

**Ex-Post Project Evaluation 2020:  
Package I – 2 (Bangladesh)**

**January 2022**

**JAPAN INTERNATIONAL COOPERATION AGENCY**

**Ernst & Young ShinNihon LLC**

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People's Republic of Bangladesh

FY2020 Ex-Post Evaluation of Japanese ODA Loan

“New Haripur Power Plant Development Project I, II”

External Evaluator: Hisae Takahashi, Ernst & Young ShinNihon LLC

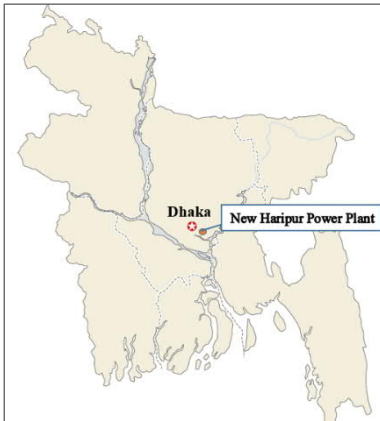
## **0. Summary**

This project was implemented with the aim of meeting the growing demand for electricity by constructing a new thermal power plant (combined cycle) in Haripur of Narayanganj district and supporting the strengthening and streamlining of the operation and maintenance system of power plants, thereby contributing to the enhancement of industrial competitiveness and improvement of people's livelihood.

This project, which aimed to respond to the increasing demand for electricity through the construction of a new power plant, is consistent with Bangladesh's development policy, which has been emphasizing the expansion of power generation and improvement of energy efficiency to meet the ever-increasing demand for electricity, its development needs for the expansion of facilities to ensure the supply of electricity, and Japan's ODA policy, which has positioned power infrastructure as a priority area for support for sustainable growth. Thus, its relevance is high. Although the project cost was within the plan, the project period largely exceeded the plan due to delays in the selection and contracting of consultants, the impact of political instability on the construction work, and the occurrence of a damage at the gas turbine, thus the efficiency of the project is fair. As for the project effects, maximum output, plant load factor, plant availability, auxiliary power rate, gross thermal efficiency, and net generation output all achieved the targets, although power outages were caused by machine failures during a certain period after the start of operation. In addition, the reduction of power outages at factories and markets due to the stable supply of electricity in areas near the power plant contributes to the improvement of the local economy by increasing profits and promoting employment, and also leads to the improvement of the convenience of daily life for households. Impacts such as women's employment and participation in income generation activities have been confirmed, thus, effectiveness and impacts of the project are high. As for the operation and maintenance, no major problems have been observed in the institutional/organizational, technical, financial aspects and current status of the operation and maintenance system. Therefore, sustainability of the project effects is high.

In light of the above, this project is evaluated to be highly satisfactory.

## 1. Project Description



Project Location



New Haripur Power Plant

### 1.1 Background

In Bangladesh, the demand for electricity was growing in line with the strong economic growth at the time of the project appraisal. However, the power supply generation capacity was about 3,800 MW, which fell far short of the peak-hour demand of around 4,700 MW (2006). Furthermore, the maximum output was far below the rated output due to aging facilities and the other issues, and planned outages were unavoidable at peak hours. At that time, the government of Bangladesh was working on capital investment with the national goal of “providing affordable and stable electricity to all citizens by 2020”. However, the gap between supply and demand was expected to widen further as the construction of new power plants had not progressed as planned and power plants in operation were planned to be decommissioned as they aged. Moreover, in order to close the supply and demand gap and achieve a stable supply of electricity, in addition to developing new power sources, a major challenge was to improve the efficiency of the sector as a whole through increasing the utilization rate of power plants and improving system losses.

### 1.2 Project Outline

The objective of this project is to meet the growing demand for electricity by constructing a new thermal power plant (combined cycle) in Haripur of Narayanganj District and supporting the strengthening and streamlining of the operation and maintenance system of power plants, thereby contributing to the enhancement of industrial competitiveness and improvement of the people’s livelihood.

Loan Approved Amount / Disbursed Amount	17,767 million yen / 17,435 million yen (I) 22,210 million yen / 20,641 million yen (II)
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Exchange of Notes Date / Loan Agreement Signing Date	December 2007 / December 2007 (I) February 2009 / March 2009 (II)
Terms and Conditions	Interest Rate                      0.01% (I) (II) Repayment Period                40 years (I) (II) (Grace Period                    10 years) (I) (II) Conditions for Procurement      Untied (I) (II)
Borrower / Executing Agency	Government of the People's Republic of Bangladesh / Electricity Generation Company of Bangladesh
Project Completion	June 2020
Target Area	Haripur of Narayanganj District (Near Dhaka)
Main Contractors	Civil Work: Marubeni Corporation (Japan) (I) (II) Procurement of equipment: Marubeni Corporation (Japan) (II), Marubeni Power & Infrastructure Systems Corporation (Japan) (II)
Main Consultants	<ul style="list-style-type: none"> <li>• SMEC International Pvt. Ltd. (Australia)/ ACE Consultants Ltd. (Bangladesh)/ SNC-Lavalin Inc. (Canada)/ AECOM New Zealand Ltd. (New Zealand)/ Sargent &amp; Lundy LLC (United States) (JV) (I) (II)</li> <li>• IRG Development Services Ltd (Bangladesh)/ Ernst &amp; Young LLP (India)/ Tractebel Engineering (India) (JV) (I) (II)</li> </ul>
Related Studies (Feasibility Studies, etc.)	<ul style="list-style-type: none"> <li>• Feasibility Study (EGCB, 2006)</li> <li>• Special Assistance for Project Formation (SAPROF) "Power Generation Capacity Development Project" (2006)</li> </ul>
Related Projects	<p>[ODA Loan Project]</p> <ul style="list-style-type: none"> <li>• Haripur Power Plant Development Project (September 1993)</li> </ul> <p>[Another donor's project]</p> <ul style="list-style-type: none"> <li>• Asian Development Bank: Assistance for Power Sector Reforms (2003), Assistance for Power Sector Reforms II (2004)</li> <li>• The World Bank: Bakhrabad-Sidhirganj Gas Transmission Pipeline Project (2007 – 2018)</li> </ul>

## 2. Outline of the Evaluation Study

### 2.1 External Evaluator

Hisae Takahashi, Ernst & Young ShinNihon LLC

### 2.2 Duration of Evaluation Study

This ex-post evaluation study was conducted with the following schedule.

Duration of the Study: November 2020 – January 2022

Duration of the Field Study: March, April and August 2021 (The field survey was conducted by the local assistant.)

