	
Project directly targets poverty and SDGs	No	Nation-wide	High
<b>6. Risk Categorization:</b>	Complex		
<b>7. Safeguard Categorization</b>	<b>Environment: B Involuntary Resettlement: A Indigenous Peoples: C</b>		
<b>8. Financing</b>			
<b>Modality and Sources</b>		<b>Amount (\$ million)</b>	
<b>ADB</b>		<b>167.00</b>	
Sovereign Project loan: Asian Development Fund		67.00	
Sovereign Project loan: Ordinary capital resources		100.00	
<b>Cofinancing</b>		<b>60.00</b>	
Asian Infrastructure Investment Bank - Loan		60.00	
<b>Counterpart</b>		<b>226.00</b>	
Government		226.00	
<b>Total</b>		<b>453.00</b>	
<b>9. Effective Development Cooperation</b>			
Use of country procurement systems		No	
Use of country public financial management systems		Yes	

## I. THE PROPOSAL

1. I submit for your approval the following report and recommendation on proposed loans to the People's Republic of Bangladesh for the Natural Gas Infrastructure and Efficiency Improvement Project.<sup>1</sup> The report also describes the proposed administration of a loan to be provided by the Asian Infrastructure Investment Bank (AIIB) for the Natural Gas Infrastructure and Efficiency Improvement Project, and if the Board approves the proposed loans, I, acting under the authority delegated to me by the Board, approve the administration of the loan.

2. The project aims to (i) improve efficiency in natural gas production by installing seven wellhead gas compressors at location A of Titas gas field,<sup>2</sup> and (ii) expand natural gas transmission pipeline capacity by constructing an approximately 181-kilometer (km), 36-inch (in) parallel gas transmission pipeline from Chittagong through Feni to Bakhrabad.<sup>3</sup>

## II. THE PROJECT

### A. Rationale

3. **Natural gas availability.** Natural gas is Bangladesh's key indigenous energy source and is a driving force of the country's economy growth. Of Bangladesh's total primary energy consumption of 28.1 million tons of oil equivalent, 75.4% is met by natural gas, while 58.0% of total natural gas production is used for electricity generation. The installed capacity of gas-based power generation is 7,628 megawatts (MW), of which 2,300 MW was added before 2015, and an additional 4,032 MW is planned by 2021. The gas supply constraint leads to less gas-based power generation and lower industrial production efficiency.<sup>4</sup>

4. As of June 2016, out of a total recoverable reserve of 27.12 trillion cubic feet (TCF), cumulative production was 13.10 TCF. The remaining recoverable reserve of about 14 TCF, if fully exploited, can meet the country's natural gas demand at best for 12 more years with a modest gas-demand growth rate of 5% per year. Currently, the gas production is 2,700 million cubic feet per day (MMCFD) against a demand of 3,155 MMCFD, indicating a daily shortage of 455 MMCFD. The deficit is expected to further exacerbate given declining gas reserves and fast-rising demand, which will eventually impact Bangladesh's energy security and constrain the nation's economic growth. As an immediate crisis management action, the Government of Bangladesh is handling the current gas supply shortfall by (i) prioritizing gas supply to power plants, (ii) curtailing gas supply to fertilizer plants, and (iii) rationing gas supply to compressed natural gas and domestic sectors.

5. **Exploration and production.** In Bangladesh, natural gas exploration and production has not kept pace with demand growth. Bangladesh Petroleum Exploration and Production Company Limited (BAPEX) has not done extensive exploration for many years due to lack of public funds. Exploration in offshore blocks stalled in the early 2000s for various reasons, including unattractive production-sharing contracts. To combat the gas crisis, there is an urgent need to accelerate gas exploration and production. The Government of Bangladesh established the gas development fund in 2012 to support upstream activities and undertake large-scale

---

<sup>1</sup> The design and monitoring framework is in Appendix 1.

<sup>2</sup> Location A is one of 10 producing areas in Titas gas field, which is located 100 km northeast from Bangladesh's capital (Dhaka).

<sup>3</sup> The Asian Development Bank (ADB) provided project preparatory technical assistance for the Natural Gas Transmission and Distribution Development Investment Program (TA-8474).

