Japanese ODA Loan

Ex-Ante Evaluation

1. Project

Country: People's Republic of Bangladesh
Name of the Project: Natural Gas Efficiency Project
Loan Agreement: June 16, 2014
Loan Amount: 23.598 billion yen
Borrower: The Government of the People's Republic of Bangladesh

2. Background and Necessity of the Project

(1) Current Status and Issues in the Energy Sector in Bangladesh

Natural gas is not only a primary energy source, but is also used as fuel for power generation and as a raw material in fertilizers. About 50% of the energy used by the population is generated by domestic natural gas. The power sector in particular consumes more than half of the country's natural gas, using it to generate about 70% of its total power. The government set a policy of reducing its unbalanced dependency on natural gas in the power sector by diversifying its energy sources. However, the development and importation of other energy sources has made little progress so far, making the stable supply and efficient use of domestic natural gas absolutely essential for ensuring a reliable power supply and economic growth.

Prior to the 1990s natural gas supply in Bangladesh was more than its demand. However, from the 21st century, the country has suffered from supply shortages to rapid economic growth, which makes more gas demand due to the expanding power and industrial sectors. On the other hand, delays in gas field development and an insufficient gas pipeline network has hindered growth in natural gas supply. In 2013, Bangladesh suffered from a serious energy shortage—supplying just 2,197 million cubic feet/day (MMCFD) towards 2,543 MMCFD demand. To cover increased demand in the immediate future, the country started importing oil as an alternative energy source. As a mid and long-term solution, the government is making efforts to import coal, LNG, and LPG in addition to oil; however, a lasting solution is not yet in sight. By 2030, potential gas demand is expected to rise to around 3,900 MMCFD, while supply will likely drop to just 1,800 MMCFD. Therefore, expanding the supply capacity of existing gas fields, enhancing gas transportation capacity, and the more efficient use of natural gas are considered as urgent issues.

As of December 2010, residual recoverable natural gas reserves were estimated at around 18.6 trillion cubic feet (TCF). About half of the country's natural gas is produced by a state-owned gas company. However, lack of investment for expansion to supply capability has created a bottleneck that hinders increases in production. Since 1998, although Bangladesh has been pushing for gas field exploration in coastal areas, the gas production has not been increased due to lack of attractive

environment for private investment.

Bangladesh cannot secure sufficient gas supply during peak usage times due to its undeveloped gas pipelines and compressors which send natural gas from production centers scattered across the northeastern area to other parts of the country. In order to improve gas use efficiency, inefficient gas-fired power plant must be improved, as well as people must be stopped wasting gas as a result of the flat-rate system which is inappropriate fee collection system. Therefore metered gas fee collection system should be introduced through installation of gas meters on homes is considered as urgent issues.

(2) Development Policies for the Energy Sector in Bangladesh and the Priority of the Project

The 6th Five-Year Plan (2011/2012–2015/2016) as the nation's top-ranked plan of the National Development Strategy defines energy sector: (1) promote efficient gas use; (2) action plan for exploring new gas fields; (3) accelerate bidding procedures and the signing of agreements for offshore mining areas; (4) restrict gas supply to sectors that can use alternative energy sources; and (5) optimize gas prices to strengthen the financial soundness in the gas sector.

(3) Japan and JICA's Policy and Operations in the Energy Sector of Bangladesh

In JICA Country Analytical Work for Bangladesh (April 2013), a "stable power supply" defined as a key issue. The Japan's Country Assistance Program for Bangladesh (June 2012) identified "accelerating inclusive economic growth" as a priority area. Electricity and energy shortfalls were defined as the greatest hindrance to economic growth. As such, this project is consistent with Japan's and JICA's aid policies. Major supports provided to the country's power/energy sector are listed below:

- Loan assistance projects: Bheramara Combined Cycle Power Plant Development Project (2013), New Haripur Power Plant Development Project (2007 and 2009), Bakhrabad Natural Gas Development Project (1980 and 1994), and others
- Technical Cooperation projects: Dispatching Power Sector Adviser (2004–present), Strengthening Management and Performance Standards in Power Sector of Bangladesh through Promotion of TQM (2006–2009), and others

(4) Other Donors' Activity

The Asian Development Bank (ADB) supports construction of gas-fired power plants, strengthening natural gas production capacity, improving gas transportation networks, and improving management/regulation systems. The World Bank supports LNG imports related survey and power station performance improvements as a part of its technical assistance for the power sector.

(5) Necessity of the Project

As noted above, this project contributes to stable gas supply and promotes the efficient use of gas in Bangladesh, a country that suffers from natural gas shortages

stemming from rapid economic growth. The project also contributes to a reduction in electricity shortfalls by supplying gas and improving efficiency in gas usage. Therefore, the aim of the project satisfies the issues and development policies of Bangladesh government as well as the assitance policies of the Government of Japan and JICA. Consequently, the necessity and relevancy to implement of this project are high.

3. Project Description

(1) Project Objectives

This project aims to address growing natural gas demand as well as ensure a stable and efficient gas supply by providing equipment and improving facilities to increase both the natural gas supply and efficiency of gas usage, thereby making a contribution to the economic growth of the country.

(2) Project Site/Target Area

Dhaka Division (Dhaka District, Narsingdi District, Tangail District, Gazipur District, Mymensingh District), Chittagong Division (Chittagong District, Brahmanbaria District), Rajshahi Division (Sirajganj District)

(3) Project Components

1) Gas compressor improvement (3 units × 1 location)
2) Gas transmission improvement
3) Gas meter installation (260,000 units)
4) Consultation services (e.g. detailed design, bidding support, supervision of construction work, promotion of implementation, enhancing maintenance management, and supporting educational activities for local residents)

(4) Total Project Cost

37,318 billion yen (including Yen Loan Amount: 23,598 billion yen)

(5) Project Implementation Schedule

From June 2014 to March 2022 (total of 94 months). The project will be completed when all the facilities start operation (March 2021).