### 2.3 Constraints during the Evaluation Study

In this ex-post evaluation, the site survey could not be implemented by the evaluator due to the effect of the spread of COVID-19. For this reason, the site survey was implemented by local assistants under the direction of the evaluator, and the evaluator conducted a desktop evaluation based on the results of the information collected, beneficiary survey, and site inspections carried out by the local assistant. In addition, the planned interviews with end-users were limited due to the prolonged lockdown to prevent COVID-19 infection in Bangladesh. Therefore, the information obtained during the site visit reflects what was confirmed during the limited interviews.

## 3. Results of the Evaluation (Overall Rating: A<sup>1</sup>)

### 3.1 Relevance (Rating: ③<sup>2</sup>)

#### 3.1.1 Consistency with the Development Plan of Bangladesh

The national development strategy, the Poverty Reduction Strategy Paper (PRSP), *Unlocking the Potential: National Strategy for Accelerated Poverty Reduction* (2005), and the *PRSP II* (2008), positioned the power sector as a key infrastructure for economic growth which leads the poverty reduction while noting the importance of the power sector reform at the time of the project (I) (II) appraisal. In addition, the sectoral plan for the power and energy sector, the *Policy Statement on Power Sector Reforms* (2000) raised three long-term visions for the power sector: to ensure electricity access for all Bangladeshis by 2020; to provide high quality and reliable electricity; and to provide electricity at reasonable prices<sup>3</sup>.

The country's development plan at the time of the ex-post evaluation, the *Eighth Five-Year Plan 2021 – 2025*, followed the policies of the *Sixth and Seventh Five-Year Plan*, and

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<sup>1</sup> A: Highly satisfactory, B: Satisfactory, C: Partially satisfactory, D: Unsatisfactory

<sup>2</sup> ③: High, ②: Fair, ①: Low

<sup>3</sup> Source: Document provided by JICA

identified the electricity and energy sectors as playing a central role in the country’s economic growth. The plan shows the key issues of increasing the power generation volume to meet the demand and improving the energy efficiency as a strategy of the power sector<sup>4</sup>. In addition, the *Power System Master Plan 2016*, which lays out the power and energy development plan through 2041, set forth a vision for the efficient use of domestic resources, large-scale development of power sources, and the provision of high quality and highly stable power to meet the increasing demand for electricity in line with economic growth, and moreover, in response to the diminishing supply of natural gas in the country. In Bangladesh, as shown in Figure 1, domestic natural gas production has been decreasing, which is a main source of energy, thus the diversification of energy sources as well as improvement of efficiency and enhancement of quality is required.

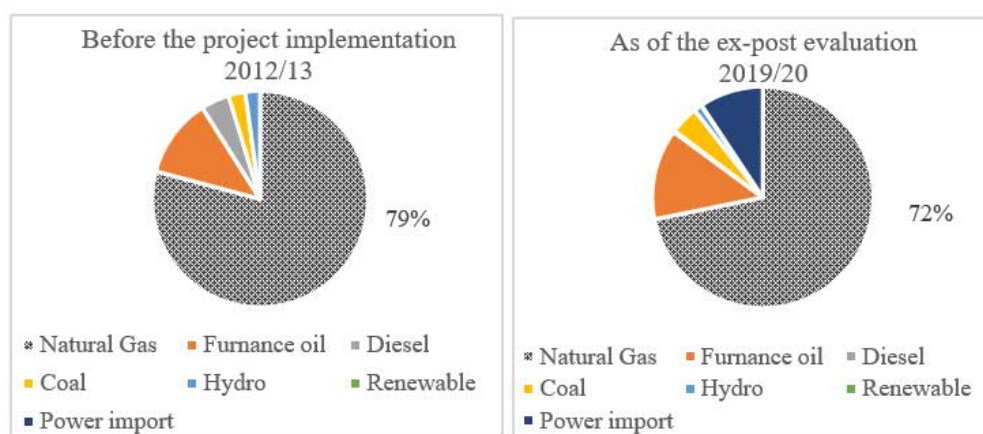


Figure 1 Power Generation Sources in Bangladesh

Source: Bangladesh Power Development Board, *Annual Report* each year edition

As mentioned above, the development document and policy have laid out the power and energy sector as a key sector to boost economic growth of Bangladesh, and prioritized infrastructure development in the sector both at the time of the project appraisal and ex-post evaluation. The project aimed to meet the increase in electric generation capacity by constructing power plants, thus is consistent with the development policy of the country.

### 3.1.2 Consistency with the Development Needs of Bangladesh

In Bangladesh, the demand for electricity was increasing due to its strong economic growth at the time of the appraisal. However, the gap between supply and demand was widening because power supply capacity did not keep the pace with the growth in demand. As a result, planned outages were forced to be carried out in each area, mainly during peak hours, and 1,400 hours of planned outages were implemented in 2005<sup>5</sup>. Moreover, peak

<sup>4</sup> Source: *8th Five Year Plan FY 2020-FY 2025*

<sup>5</sup> Source: Document provided by JICA

electricity demand was projected to increase at 8 – 10% annually, and it was estimated to increase to 6,608 MW in 2010. Therefore, the construction and renovation of new power supply facilities required 4,355 million USD by 2012, but capital investment was delayed due to a shortage of funds. The national electricity access rate was also only 42% (72% in urban and 23% in rural areas) and electricity consumption by per capita was about 140 kWh/year, one of the lowest in the world<sup>6</sup>. In addition, inefficiencies in the sector as a whole had also been identified, particularly in the power plants maintained by the Bangladesh Power Development Board (BPDB), which were operating at around 60% of their original capacity due to shortages of staff, funds and fuel, inadequate maintenance, and aging equipment.

The country's electricity supply capacity had improved to 96% of its demand (13,300 MW peak-hour electricity demand and 12,738 MW maximum peak-hour generation) (2019/20) by the time of the ex-post evaluation. The electricity access rates also improved to 97.8% in urban and 88.9%<sup>7</sup> in rural areas, and electricity consumption per capita has increased to about 378 kWh/year<sup>8</sup>. Meanwhile, electricity demand continues to increase at an annual rate of 9 – 10% and is expected to continue to increase further. It is estimated that about 21,977 MW of new electricity generation will be required by 2025 to fill the supply-demand gap<sup>9</sup>.

As mentioned above, the peak demand for electricity in Bangladesh is increasing with the development of its economy, and there is a need for additional facilities to ensure that the supply which can meet this increase. Therefore, the need for additional power supply facilities was confirmed at the time of the ex-post evaluation.