<sup>4</sup> In 2015, 800–1,000 MW of generation capacity was not operational because of inadequate gas supplies. In January 2016, 680 million cubic feet per day (MMCFD) out of 1,548 MMCFD demand could not be met.

exploration in onshore and offshore areas.<sup>5</sup> BAPLEX has initiated well appraisals, such as three-dimensional seismic surveys and development of discovered and producing gas fields, to prove additional gas reserves. It is also undertaking an ambitious exploration program of drilling 108 wells (53 exploration, 35 development, and 20 workovers) by 2021 using the gas development fund and other resources to increase production by 1,200 MMCFD.<sup>6</sup> Bangladesh Oil, Gas and Mineral Corporation (Petrobangla) has assigned offshore exploration rights to and signed new production-sharing contracts with international oil companies to complement BAPLEX's onshore exploration program. In the meantime, Petrobangla is pursuing a program to increase recovery from existing gas fields by installing wellhead gas compressors. The government is also considering establishing an energy security fund that will be earmarked for the construction of liquefied natural gas (LNG) terminals, including the import of LNG and liquefied petroleum gas.<sup>7</sup>

6. As part of gas crisis management, Petrobangla is diversifying the gas supply source through imports either through inter-country gas transmission pipeline or as LNG. The private sector is constructing a floating storage and regasification unit near Maheshkhali<sup>8</sup> on a build-own-operate-transfer basis to import about 500 MMCFD of gas, and the terminal construction will be completed by the end of 2018. Other initiatives, such as importing gas from neighboring countries and constructing land-based LNG terminals, are under consideration to augment gas supply in Bangladesh.

7. Since January 2009, a total 706 MMCFD of gas production capacity has been added through new wells, workovers, or capacity enhancements. An additional 400 MMCFD may be produced when the production augmentation programs under the Seventh Five-Year Plan, FY2016–FY2020 are implemented.<sup>9</sup>

8. **Natural gas transmission infrastructure.** Inadequate gas transmission infrastructure is another hurdle in Bangladesh's gas sector. The gas transmission infrastructure coverage is not able to serve the country's key market areas, as most gas supply points are in the northeast and central regions, while delivery points are in the central, south, and west. Ongoing Asian Development Bank (ADB) loans have greatly enhanced the transmission capability.<sup>10</sup> However, the Chittagong area is still suffering from a gas supply shortfall due to full capacity attainment of the existing 175 km, 24-in Bakhrabad–Chittagong gas transmission pipeline. To enhance the throughput capabilities and facilitate transmission of additional gas, the gas transmission network must be expanded to accommodate the upcoming diversified gas supply sources from imports and offshore discoveries into the national gas network.

9. **Gas pricing.** The non-cost reflective pricing mechanism constrains gas sector development. The average retail price of gas in Bangladesh is \$1.88/million British thermal unit. It is the lowest in the region, is heavily subsidized (compared to alternative sources of energy), and does not adequately reflect the gas resources' actual cost and value. Through its previous interventions, ADB supported the government in implementing sector reforms and addressing institutional issues, which improved operational efficiency and sector governance.<sup>11</sup> However,

<sup>5</sup> Currently, the fund size is \$900 million equivalent, all of which has been committed for use by 2021.

<sup>6</sup> BAPLEX. 2015. *Exploration Program during Seventh Five-Year Plan (Annual Report)*. Dhaka.

<sup>7</sup> The initial energy security fund would amount to \$300 million equivalent, with subsequent increases each year.

<sup>8</sup> Maheshkhali is an island near Cox's Bazar in the southeast coast of Bangladesh.

<sup>9</sup> Government of Bangladesh, Planning Commission, Ministry of Planning. 2015. *The Seventh Five-Year Plan (FY2016–FY2020): Accelerating Growth, Empowering Citizens*. Dhaka.

<sup>10</sup> ADB. 2010. *Report and Recommendation of the President to the Board of Directors: Proposed Loans to the People's Republic of Bangladesh for Natural Gas Access Improvement Project*. Manila.

<sup>11</sup> Sector Assessment (Summary): Natural Gas (accessible from the list of linked documents in Appendix 2).

gas pricing reform has lagged because of the urgency to combat the country's energy crisis. The expected outcome of the covenants on gas pricing in the ongoing ADB loans can be seen in the government effort to increase gas tariffs and establish energy security funds.

10. In a move to rationalize gas prices to align with equivalent energy prices, the government introduced the resource price of gas in September 2014 and also increased end-user gas prices by 25% in September 2015. The government is working on a proposal to revise the natural gas-pricing framework based on principles of economic efficiency, financial viability, and social equitability. The proposed framework envisages that market-related consumer prices will be achieved in a phased manner over 7 to 8 years. Given the urgency of gas import including LNG, expected in 2018, the government is making further adjustments in domestic gas prices to reflect the cost of gas import. The actions under consideration include blending the imported LNG prices with domestically produced gas to ensure sustainability.<sup>12</sup> ADB will continue policy dialogue with the government and other stakeholders to establish a cost-reflective pricing mechanism.

11. **Government development plan.** The government recognizes the strong link between energy and economic growth, and the urgency to sustain gas supply and address inadequate gas-transmission infrastructure. In the Seventh Five-Year Plan, the government will promote gas sector development through (i) prioritized gas allocation, (ii) strengthened gas exploration, and (iii) rationalized gas pricing. The plan prioritizes LNG import or import through cross-border pipelines to increase gas supply, improve gas use efficiency, and mobilize private sector investments. The proposed project forms an essential part of the government's gas sector development plan.