(6) Project Implementation Structure

1) Borrower: The Government of the People’s Republic of Bangladesh
2) Executing Agency:
    i. Gas compressor improvement: Bangladesh Gas Fields Company Limited (BGFCL)
    ii. Gas transmission improvement: Gas Transmission Company Limited (GTCL)
    iii. Gas meter installation: Titas Gas Transmission and Distribution Company Limited (TGTDCL) and Karnaphuli Gas Distribution Company Limited (KGDCL)
3) Operation and Maintenance System: The same as the executing agency above.

(7) Environmental and Social Considerations, Poverty Reduction, and Social Development

1) Environmental and Social Considerations

i. Category: B

ii. Reason for Categorization: The Project is classified category B in accordance with JICA Guidelines for Environmental and Social Considerations (April 2010). There is no significant negative environmental and social impact caused by the Project both during the construction and operation phases.

iii. Environmental Permits: The Environmental Impact Assessment (EIA) Report for gas pipeline improvement required under Bangladeshi environmental laws and ordinances will be approved by the Department of Environment before civil engineering work begins.

iv. Anti-Pollution Measures: Measures (e.g. such as water sprinkling, acoustic insulators, and sand basins) will be taken to avoid or mitigating expected impacts on air, drainage water, and noise during construction in order to meet domestic and international standards.

v. Natural Environment: The project site is not located in or around sensitive areas such as national parks, and adverse impact on the natural environment is assumed to be minimal.

vi. Social Environment: The project will involve land acquisition of 120 hectares for pipeline construction and involuntary resettlement of 140 persons, both of which will be carried out in accordance with the nation's domestic procedures and the simplified resettlement action program.

vii. Other/Monitoring: Execution agencies will monitor air quality, noise, and water quality during construction and after starting use of facilities.

2) Promotion of Poverty Reduction: N/A

3) Promotion of Social Development (e.g. Gender Perspective, Measures to Prevent Infectious Diseases Including AIDS, Participatory Development, Consideration for the Handicapped, etc.): N/A

(8) Collaboration with Other Schemes and Donors

Prior to full-fledged introduction of gas meters under this project, 200 gas meters were introduced on a trial basis under a Private Sector for Disseminating Japanese Technology project entitled "Survey on installing prepaid gas meters in general households". The pilot project is designed to verify the extent to which gas meters installed in households limit gas usage. Based on the outcomes and lessons learned from this project, support will be provided for designing legal systems to spread gas meters throughout the country in the future by the Technical Assistance Related to ODA Loan and related educational activities.

(9) Other Important Issues: N/A

4. Project Benefits

(1) Quantitative benefits

1) Evaluation Indicators (Operation and Effect Indicators)

Sub-projects	Indicators (unit)	Baseline (2014 actual)	Target (2023) two years after completion
Gas compressor improvement	Downtime due to malfunction (hours)	N/A	0
	Downtime due to human error (hours)	N/A	0
	Cumulative gas production at the Narsingdi gas field (MMSCF/two-year period)	20,100	Increased
	Cumulative gas production at the Titas-C gas field (MMSCF/two-year period)	105,190	Increased
Gas transmission improvement	Gas inlet flow (MMSCFD)	400	550
	Suspended gas transfers due to equipment problems (hours)	N/A	0
Gas meter installation	Average gas used in homes (m^3/month)	99	72
	Percentage of failed meters (%)	N/A	0.1

2) Internal Rate of Return (IRR)

Based on the conditions below, the Economic Internal Rate of Return (EIRR) for this project was calculated at 21.18%, while the Financial Internal Rate of Return (FIRR) was 9.35%.

EIRR:

Cost: Project costs (excluding taxes)

Benefits: Economic effects brought by stabilized gas supply and balance between imported LNG and domestic natural gas

Project Life: 30 years

FIRR:

Cost: Project cost

Benefits: Profits from the sale of natural gas

Project Life: 30 years

(2) Qualitative benefits

Economic growth of Bangladesh

5. External Risk Factors and Risk Control

Delay in civil engineering work due to natural disasters such as floods

6. Evaluation Results and Lessons Learned from Past Projects

(1) Evaluation results in similar projects

The ex-post evaluation results for India's Bombay Offshore Oil Field Development Project demonstrate that performing appropriate maintenance on devices such as compressors and gas meters is essential to eliminating obstacles to a stable gas supply. The ex-post evaluation results for Bangladesh's Bakhrabad Natural Gas Development Project demonstrate that conducting surveys on the production status of each ore chute is essential to achieving stable production throughout the gas field as a whole and to extending the production life of the ore chutes.

(2) Lessons for the Project

This project plans to install gas compressors, gas pipelines, and gas meters. Based on the lessons learned from previous projects, the project will include capacity-building for executing agencies that maintain devices and equipment and will evaluate production status of ore chutes covered by this project while receiving consultation services.

7. Plans for Future Evaluation

(1) Indicators for Future Evaluation:

1) Downtime due to malfunction (hours)
2) Downtime due to human error (hours)
3) Cumulative gas production at the Narsingdi gas field (MMSCF/two-year period)
4) Cumulative gas production at the Titas-C gas field (MMSCF/two-year period)
5) Gas inlet flow (MMSCFD)
6) Suspended gas transfers due to equipment problems (hours)
7) Average gas used in homes (m^3/month)
8) Percentage of failed meters (%)
9) Economic Internal Rate of Return (EIRR) (%)
10) Financial Internal Rate of Return (FIRR) (%)

(2) Timing of Next Evaluation: Two years after completion