### 3.1.3 Consistency with Japan's ODA Policy

The *Country Assistance Policy for Bangladesh* (2006) at the time of the appraisal indicated a lack of capital investment, inefficient management, and inappropriate electricity price setting as challenges in the power sector, and stated that the focus would be on “support for improving sector-wide policies, management, operations, and finance” and “increasing generation capacity”. In addition, the *Overseas Economic Cooperation Operations* (2005) also positioned a key economic infrastructure development to promote economic growth to support the power sector. The *Country Assistance Strategy for Bangladesh* (2006) set the power sector as one of the priority areas for support, with a commitment to providing loans to support and promote sector reform, and working to build

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<sup>6</sup> Source: Document provided by JICA

<sup>7</sup> Source: World Bank Website <https://data.worldbank.org/indicator/EG.ELC.ACCS.ZS> (Confirmed on September 3, 2021)

<sup>8</sup> Source: BPDB *Annual Report 2019*

<sup>9</sup> Source: Questionnaire responses, and BPDB *Annual Report 2019*



the capabilities and organizational structures of implementing agencies. Under the project, power plant was constructed near Dhaka, Bangladesh, to increase power supply and support the Electricity Generation Company of Bangladesh Limited (EGCB), which was spun off from the BPDB, to strengthen and improve the efficiency of its power plant operations, and is thus consistent with Japan’s ODA policy.

In light of the above, this project has been highly relevant to the Bangladesh’s development plan and development needs, as well as Japan’s ODA policy. Therefore, its relevance is high.

### 3.2 Efficiency (Rating: ②)

#### 3.2.1 Project Outputs

The planned major outputs of the project consisted of the construction of the combined cycle thermal power plant and consulting services. The major planned and actual outputs are shown in Table 1.

Table 1 Planned and Actual Output

Plan	Actual
Gas combined power plant development	
1) Installation of 360 MW gas combined power plant and related facilities	1) Installation of 412 MW gas combined power plant and related facilities
2) Long Term Service Agreement (LTSA)	2) As planned
3) Relocation and dismantling of existing substation in the proposed power plant construction site	3) As planned
4) Installation of gas pipeline	4) As planned
Consulting services	
5) Engineering service consultant <ul style="list-style-type: none"> <li>· Detailed design of power plant development and relocation of substations, follow up on procurement, construction supervision (including the measures for HIV / AIDS)</li> <li>· Follow up on tendering and contract negotiation for “LTSA”.</li> </ul>	5) As planned
6) Management service consultant <ul style="list-style-type: none"> <li>· Support for the establishment and revitalization of the operation and maintenance system for new and existing power plant under the project, upon the introduction of the Business Unit (SBU), which is an independent accounting system.</li> </ul>	6) Implemented only for the new Haripur power station (Existing power plant are out of scope of this project).

Source: Documents provided by JICA, Project Completion Report (PCR) and questionnaire responses from the executing agency

As shown in Table 1, the major changes of output were an increase in the output of the gas combined cycle power plant, and a change in the support provided under 6) Management service consultant, which were planned for both the new and existing Haripur power plants, wherein support was provided only for the new plant. The details of each change and the reasons for the changes are explained below.

[Change of power output of gas combined cycle]

The power output of installed gas combined cycle under this project was increased from 360 MW to 412 MW. This change was made in response to a recommendation from the contractors, which would allow for an increase in output without changing the price. There is no problem with this change since it contributes to achieving the project's objective of increasing electricity demand.

[Consulting services: Change in the recipient of Management service consultant]

Under this project, support was planned to be provided on the operation and maintenance of the existing power plant in addition to the new Haripur power plant. The EGCB did not have a power plant under its jurisdiction at the time of the appraisal, and the existing Haripur power plant was to be transferred to the EGCB from the BPDB along with the new Haripur power plant after the implementation of the project. This was the reason for the planned assignment of Management service consultant to the existing power plant as well as the new power plant. However, the existing power plant was not transferred to the EGCB at the time of the project's completion, and support for the existing Haripur power plant was not included under the scope of this project. A total of 59 new power plant and EGCB staff have been trained (42 man-months) for the operation and maintenance of the new Haripur power plant.



Photo: Gas Turbine



Photo: Main Transformer

### 3.2.2 Project Inputs

#### 3.2.2.1 Project Cost

Table 2 shows the planned project cost at the time of the appraisal (I) and the actual project cost. As shown in the table, the project cost was within the plan (80 % of the original plan).

Table 2 Planned and Actual Project Cost

(Unit: million yen)

	Plan <sup>Note 2</sup>	Actual	Actual/planned ratio
Total project cost <sup>Note 1</sup>	54,409	43,690	80 %
Project cost (I)	—	21,748	—
Project cost (II)	—	21,942	—
Loan portion	41,066	38,076	93 %
Project cost (I)	17,767	17,435	98 %
Project cost (II)	23,229	20,641	89 %

Source: Document provided by JICA, PCR

Note 1: Since the documents at the time of the appraisal did not state the breakdown of each cost of (I) and (II) other than the amount covered by the yen loan, the difference for each cost of (I) and (II) was not analyzed.

Note 2: The amount at the time of planning is based on the project cost at the time of appraisal (I).

The main reason why the actual project cost was lower than the planned cost was the fluctuation in exchange rates during the project period. The exchange rate at the time of the appraisal was 1.66 yen per taka, whereas the average exchange rate during the project period was 1.33. It was 1.08 yen when the construction and procurement contract was signed in 2011, and it was less than 1 yen when beginning full-scale work in 2012. Other reasons for the reduction in costs include the cancellation of consultant services assignment for existing power plants planned at the time of the appraisal.

#### 3.2.2.2 Project Period

The project period<sup>10</sup> was planned to be 96 months as opposed to an actual 151 months, from December 2007 to June 2020, which was longer than planned (157% of the plan).

Table 3 Planned and Actual Project Period

	Plan	Actual
L/A	December 2007	
Selection of consultant	September 2007 – April 2009	June 2010
Tender and contract	February 2008 – September 2009	June 2010 – February 2011
Construction and procurement	October 2009 – September 2012	February 2011 – March 2014
Warranty period	No information	March 2014 – January 2018

<sup>10</sup> The project period is defined as the period from the month in which the Loan Agreement (L/A) is signed to the month in which the Long-Term Service Agreement period ends.