12. **ADB intervention.** ADB's assistance, totaling \$675 million since 1993, has helped increase gas production capacity, improve the gas transmission and distribution network, improve gas operational efficiencies, strengthen the policy framework, and build the capacity of sector institutions.<sup>13</sup> The gas sector reforms supported by ADB's ongoing loans covered (i) institutional and financial restructuring of gas sector companies to ensure long-term financial sustainability, (ii) transforming gas companies to diversify ownership involving private or institutional investors, and (iii) restructuring and unbundling gas sector institutions and enterprises. Given the gas sector's crucial role in promoting economic growth through expanded power generation, it is necessary for ADB to continue its support in this area. Reinforcing the natural gas infrastructure is essential to ensure delivery reliability and efficiency, in particular for evacuating and transmitting imported LNG or pipeline gas in conjunction with domestic gas production. The twin effect of these initiatives will be the scaling up of gas availability for power generation to ensure energy security and support economic growth. The capacity of the national gas companies is not sufficiently developed to access international financing. Therefore, natural gas production and transmission continue to entail development partners' support. Consistent with Sustainable Development Goal 7 for Energy, which seeks to ensure affordable, reliable, and sustainable modern energy for all, the project will expand access to reliable energy by addressing the prevailing gas supply constraint, supporting reservoir management designed to enhance energy security, and ensuring low-emission development.<sup>14</sup>

---

<sup>12</sup> The weighted average consumer-level price of domestic gas produced by both national gas companies and international oil companies is \$2.17/cubic meter. The consumer-level price of regasified, imported LNG when blended with national gas would be \$4.35/cubic meter.

<sup>13</sup> Development Coordination (accessible from the list of linked documents in Appendix 2).

<sup>14</sup> Government of Bangladesh, Ministry of Environment and Forest. 2015. Intended Nationally Determined Contributions. Dhaka.



13. The proposed project is an essential component of the Seventh Five-Year Plan to ease the country's energy crisis and accelerate economic growth and is aligned with ADB's country partnership strategy for Bangladesh, 2016–2020 and its country operations business plan for Bangladesh, 2017–2019.<sup>15</sup> The ongoing ADB-supported gas projects experienced delays in achieving targets because of procurement difficulties and institutional weaknesses. Lessons learned from these operations have been taken into account in the proposed project. ADB's introduction of advance action based on an agreed procurement plan and provision of training for executing agencies personnel in procurement, financial management, and reporting and monitoring will help improve executing agencies' knowledge of ADB procedures and guidelines, and ensure timely project implementation.

14. **Project features.** Following the government's request, the proposed project will help improve gas production efficiency to maximize recovery from the Titas gas field, the country's largest producing gas field, and to maintain the current level of production at required delivery pressure to the gas transmission system. Titas gas field has been producing gas since 1968, and wellhead pressure has declined from about 3,000 pounds per square inch gauge (psig) to an average of 1,250 psig. This is expected to reduce to below the 1,000 psig threshold by 2019. Bangladesh Gas Fields Company Limited (BGFCL) is installing wellhead gas compressors at Titas gas field location A to ensure smooth gas production at the current level. Japan International Cooperation Agency has also provided support in installing wellhead compressors at location C of Titas gas field and of Narsingdi gas field. After the installation of wellhead compressors, an additional 1.0 TCF of gas will be produced from Titas gas field, which has a remaining reserve of 2.5 TCF.

15. The initial 500 MMCFD of LNG imported and regasified at the floating storage and regasification unit will be transported from Maheshkhali to Anwara by a 30-in transmission pipeline being constructed by Gas Transmission Company Limited (GTCL) to connect with the existing 300 psig ring main gas pipeline around Chittagong. The regasified LNG will be partially consumed in the Chittagong area, and the balance will be transmitted through the existing 24-in transmission pipeline to meet gas demand in other parts of the country. Transmitting imported LNG or pipeline gas into the national network will necessitate constructing a 181 km, 36-in parallel gas transmission pipeline from Chittagong through Feni to Bakhrabad. The proposed pipeline will constitute a loop between Chittagong and Bakhrabad and overcome the 24-in pipeline's capacity limitation, which will ensure a dependable and reliable gas transmission network, and increase operational flexibility and supply integrity.

## **B. Impact and Outcome**

16. The project impact will be increased energy sector contribution to sustainable economic growth, which aligns with the government's Seventh Five-Year Plan. The outcome will be improved efficiency in gas production and expanded gas transmission pipeline capacity.