Long-term service agreement	October 2012 – September 2015	June 2017 – June 2020
Consulting services	June 2008 – June 2013	December 2008 – December 2017
Project completion	September 2015	June 2020
Project duration	96 months	151 months

Source: Documents provided by JICA, PCR, questionnaire responses from the executing agency

The main reason for this delay was due to delays in procurement and contracting, the impact of hartals<sup>11</sup> and road blocks caused by political unrest, which delayed the movement of equipment, materials, and workers. In addition, the power plant shut down suddenly and damage was found in the gas turbine in May 2015, requiring more time for inspection and replacement of the gas turbine, then the warranty period was extended. The start of a Long-Term Service Agreement (LTSA) was postponed accordingly, which also contributed to the delay in the project period. The impact on construction work due to hartals and other circumstances related to political unrest, and the sudden stop of the power plant due to damage of the gas turbine were unexpected issues, and were events beyond the control of the executing agency and project stakeholders. The selection and contracting of consultants can be deemed as project management issues, however, according to the executing agency, the bidding process consists of two steps, the Expression of Interest (EOI) and Request for Proposal (RFP), which require a lot of time to prepare, revise, and discuss various documents before the contract is signed, often leads to project delays, not only for this project.

### 3.2.3 Results of Calculations for Internal Rates of Return (Reference only)

The Internal Rates of Return calculated at the time of the appraisal and ex-post evaluation of this project and the conditions are shown in Table 4.

Table 4 IRR and Conditions

	Financial Internal Rate of Return	Economic Internal Rate of Return
IRR	As of the appraisal: (I) 6.7 %, (II) 8.8 % As of the ex-post evaluation: 4.2%	As of the appraisal: (I) 20.7 %, (II) 20.6 % As of the ex-post evaluation: 13.4 %
Cost	Project cost, operation and maintenance expenses	Project cost (excluding taxes), operation and maintenance expenses
Benefit	Revenue from sale of energy	Revenue from sale of energy based on assumed wholesale electricity prices <sup>12</sup>
Project life	25 years	

Source: Documents provided by JICA

<sup>11</sup> A “general strike” and is part of political campaigns that take place mainly in South Asia.

<sup>12</sup> EIRR was calculated based on the estimated wholesale electricity prices which were estimated based on retail prices from the World Bank’s survey in accordance with conditions at the time of the appraisal.

### Financial Internal Rate of Return (FIRR)

The FIRR at the time of the ex-post evaluation was lower than the one at the time of the appraisal. The delay in the start of operation of the facility due to the prolonged project period and maintenance costs exceeding forecast amounts at the time of the appraisal<sup>13</sup> were deemed as the reasons for the lower FIRR, while a decrease in project costs due to fluctuations of exchange rates and an increase in electricity sale revenue<sup>14</sup>, etc. were confirmed.

### Economic Internal Rate of Return (EIRR)

For calculating EIRR, although taxes are excluded from the project cost, the calculation cost is basically the same as in the case of FIRR. As with the FIRR, the EIRR at the time of the ex-post evaluation also became lower than the one at the time of the appraisal because the project period was extended and maintenance costs were higher than assumed at the time of the appraisal.

In light of the above, although the project cost was within the plan, the project period exceeded the plan. Therefore, efficiency of the project is fair.

## 3.3 Effectiveness and Impacts<sup>15</sup> (Rating: ③)

### 3.3.1 Effectiveness

#### 3.3.1.1 Quantitative Effects (Operation and Effect Indicators)

Table 5 summarizes the actual data since the completion year of the facility construction for each of the operation and effect indicators established at the time of the appraisal of the project.

Table 5 Operation and Effect Indicators of the Project

	Target	Actual					
	2017	2014/5	2015/6	2016/7	2017/8	2018/9	2019/20
	3 Years after facility construction Note 1	Construction completion Year	After construction completion				
		1 Year	2 Year	3 Year	4 Year	5 Year	
Maximum output (MW) <sup>Note 2</sup>	<b>360→412</b>	474	466	477	483	472	469
Plant load factor (%)	<b>70</b>	49	34	85	89	80	81
Plant availability (%)	<b>86.3</b>	54	41	89	94	90	93

<sup>13</sup> Although it was confirmed with the accounting team of the executing agency, the reason, why the maintenance cost was higher than the assumption at the time of the appraisal, was unknown. It may be considered as one of the factors that prices, especially the one for fuel, have increased more than expected since the time of the appraisal (2007).

<sup>14</sup> The plant's rate of operation was 10% higher than that of estimated rate (70%) at the time of the appraisal.

<sup>15</sup> Sub-rating for Effectiveness is to be put with consideration of Impacts.

Auxiliary power rate (%)	<b>5</b>	3.8	4.1	3.8	3.9	4.1	4.2
Gross thermal efficiency (%)	<b>50</b>	47	46	58	58	53	54
Outage hours							
by human errors	<b>0</b>	0	0	0	0	0	0
by machine failures	<b>0</b>	3,325	5,095	31	14	105	53
by periodical inspections	<b>1,200</b>	696	0	0	324	668	0
Outage times							
by human errors	<b>0</b>	0	0	0	0	0	0
by machine failures	<b>0</b>	15	7	6	4	8	8
by periodical inspections	<b>1</b>	1	0	0	1	1	0
Amount of net generation output (GWh/Year)	<b>2,097</b>	1,783	1,232	2,855	3,008	2,706	2,783

Source: Documents provided by JICA, questionnaire response from the executing agency

Note 1: Normally, the ex-post evaluation of an ODA loan project is carried out two years after the completion of project, but under this project, a long-term service agreement was provided for three years after construction, so the operation and effect indicator targets were set three years after completion of construction.

Note 2: As the output of the gas combined cycle increased from 360MW at the time of the appraisal to 412 MW, the target has been also revised to 412 MW.

As a long-term service agreement was to be provided for three years after construction under this project, the targets for operation and effect indicators, which were set at the time of the appraisal, were expected to be achieved three years after completion of construction of the gas combined cycle facility. While the construction of the facility was completed in 2014/5, the provision of long-term maintenance services ended in 2020 as already mentioned in “3.2.2.2 Project Period”. Therefore, the achievements of the indicators are analyzed based on the data of 2019/20 while also confirming the trends since the completion year of facility construction. All indicators including actual data of maximum output, plant load factor, plant availability, auxiliary power rate, gross thermal efficiency and amount of net generation output in 2019/20 achieved the targets. The reason why the plant’s load factor and plant availability in 2015/6 were about 50% of the targets was due to adjustments made to the steam turbine. In addition, a damage occurred in the gas turbine in May 2015, and operations were suspended until January 2016, resulting in the plant’s load factor and plant availability for 2015/16 to be less than 50% of targets. Thereafter, both turbines have been operating without problems, and plant’s load factor and plant availability have been exceeding targets. Since 2017/18, maximum output and net generation output generation have been decreased in 2018/19 and 2019/20. This was due to the implementation of scheduled inspections of steam and gas turbines in 2018/19, and maintenance of equipment<sup>16</sup> repairs of gas turbines and problems occurred in the gas compressor control systems that needed to be addressed in

<sup>16</sup> Bypass Stack Silencers

2019/20.

The number of stoppage times and hours caused by human error were both zero and in line with targets. However, the actual stoppage hours due to mechanical failure was 53 hours and the actual number of stoppages was eight, exceeding targets (both set at 0). The actual stoppage hours due to mechanical failures exceeded 3,000 hours and 5,000 hours in the year of the completion of the facility construction and one year later, respectively, mainly due to an unexpected turbine accident and the time required to repair it as mentioned above. The problem has since been resolved, and the stoppage times and hours have significantly improved<sup>17</sup>. Stoppage hours were 324 hours in 2017/18, 668 hours in 2018/19 and 0 hour in 2019/20 compared to the planned 1,200 hours, which raises concerns that less planned maintenance was performed than expected<sup>18</sup>. On the other hand, the planned outage times by periodical inspections, which was targeted to be once per year, was as planned in 2017/8 and 2018/19, and the actual number in 2019/20 was 0 time.

### 3.3.1.2 Qualitative Effects (Other Effects)

At the time of the appraisal, the project was expected to contribute to the “vitalization of local economy and improvement of convenience for residents” as a qualitative effect, however, this is evaluated in the impact section since the content is considered impact.

In terms of qualitative effects, the executing agency explained that the construction of the new Haripur power plant has increased the reliability of the power supply system by reducing load shedding<sup>19</sup>. In addition, the new Haripur power plant has higher thermal efficiency<sup>20</sup> than other power plants in Dhaka Division (see Table 6), which contributes to the reduction of fuel consumption and improvement of power generation efficiency. In fact, a comparison with the other two power plants owned by EGCB confirms that the new Haripur power plant has the lowest fuel cost per unit of electricity generated (see Table 7).

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<sup>17</sup> With regard to the stoppage hours and number of times due to mechanical failure, documents at the time of the appraisal stated that target goals should be set, although mechanical failure may occur suddenly. Therefore, while the target was set as zero, a certain degree of mechanical failure was also expected.

<sup>18</sup> In this project, the planned outage hours by periodical inspections was planned to be 1,200 hours per year. On the other hand, with regard to the gas combined-cycle thermal power plants constructed with the support of Japanese ODA loans, the target values for the same indicators were set at 775 hours per year for the Simar Power Plant Unit 2 (400 MW) (Azerbaijan) and 192 hours for the Bheramara Power Plant (360 MW) (Bangladesh), indicating that the target values for this project may be higher than for similar projects.

<sup>19</sup> A system that temporarily shuts down the power supply to a specified location or device to prevent an overload that could result in a total blackout caused by demand exceeding supply when power use increases.

<sup>20</sup> Thermal efficiency is the rate at which the thermal energy (calorific value) of fuel can be converted into electrical energy (power generation). The higher the thermal efficiency, the more electricity can be produced with less fuel.

Table 6 Thermal Efficiency of Each Power Plant

Power plant	Haripur (New)	Haripur (Existing)	Sidhirganj 2 x 120MW PPP <sup>Note 1</sup>	Ghorasal Unit 1&2	Ghorasal Unit 7	Sidhirganj 335 MW CCPP
Thermal efficiency	55.2%	18.5%	24.6%	25.0%	47.2%	36.6%

Source: BPDB *Annual Report 2019-20*

Note 1: Peaking Power Plant.

Note 2: Combined Cycle Power Plant

Table 7 Cost of Fuel per Unit Generation at the Power Plant Managed by EGCB

(Unit: taka/kWh)

	Sidhirganj 2 x 120MW PPP <sup>Note 1</sup>	Haripur (New)	Sidhirganj 335 MW CCPP <sup>Note 2</sup>
2018/19	1.20	0.58	0.88
2019/20	1.72	0.82	1.05

Source: EGCB *Annual Report*, each year edition

Note 1: Power generation capacity was 210 MW.

Note 2: Power generation capacity was 335 MW.

### 3.3.2 Impacts

#### 3.3.2.1 Intended Impacts

##### (1) Contribution to the vitalization of the local economy

In this ex-post evaluation, it was examined for obtaining information and analyzing the impact generated by the project implementation, after confirming areas where the effects of power generation have been spread to the power distribution companies. However, since the power generated in Bangladesh is integrated into the national grid from each power plant, it has been difficult to determine the exact impact on the economy in a particular area. Therefore, although exact areas cannot be identified, the power generation capacity of the new Haripur power plant accounted for about 4.2% of the total power generation capacity in Bangladesh at the time of completion of facility construction, and about 2%<sup>21</sup> at the time of ex-post evaluation, which means that the project has made a certain level of contribution to the country's power system.

Furthermore, interviews with the executing agency and beneficiaries<sup>22</sup> indicate that the project has reduced the frequency and number of power outages, and that the stable supply

<sup>21</sup> In contrast to the 420 MW capacity of the new Haripur power plant, the total capacity of the country's power generation facilities at the completion of facility's construction was 9,821 MW, and the same capacity at the time of the ex-post evaluation was 18,961 MW. (Source: Questionnaire responses from the executing agency)

<sup>22</sup> As mentioned above, it is not possible to specify the exact areas where the power generated from the new Haripur power plant is distributed, but according to the executing agency, the contribution by the project would be significantly high in the area near Dhaka because of its location near the Load Center, which is located near Dhaka. Therefore, interviews were conducted by the local staff in the suburbs of Dhaka and near the city of Narayanganj, where the power plant is located. Interviews were conducted on April 1 and 2 at four locations: a chemical factory, a food plant, a steel factory, and a cotton mill.



of electricity has positively affected the operational status of factories. Specifically, the following impacts were reported.

- Increased factories operating hours, increased work efficiency by reducing the time and frequency of work interruptions, resulting in increased production and improved product quality
- Reduction of food loss due to interruption of work (especially in factories that handle food), and increase in profits through the reduction of the food loss
- Increased employment due to longer operating hours and increased production

According to the executing agency, 130 staff members were employed at the new Haripur power plant after its construction and continue to work at the time of the ex-post evaluation. In terms of boosting employment, in addition to the staff, the services of many suppliers and contractors involved in the operation of the power plant have been expanded, contributing to the economic vitality of the neighboring areas.

## (2) Improving convenience for residents and contributing to their daily lives<sup>23</sup>

Through interviews with residents, all respondents answered that both the duration and frequency of power outages have improved as a change after the implementation of this project. As a result, the following lifestyle and economic changes were mainly reported.