## **C. Outputs**

17. The project comprises two outputs: (i) increased and sustained wellhead gas delivery pressure at location A of Titas gas field by installing seven wellhead gas compressors to maintain the current gas production level to the gas transmission pipeline system; and (ii) expanded capacity of Chittagong–Feni–Bakhrabad gas transmission pipeline by constructing

---

<sup>15</sup> ADB. 2016. *Country Partnership Strategy: Bangladesh, 2016–2020*. Manila; and ADB. 2016. *Country Operations Business Plan, 2017–2019*. Manila.

an approximately 181 km, 36-in parallel gas transmission pipeline to transmit additional gas to the national network.

#### D. Investment and Financing Plans

18. The project is estimated to cost \$453 million (Table 1).

**Table 1: Project Investment Plan**  
(\$ million)

Item	Amount <sup>a</sup>
<b>A. Base Cost<sup>b</sup></b>	
1. Installation of seven wellhead gas compressors	113.0
2. Construction of 181 km, 36-in parallel gas transmission pipeline	276.0
<b>Subtotal (A)</b>	<b>389.0</b>
<b>B. Contingencies<sup>c</sup></b>	<b>25.0</b>
<b>C. Financing Charges during Implementation<sup>d</sup></b>	<b>39.0</b>
<b>Total (A+B+C)</b>	<b>453.0</b>

in = inch, km = kilometer.

<sup>a</sup> Includes taxes and duties of \$55 million to be financed from government resources through cash contribution.

<sup>b</sup> In mid-2016 prices.

<sup>c</sup> Physical contingencies computed at 2% of base costs. Price contingencies computed using international and domestic inflation rate forecast by the Asian Development Bank (ADB), including provision for potential exchange rate fluctuation under the assumption of a purchasing power parity exchange rate.

<sup>d</sup> Includes interest, commitment fee, and other charges to be incurred under all loans. Interest during construction for ADB ordinary capital resources loan has been computed at the 5-year forward London interbank offered rate (LIBOR) plus a spread of 0.50%. Commitment charge for the ADB ordinary capital resources loan is 0.15% per year to be charged on the undisbursed loan amount. Interest for the Asian Development Fund loan has been computed at 2.00% during the grace period and thereafter. Interest, commitment charge, and other fees for the Asian Infrastructure Investment Bank loan have been computed based on the published sovereign loan pricing on its website.

Sources: Asian Development Bank, Bangladesh Gas Fields Company Limited, and Gas Transmission Company Limited estimates.

19. The government has requested a loan of \$100 million from ADB's ordinary capital resources to help finance the project. The loan will have a 25-year term, including a 5-year grace period, an annual interest rate determined following ADB's London interbank offered rate-based lending facility,<sup>16</sup> a commitment charge of 0.15% per year (the interest and other charges during construction to be capitalized in the loan), and such other terms and conditions set forth in the draft loan and project agreements.

20. The government has also requested a loan in various currencies equivalent to SDR47,870,000 from ADB's Special Funds resources to help finance the project. The loan will have a 25-year term, including a 5-year grace period, an interest rate of 2.0% per annum during the grace period and thereafter, and such other terms and conditions set forth in the draft loan and project agreements.

21. The government has requested the AIIB to provide a cofinancing loan equivalent to \$60 million, to be administered by ADB.<sup>17</sup> AIIB will sign a separate loan agreement with the government. The AIIB loan will have a 25-year term, including a 5-year grace period, with an interest rate to be determined according to AIIB procedures. ADB and AIIB will conclude a joint cofinancing agreement. The proceeds of the ADB and AIIB loans will be re-lent to the executing agencies under subsidiary loan agreements with terms and conditions acceptable to ADB.

<sup>16</sup> The interest includes a maturity premium of 10 basis points. This is based on the indicated loan terms and the government's choice of repayment option and dates.

<sup>17</sup> For ADB-administered funds, cost sharing will be applied.

22. In the event AIIB cofinancing does not materialize, ADB will consider additional financing to fill up the funding gap. The financing plan is in Table 2.

**Table 2: Financing Plan**

Source	Amount (\$ million)	Share of Total (%)
Asian Development Bank		
Ordinary capital resources (loan)	100.0	22.0
Special Funds resources (loan)	67.0	15.0
Asian Infrastructure Investment Bank	60.0	13.0
Government and executing agencies	226.0	50.0
<b>Total</b>	<b>453.0</b>	<b>100.0</b>

Source: Asian Development Bank.