- Increased study time of students and increased study through the use of PCs and the Internet
- Use of electrical appliances (such as fans, ovens, refrigerators, battery chargers, mixers, electric heaters) reduced housework and improved convenience in daily life.
- Improved security in the areas at night
- Reduced expenses on lamp fuel, and reduced fire risks associated with lamp use.
- Improved convenience by extending market operation hours
- Boosted employment (in factories for beverages, sewing, flour milling, hospitals, etc.) and generated/increased income

Through these effects, the stabilization of electricity supply by this project is believed to have contributed to the improvement of convenience in daily life and also the reduction of poverty in the region.

### 3.3.2.2 Other Positive and Negative Impacts

#### (1) Impacts on the natural environment

In accordance with the *JBIC Guidelines for Confirmation of Environmental and Social*

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<sup>23</sup> Interviews with end-users were conducted by the local assistant in the neighboring area of Narayanganj city. The interviews were conducted on March 23 and 24. Six people (two in their 20s, three in their 30s, and one in his 40s) were interviewed.

*Considerations* (April 2002), the project falls into Environmental Category A, as this project is categorized as a thermal power generation sector. An Environmental Impact Assessment (EIA) report of this project was approved in September 2006 by the Department of Environment (DOE). During the implementation of the project, a required wastewater treatment facility was constructed, and measures were taken to discharge the exhaust emissions through a 65-meter high exhaust duct, as well as to construct a cooling tower for recycling and to install a sound-absorption system. In addition to the above items specified in the EIA, monitoring of other components (dust and noise during construction, noise, air quality, and wastewater after construction) has been conducted, and they meet standards set by the DOE and World Bank<sup>24</sup>. The monitoring logs have been confirmed at the site through the site visits of this ex-post evaluation, and it has been confirmed by the executing agency that there have been no negative impacts due to the implementation of this project during and after the completion of construction.

#### (2) Resettlement and land acquisition

As the new Haripur power plant was constructed on the existing power plant premises, it was planned that neither land acquisition nor resettlement would be necessary. It was confirmed with the executing agency that neither resettlement nor land acquisition had occurred as planned at the time of the appraisal.

#### (3) Unintended positive/negative impacts

##### Impact from a gender perspective<sup>25</sup>

With the stable supply of electricity procured through the implementation of this project, the operations of markets and factories are accelerating in the neighboring areas of Narayanganj city. At the same time, the use of electrical appliances has reduced the burden of housework on women, which is thought to have contributed to the expansion of employment opportunities for women by allowing them to use their time to engage in income generating activities or to obtain jobs.

For example, 17 women were employed during the construction of the new Haripur power plant, and they have been working in the operation and cleaning of the plant after the start of operations<sup>26</sup>. According to a woman who got a job at the power plant, getting a job has enabled her to become financially independent and support her family

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<sup>24</sup> Source: Documents provided by JICA and the executing agency, and questionnaire response from the executing agency

<sup>25</sup> Interviews were conducted in August 2021 with 10 women (four in their 20s, three in their 30s, and three in their 40s) who obtained jobs or started income generating activities after the completion of the project at the new Haripur power plant and near Narayanganj city. The breakdown of occupations was: five power plant employees, two tailors, one milk plant worker, and one hospital worker.

<sup>26</sup> Source: Interviews with local residents of the new Haripur power plant

financially. In addition, she explained that her family and relatives began to respect her opinions and ideas in the decision-making process by becoming financially independent. In addition, the extended hours of operation of markets and factories have increased the opportunities for women to obtain jobs in various factories, hospitals, and other workplaces. Cases were also reported that women earn income from tailoring clothes and making and selling handicrafts, which enables them to pay for their children's education and house rent<sup>27</sup>.

As mentioned above, at the new Haripur power plant has mostly achieved targets for plant load factor, plant availability, auxiliary power rate, gross thermal efficiency, outage hours and times by human error and periodical inspections, and net generation output. In addition, after the turbine was repaired, the hours and number of times of outages due to machine failures significantly decreased. Accordingly, a continuous and stable electricity supply was made possible, and factories and markets were able to conduct their operations stably without being affected by power outages in neighborhoods near the power plant, contributing to the improvement of the local economy by increasing profits and boosting employment. In addition, it has been confirmed that the convenience of daily life has been improved in households, etc. In light of the above, this project has mostly achieved its objectives. Therefore, effectiveness and impacts of the project are high.

### 3.4 Sustainability (Rating: ③)

#### 3.4.1 Institutional/Organizational Aspects of Operation and Maintenance

The EGCB, the executing agency of the project, is a power generation company spun off from BPDB in 2004, and the new Haripur power plant is under the jurisdiction of the EGCB. The number of staff of the EGCB increased from 71 at the time of the appraisal shortly after the spin-off to 553 at the time of the ex-post evaluation (including the number of staff at each power plant). Currently, the EGCB has jurisdiction over the new Haripur power plant as well as two other power plants.

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<sup>27</sup> Source: Questionnaire responses from the executing agency

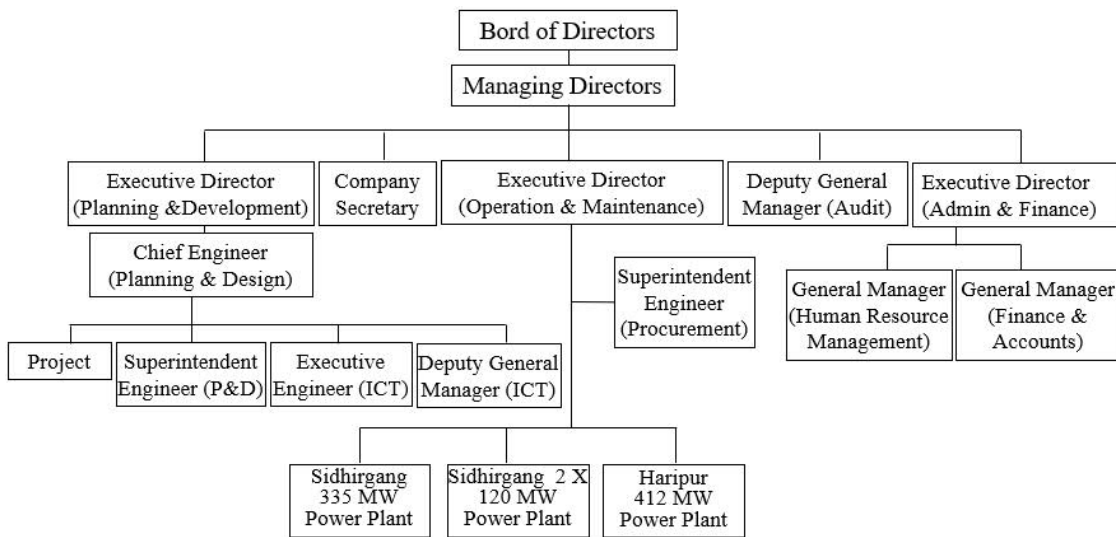


Figure 2 Organization Chart of EGCB

Source: EGCB Website <http://www.egcb.gov.bd/site/page/bb844d1c-13ad-4689-9bc9-7c3028c56c48/->  
 Accessed on September 3, 2021)

At the time of ex-post evaluation, 143 staff members were assigned to the new Haripur power plant, with engineers from the plant’s operations and maintenance departments in charge of maintenance, and 107 staff members, including drivers and other workers, engaged in operation and maintenance. A part of the regular maintenance is carried out with the support of manufacturers, but no problems such as personnel shortages have arisen.

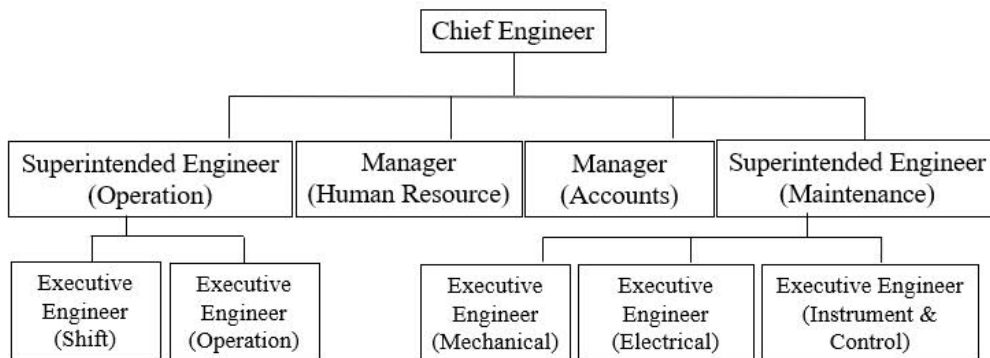


Figure 3 Organization Chart of New Haripur Power Plant

Source: EGCB Website <http://www.egcb.gov.bd/site/page/bb844d1c-13ad-4689-9bc9-7c3028c56c48/->  
 (Accessed on September 3, 2021)

As indicated in the organizational chart of the EGCB (see Figure 3), the new Haripur power plant is under the jurisdiction of the EGCB, and adequate communication is in place. In addition, the number of staff at the EGCB has increased since the time of the appraisal in line with the increase in the number of power plants under its jurisdiction,

and the number of staff at the new Haripur power plant has been also appropriately assigned, indicating that there are no problems from an institutional/organizational aspects.

#### 3.4.2 Technical Aspects of Operation and Maintenance

The core members of the EGCB have been assigned by BPDB personnel with experience in the construction and operation of thermal power plants. The new Haripur power plant is a gas combined cycle power plant, which requires more advanced operation and maintenance capabilities than the simple gas-fired power plants prevailing in Bangladesh at the time of the appraisal. Thus, EGCB engineers, including those of the new Haripur power plant, had the opportunity to improve their technical expertise through consulting services. Through the consulting services, EGCB's engineers were able to be on site during the construction of the power plant to learn and understand in detail the functioning of the new power plant facilities and equipment. Through hands-on experience, such as collaborating with engineers from Japanese manufacturers on overhaul work at the site, it became possible to perform operation and maintenance of equipment using the latest technology as routine tasks. In addition, more than 30 staff members participated in overseas training in South Korea for four weeks on operation and maintenance. According to EGCB staff, compared to the simple gas-fired power plant equipment they had handled in the past, the latest gas turbines, heat recovery steam generators<sup>28</sup>, turbine bypasses<sup>29</sup>, and other equipment installed in gas combined cycle plants were facilities and equipment they had less experiences before. Thanks to the adequate training opportunities provided by the project, the staff engaged in operation and maintenance are performing the necessary operational and maintenance tasks leveraging these experiences after the new Haripur power plant went into operation. The EGCB has also arranged capacity building and performance improvement training for their staff. The EGCB has set a goal and worked to ensure 70 hours of training per person per year, and, it achieved 83 hours of training in 2018/19 to improve staff capacity.

As planned at the time of the appraisal, LTSA was signed for the gas turbine and maintenance support has been received. At the time of the ex-post evaluation, the initial contract for three years had already been completed and the contract was renewed. Based on the LTSA, about 90% of the services mainly relate to the procurement of spare parts required for gas turbines. The remaining 10% of the services are provided by specialists, who provide remote monitoring of the gas turbines and a certain level of support during

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<sup>28</sup> A heat recovery steam generator is one of the main components of a gas turbine combined cycle power plant with high thermal efficiency and low CO<sub>2</sub> emissions. This is a heat exchanger that uses the heat of exhaust gas to generate steam.

<sup>29</sup> A device installed mainly to reduce time to start up boilers and improve start-up performance.

maintenance when spare parts need to be replaced.

Although some support is provided as mentioned above, the EGCB staff, including those at the new Haripur power plant, have the technical expertise required to carry out the necessary operations and maintenance. Moreover, although it has been pointed out that consumables and spare parts are time-consuming and costly to obtain, they have been properly managed through the LTSA and there are no concerns that could seriously affect the operation of the power plant.

### 3.4.3 Financial Aspects of Operation and Maintenance

As shown in the Table 8, the EGCB's profits over the past three years have been increasing. The sales of energy have also been increasing year by year, therefore, it can be considered that the EGCB has been receiving stable energy revenue. In terms of key financial indicators (see Table 9), the debt-servicing capability, financial sustainability and profitability are all stable, thus its financial condition is generally sound.

Table 8 Profits and Losses of EGCB

(Unit: million taka)

	2017/18	2018/19	2019/20
<b>Revenue</b>			
Sales of energy	8,340	9,353	11,786
Non operating income	689	590	727
<b>Total revenue</b>	<b>9,029</b>	<b>9,943</b>	<b>12,513</b>
<b>Expenditure</b>			
Cost of revenue	5,954	6,982	8,854
Administrative expenses	279	226	232
Financial expenses	793	740	782
Foreign exchange gain/loss	103	21	(2)
Other	95	99	132
<b>Total expenditure</b>	<b>7,224</b>	<b>8,068</b>	<b>10,000</b>
<b>Profit before tax</b>	<b>1,805</b>	<b>1,875</b>	<b>2,513</b>
<b>Net profit after tax</b>	<b>1,751</b>	<b>1,816</b>	<b>2,439</b>

Source: EGCB Annual Report each year edition

Table 9 Major Financial Information of EGCB

		2017/18	2018/19	2019/20
Debt-servicing capability	1. Current ratio (%)	1.30	1.38	1.43
	2. Debt equity ratio (%)	4.12	3.74	3.47
	3. Debt service coverage ratio (%)	1.50	1.22	1.24
Financial sustainability	4. Equity ratio (%)	0.17	0.18	0.19

Profitability	5. Operating profit ratio (%)	29.00	5.99	4.75
	6. Return on asset (ROA) (%)	2.13	2.15	2.69
	7. Return of equity (ROE) (%)	12.90	12.12	14.01

Source: EGCB *Annual Report* each year edition

The operation and maintenance costs for the new Haripur power plant also have been increasing based on the data for the past five years. The costs for the LTSA have been paid from the operation and maintenance budget, and expenditures can be recognized without any problem if the contract is re-signed in the future<sup>30</sup>. In interviews with the new Haripur power plant, it was reported that the necessary budget for operations and maintenance has been allocated, thus there is no concern about operations and maintenance from a financial perspective.