## E. Implementation Arrangements

23. The implementation arrangements are summarized in Table 3 and detailed in the project administration manual.<sup>18</sup>

**Table 3: Implementation Arrangements**

Aspects	Arrangements		
Implementation period	November 2016–December 2021		
Estimated completion date	31 December 2021 (loan closing date will be 30 June 2022)		
Management			
(i) Oversight body	Steering committee: secretary of EMRD; chairman of Petrobangla; managing directors of BGFCL and GTCL; and representatives from the Finance Division, Planning Commission, and IMED		
(ii) Executing agencies	BGFCL for output 1 and GTCL for output 2		
(iii) Implementation unit	A PIU will be established under each executing agency to carry out day-to-day administration and management activities. The PIU will be headed by a project director with 16 designated staff for BGFCL and 40 designated staff for GTCL.		
Procurement	International competitive bidding (financed by ADB and AIIB)	9 contracts	\$203 million
	National competitive bidding (financed by the government)	32 contracts	\$49 million
Consulting services (project implementation support and human resource development)	Financed by ADB and AIIB (QCBS)	102 person-months	\$3 million
	Financed by the government	15 person-months	\$0.2 million
Advance contracting and retroactive financing	Advance contracting and retroactive financing will be allowed, subject to ADB policies and procedures. Retroactive financing will be applicable to the advance contracting packages for up to 20% of ADB and AIIB loan amounts for eligible expenditures, including goods and consulting services, which may be incurred prior to loan effectiveness but not earlier than 12 months before the date of loan agreement signing.		
Disbursement	The loan proceeds will be disbursed following ADB's <i>Loan Disbursement Handbook</i> (2015, as amended from time to time) and detailed arrangements agreed between the government and ADB.		

ADB = Asian Development Bank, AIIB = Asian Infrastructure Investment Bank, BGFCL = Bangladesh Gas Fields Company Limited, EMRD = Energy and Mineral Resources Division, GTCL = Gas Transmission Company Limited, IMED = Implementation Monitoring and Evaluation Division, PIU = project implementation unit, QCBS = quality- and cost- based selection.

Source: ADB.

24. The recruitment of consultants will follow ADB's Guidelines on the Use of Consultants

<sup>18</sup> Project Administration Manual (accessible from the list of linked documents in Appendix 2).

(2013, as amended from time to time). Project-related procurement will be carried out following ADB's Procurement Guidelines (2015, as amended from time to time). As the project will be jointly financed by ADB and AIB, universal procurement will be applied to works, goods, and consulting services to be financed under the project.<sup>19</sup>

### III. DUE DILIGENCE

#### A. Technical

25. Technical due diligence of the project focused on reviewing feasibility of the technical solutions, investment plan, and operating cost structure. The executing agencies carried out the detailed designs for their respective project components to address their specific needs. BGFCL intends to optimize natural gas production at location A of Titas gas field. Installing gas compressors will boost wellhead pressure to sustain current production levels from the wells to the gas transmission network, and allow optimum condensate recovery. The proposed design and technology are similar to BGFCL's existing compressor installation at Bakhrabad gas field.

26. GTCL intends to increase gas supply in the national network and the Chittagong area through imported LNG or pipeline gas. The construction of the Chittagong–Feni–Bakhrabad pipeline will enable GTCL to meet Chittagong's gas demand and transmit additional gas to the national network. The pipeline design was prepared based on international codes and practices and in compliance with Bangladesh Natural Gas Safety Rule (1991).

#### B. Economic and Financial

27. The project's economic analysis has been carried out with non-incremental benefits and costs in economic prices estimated and compared over the project's life. All costs and benefits were expressed in mid-2016 constant prices. Given the uncertainty in the global energy market, the sensitivity analysis tested for the impact of crude oil price changes on the prices of both LNG and liquid fuel alternatives. A long-run crude oil real price of \$50/barrel was used as the base case; however, the impact of a lower oil price scenario (\$30/barrel) and a higher price scenario (\$70/barrel) was also tested. The base case price for LNG was assumed at \$8/million British thermal unit. The economic analysis was conducted from both the national and global perspective. In the base case, the project as whole has an economic internal rate of return of 19% from a national perspective and 25% when global gains in terms of carbon dioxide emissions reduction are added to the national gains.<sup>20</sup>

28. All financial benefits and costs were expressed in mid-2016 constant prices. The project's financial viability was assessed by comparing the weighted average cost of capital in real terms to the financial internal rate of return (FIRR). The project's overall FIRR was estimated at 2.93%, which exceeded the estimated weighted average cost of capital (1.22%), indicating the project's financial viability, based on the assumption that the regulator will increase the wheeling charge for GTCL as petitioned.<sup>21</sup> While the FIRR is not sensitive to other adverse movements in the underlying assumptions, it will fall below the weighted average cost of capital if the wheeling charge is not adequately increased.

<sup>19</sup> ADB. 2015. *Enhancing Operational Efficiency of the Asian Development Bank*. Manila.

<sup>20</sup> Economic Analysis (accessible from the list of linked documents in Appendix 2).

<sup>21</sup> Financial Analysis (accessible from the list of linked documents in Appendix 2).

### C. Governance

29. **Financial management.** Financial management assessments have been carried out for BGFCL and GTCL. Both executing agencies have experience implementing externally funded projects. BGFCL and GTCL have been the recipients of ADB financing, have implemented ADB projects, and are familiar with ADB's project accounting, auditing, and disbursement requirements. The assessments indicated that financial management risks of both BGFCL and GTCL are *moderate*. A financial management action plan has been prepared, recommending the executing agencies further strengthen their internal audit and information systems.

30. **Procurement.** Procurement capacity assessments indicated that both executing agencies have experience handling the procurement of works, goods, and services under donor-funded as well as government-funded projects and are familiar with ADB bidding guidelines and procedures. The project's overall rating of procurement risk is *moderate*. Risk mitigation measures made to ensure timely and smooth project implementation have included providing continuous training to project implementation unit staff by ADB to strengthen their procurement capacities, and preparing master bidding documents by executing agencies for similar packages to enable ADB's quick review and approval.

31. **Anticorruption.** ADB's Anticorruption Policy (1998, as amended to date) was explained to and discussed with the government, BGFCL, and GTCL. The specific policy requirements and supplementary measures are described in the project administration manual.<sup>22</sup> ADB reserves the right to review and examine, directly or through its agents, any alleged corrupt, fraudulent, collusive, or coercive project-related practices under the project. Relevant provisions of the Anticorruption Policy will be included in the loan agreement and the bidding documents.

### D. Poverty and Social

32. The project is designed to improve gas supply reliability. Industries will benefit from the reliable gas supply by creating more economic opportunities. People, including the poor, vulnerable consumers, and women, will benefit through increased job opportunities for skilled and unskilled labor during construction and beyond. Using cleaner energy will also improve urban and rural air quality, people's health, living conditions, and quality of life.

### E. Safeguards

33. The project's environmental categorization is B following ADB's Safeguard Policy Statement (2009), as potential negative environmental impacts, including dust and noise, will be temporary and reversible, and can be managed through appropriate engineering, design, and health and safety measures. BGFCL and GTCL have prepared initial environmental examinations (IEEs) of their respective components based on the analysis of data collected through sampling, reviews of available reports, discussions with stakeholders, and field visits to the project area.<sup>23</sup> All construction impacts and those associated with the operation of the project and associated facilities, including occupational and safety hazards, were also considered in the IEEs, which were uploaded on the ADB website in August 2016. The environmental management plans included in the IEEs are sufficient to mitigate potential impacts. The Bangladesh Department of Environment is expected to accord the required environmental clearances for the project before construction begins in 2017. Environmental

---

<sup>22</sup> Project Administration Manual (accessible from the list of linked documents in Appendix 2).

<sup>23</sup> Initial Environmental Examination (accessible from the list of linked documents in Appendix 2).

monitoring reports will be submitted to ADB semiannually. If any unanticipated environmental impacts are identified during implementation, BGFCL and GTCL will update the IEEs and revise the environmental management plan accordingly.

34. Due diligence was undertaken, which included an environmental audit of the existing Titas gas field facilities and three associated facilities: the Maheshkhali–Anwara gas transmission pipeline, GTCL’s Anwara–Faujdarhat transmission pipeline, and the private sector’s LNG terminal at Maheshkhali. All the three associated facilities are under construction and scheduled for completion by 2018. These facilities will supply the gas, which would not be otherwise available, into the project’s transmission pipeline. Following Bangladesh’s applicable national laws and regulations, GTCL prepared environmental impact assessments—including environmental management plans for these associated facilities to mitigate potential environmental impacts. The environmental assessments are generally in line with ADB’s Safeguard Policy Statement. The government will ensure the design, construction, implementation, and operation of the associated facilities comply with all applicable laws and regulations on environment, health, and safety.

35. The project is classified as A for involuntary resettlement. The gas transmission pipeline route has been carefully designed to minimize land acquisition and involuntary resettlement. The gas transmission pipeline’s right-of-way is 8 meters wide, and about 148.8 hectares of private land will be permanently acquired for the pipeline and related facilities. The project is expected to affect 1,382 households and 5,693 persons. Additionally, 15 meters of right-of-way will be used on a temporary basis during construction as requisition (temporarily occupied) area; the area’s size is 271 hectares. Social surveys and consultations were undertaken following ADB’s Safeguard Policy Statement. The resettlement plan was prepared and disclosed on ADB’s website in August 2016. Budgetary provisions are in place to compensate affected people including non-titleholders in a timely manner for their losses. GTCL and an external monitoring agency will supervise implementation of the resettlement plan, and monitoring reports will be submitted to ADB semiannually. The project categorization for indigenous people is C. According to social assessments, no indigenous peoples are expected to be affected by the project. Thus, preparation of an indigenous peoples plan is not required.

36. **Climate change impact.** The main climate impact on the project is the increasing risks of hydrometeorological hazards. The executing agency will monitor and maintain the depth of cover of pipelines through visual inspections, including corrosion protection and maintenance of right-of-way. The replacement of alternate fuels by natural gas supplied from the project will result in a reduction of 703,522 tons of carbon dioxide emissions per year from 2021 to 2031.

## **F. Risks and Mitigating Measures**

37. The project’s integrated benefits and impacts are expected to outweigh the costs. Major risks and mitigating measures are summarized in Table 4 and described in detail in the risk assessment and risk management plan.<sup>24</sup>

---

<sup>24</sup> Risk Assessment and Risk Management Plan (accessible from the list of linked documents in Appendix 2).

**Table 4: Summary of Risks and Mitigating Measures**

<b>Risks</b>	<b>Mitigating Measures</b>
Import of LNG or pipeline gas does not materialize, affecting full use of the transmission pipeline in the short term.	Petrobangla has signed the FSRU terminal use agreement with the concerned private investor. Negotiations on LNG supply agreement are ongoing, and discussions on pipeline gas supply are underway.
Non-cost reflective gas price and tariffs impact project financial viability and executing agencies' sustainability.	The government is revising the gas-pricing framework that will enable market-oriented pricing, taking into account LNG and cross-border import. Related covenants have been introduced in the loan agreement.
Delay in government counterpart funds release affects land acquisition or requisition and other project activities.	The government's assurance of timely release of counterpart funding will mitigate this risk.

FSRU = floating storage and regasification unit, LNG = liquefied natural gas.

Source: Asian Development Bank.

#### **IV. ASSURANCES AND CONDITIONS**

38. The government, BGFCL, and GTCL have assured ADB that implementation of the project shall conform to all applicable ADB policies, including those concerning anticorruption measures, safeguards, gender, procurement, consulting services, and disbursement as described in detail in the project administration manual and loan documents.

39. The government, BGFCL, and GTCL have agreed with ADB on certain covenants for the project, which are set forth in the loan agreements and project agreements.

40. No withdrawals will be made from the loan account for expenditures until the government has submitted to ADB a draft of the revised gas-pricing framework covering upstream and downstream gas prices in Bangladesh.

#### **V. RECOMMENDATION**

41. I am satisfied that the proposed loans would comply with the Articles of Agreement of the Asian Development Bank (ADB) and recommend that the Board approve

- (i) the loan of \$100,000,000 to the People's Republic of Bangladesh for the Natural Gas Infrastructure and Efficiency Improvement Project, from ADB's ordinary capital resources, with interest to be determined in accordance with ADB's London interbank offered rate (LIBOR)-based lending facility; for a term of 25 years, including a grace period of 5 years; and such other terms and conditions as are substantially in accordance with those set forth in the draft loan and project agreements presented to the Board; and
- (ii) the loan in various currencies equivalent to SDR47,870,000 to the People's Republic of Bangladesh for the Natural Gas Infrastructure and Efficiency Improvement Project, from ADB's Special Funds resources, with an interest charge at the rate of 2% per annum during the grace period and thereafter; for a term of 25 years, including a grace period of 5 years; and such other terms and conditions as are substantially in accordance with those set forth in the draft loan and project agreements presented to the Board.

Takehiko Nakao  
President

26 October 2016

## DESIGN AND MONITORING FRAMEWORK

<b>Impact the Project is Aligned with</b>			
Energy sector contribution to sustainable economic growth increased (Bangladesh Seventh Five-Year Plan, FY2016–FY2020) <sup>a</sup>			
<b>Results Chain</b>	<b>Performance Indicators with Targets and Baselines</b>	<b>Data Sources and Reporting</b>	<b>Risks</b>
<p><b>Outcome</b></p> <p>Efficiency in gas production improved and gas transmission pipeline capacity expanded</p>	<p>By 2021:</p> <p>a. Average annual wellhead pressure drop reduced to 50–60 psig (2016 baseline: average annual pressure drop at 90 psig)</p> <p>b. Gas production sustained at 230 MMCFD (2016 baseline: 230–235 MMCFD)<sup>b</sup></p> <p>c. Natural gas transmission and delivery capacity expanded to 3,500 MMCFD (2016 baseline: 2,700 MMCFD)</p> <p>d. CO<sub>2</sub> emission reduction maintained at 703,522 tons per year during 2021–2031 (2016 baseline: 9.8 million tons)</p>	<p>a–b. Annual reports of Petrobangla and BGFCL</p> <p>a–c. BGFCL and GTCL quarterly reports to EMRD and IMED</p> <p>c. Annual reports of Petrobangla and GTCL</p> <p>d. MOEF and BPDB reports</p>	<p>Non-cost reflective gas price and tariffs impact project financial viability and executing agencies' sustainability.</p> <p>Import of LNG or pipeline gas does not materialize, affecting full use of the transmission pipeline in the short term.</p>
<p><b>Outputs</b></p> <p>1. Wellhead gas delivery pressure at location A of Titas gas field increased and sustained</p> <p>2. Capacity of Chittagong–Feni–Bakhrabad gas transmission pipeline expanded</p>	<p>By 2020:</p> <p>1a. Seven wellhead gas compressors in location A of Titas gas field installed (2016 baseline: 0)</p> <p>1b. Wellhead gas delivery pressure maintained at 1,250 psig (2016 baseline: 1,250 psig)</p> <p>2a. 181 km, 36-in parallel gas transmission pipeline traversing Chittagong through Feni to Bakhrabad constructed (2016 baseline: 175 km, 24-in Bakhrabad–Chittagong transmission pipeline)</p>	<p>1a–b. Annual reports of Petrobangla and BGFCL</p> <p>1a–2a. BGFCL and GTCL quarterly reports to EMRD and IMED</p> <p>2a. Annual reports of Petrobangla and GTCL</p>	<p>Delay in government counterpart funds release affects land acquisition or requisition and other project activities.</p>



<b>Key Activities with Milestones</b>
<p><b>1. Wellhead gas delivery pressure at location A of Titas gas field increased and sustained</b></p> <p>1.1 Initiate recruitment of design consultants (Q4 2016).  1.2 Mobilize the consultants (Q1 2017).  1.3 Prepare engineering design (Q1–Q2 2017).  1.4 Prepare bidding documents (Q3 2017).  1.5 Award contract for goods, works, and services (Q1 2018).  1.6 Procure, construct, install, and commission seven wellhead gas compressors (Q1 2018–Q4 2019).  1.7 Make compressors operational (Q1 2020).</p> <p><b>2. Capacity of Chittagong–Feni–Bakhrabad gas transmission pipeline expanded</b></p> <p>2.1 Prepare bidding document for procurement of line pipes and associated materials (Q2–Q4 2016).  2.2 Award contracts for line pipes and associated materials (Q4 2016)  2.3 Submit land acquisition proposal to the government for approval and complete land acquisition (Q3 2016–Q4 2017)  2.4 Construct 181 km pipeline (Q4 2017–Q2 2018).  2.5 Construct pipeline for river crossing by horizontal directional drilling (Q4 2016–Q4 2017).  2.6 Install two town border stations (Q2 2017–Q2 2018).  2.7 Complete construction of 181 km, 36-in parallel gas transmission pipeline (Q2 2019).</p>
<p><b>Inputs</b></p> <p>ADB : \$167 million (loan)  AIB: \$60 million (loan)  Government and executing agencies: \$226 million</p>
<p><b>Assumptions for Partner Financing</b></p> <p>Not applicable.</p>

ADB = Asian Development Bank; AIB = Asian Infrastructure Investment Bank; BGFCL = Bangladesh Gas Fields Company Limited; BPDB = Bangladesh Power Development Board; CO<sub>2</sub> = carbon dioxide; EMRD = Energy and Mineral Resources Division; GTCL = Gas Transmission Company Limited; IMED = Implementation Monitoring and Evaluation Division; in = inch; km = kilometer; LNG = liquefied natural gas; MMCFD = million cubic feet per day; MOEF = Ministry of Environment and Forest; psig = pounds per square inch gauge; Q = quarter.

<sup>a</sup> Government of Bangladesh, Ministry of Planning. 2015. *Bangladesh Seventh Five-Year Plan, FY2016–FY2020*. Dhaka.

<sup>b</sup> Daily production of 525 MMCFD from the Titas gas field would reduce to 230–235 MMCFD once the wellhead pressure declines below 1,200 psig, resulting in suspension of production from the wells. Upon completion of the project facilities, the production from the wells would be sustained during the project's operating life.

Source: ADB.

**LIST OF LINKED DOCUMENTS**

<http://www.adb.org/Documents/RRPs/?id=45203-006-3>

1. Loan Agreement: Asian Development Fund
2. Loan Agreement: Ordinary Capital Resources
3. Project Agreement: Bangladesh Gas Fields Company Limited
4. Project Agreement: Gas Transmission Company Limited
5. Sector Assessment (Summary): Natural Gas
6. Project Administration Manual
7. Contribution to the ADB Results Framework
8. Development Coordination
9. Financial Analysis
10. Economic Analysis
11. Country Economic Indicators
12. Summary Poverty Reduction and Social Strategy
13. Initial Environmental Examination: Bangladesh Gas Fields Company Limited
14. Initial Environmental Examination: Gas Transmission Company Limited
15. Resettlement Plan
16. Risk Assessment and Risk Management Plan

**Supplementary Documents**

17. Project Technical Description
18. Financial Management Assessment
19. Detailed Economic Analysis
20. Gas Price Assessment
21. Project Climate Risk Assessment and Management Report