Table 10 Operation and Maintenance Cost of New Haripur Power Plant

(Unit: million taka)

	2015/16	2016/17	2017/18	2018/19	2019/20
Operation and maintenance cost	2,184	3,554	3,689	3,522	4,488

Source: EGCB *Annual Report* each year edition

#### 3.4.4 Status of Operation and Maintenance

It was confirmed through the questionnaire responses from the executing agency and the site visit that there were no problems in the operation and maintenance of the gas combined cycle and auxiliary facilities developed in this project, and the status at the time of the ex-post evaluation was generally good.

After the start of operation, there were some instances where metal particles were mixed in the gas supply through the pipeline, which interfered with the operation of the power plant, and other instances where the power factor of the output was unsatisfactory due to poor current flow in the transformers. However, all of these issues have already been resolved, and the high plant availability at the time of the ex-post evaluation indicates that there has been no impact on the plant's operation. According to the executing agency, maintenance has been carried out in line with the weekly maintenance plan, and manuals have been utilized at the sites as needed. However, as stated in the effectiveness, the actual planned outage hours of facilities have not achieved the target. It is possible that the target of planned outage hours was set too high, but in any case, the fact that there are some years with zero hours is a matter of some concern. At the time of the ex-post evaluation, it was confirmed with the executing agency and the site inspection that no serious problems have

<sup>30</sup> Source: Interview with EGCB

occurred in the facilities, but it is necessary to review the plan for periodic maintenance and to implement maintenance accordingly.

As described in “3.4.2 Technical Aspects of Operation and Maintenance”, through the consulting services under this project, the engineers of EGCB and the new Haripur power plant have learned the mechanisms for the newly introduced combined cycle power generation and the operation and maintenance activities through on-the-job training. This know-how has been utilized in the actual operation and maintenance activities after the completion of the project. In addition, the LTSA has been extended the contract after three years of facility construction, and the procurement of necessary spare parts and consumables have been made without any problems while receiving support under the LTSA even at the time of the ex-post evaluation.

In light of the above, no major problems have been observed in the institutional/organizational, technical, financial aspects and current status of the operation and maintenance system. Therefore, sustainability of the project effects is high.

#### **4. Conclusion, Lessons Learned and Recommendations**

##### 4.1 Conclusion

This project was implemented with the aim of meeting the growing demand for electricity by constructing a new thermal power plant (combined cycle) in Haripur of Narayanganj district and supporting the strengthening and streamlining of the operation and maintenance system of power plants, thereby contributing to the enhancement of industrial competitiveness and improvement of people’s livelihood.

This project, which aimed to respond to the increasing demand for electricity through the construction of a new power plant, is consistent with Bangladesh’s development policy, which has been emphasizing the expansion of power generation and improvement of energy efficiency to meet the ever-increasing demand for electricity, its development needs for the expansion of facilities to ensure the supply of electricity, and Japan’s ODA policy, which has positioned power infrastructure as a priority area for support for sustainable growth. Thus, its relevance is high. Although the project cost was within the plan, the project period largely exceeded the plan due to delays in the selection and contracting of consultants, the impact of political instability on the construction work, and the occurrence of a damage at the gas turbine, thus the efficiency of the project is fair. As for the project effects, maximum output, plant load factor, plant availability, auxiliary power rate, gross thermal efficiency, and net generation output all achieved the targets, although power outages were caused by machine failures during a certain period after the start of operation. In addition, the reduction of power outages at factories and markets due to the stable supply of electricity in areas near the power



plant contributes to the improvement of the local economy by increasing profits and promoting employment, and also leads to the improvement of the convenience of daily life for households. Impacts such as women's employment and participation in income generation activities have been confirmed, thus, effectiveness and impacts of the project are high. As for the operation and maintenance, no major problems have been observed in the institutional/organizational, technical, financial aspects and current status of the operation and maintenance system. Therefore, sustainability of the project effects is high.

In light of the above, this project is evaluated to be highly satisfactory.

## 4.2 Recommendations

### 4.2.1 Recommendations to the Executing Agency

In this project, the actual number of outage hours by periodical inspections, which was set as an operation and effect indicator, was 324 hours, compared to the planned target of 1,200 hours. The target of this project set at the time of the appraisal might have been higher than that of similar projects, but the fact that there were some years with zero outage hours is a matter of some concern. At the time of the ex-post evaluation, it was confirmed that no serious problems had occurred in the facilities through confirmations with the executing agency and the site visit, however, the EGCB needs to review the plan for regular maintenance and conduct maintenance appropriately according to the plan.

### 4.2.2 Recommendations to JICA

None

## 4.3 Lessons Learned

### Ensure sustainability through long-term support for operation and maintenance

The power plant constructed in this project is a gas combined cycle power plant, which requires an advanced level of operation and maintenance capability compared to the simple gas-fired power plants that had been prevalent in Bangladesh. In this project, the manufacturers provided guidance on the operation and maintenance activities of the new power plant in the form of on-the-job training during the construction of the power plant, and after the completion of the facility construction, the operations and maintenance staff of the new power plant were able to receive support as needed, such as ensuring the procurement of spare parts through the LTSA. As a result, operation and maintenance have been appropriately conducted through the time of the ex-post evaluation. In cases such as this project, where operation and maintenance require more advanced capabilities and responses than those facilities and equipment that have been widely used in the target country to date, continued support for operation and maintenance for a certain period of time during

and after implementation is effective for continuing appropriate operation and maintenance activities.

#### Setting of bidding period for selection of consultants

In this project, the project period was 157% of the planned period, which largely exceeded the plan. One of the main reasons was the delay in the bidding and contracting processes for the selection of consultants. Although this delay is a project management issue, according to the executing agency, the bidding process with two processes of EOIs and RFPs takes a lot of time to reach the contract, and there have been many cases in the country, not only for this project, where delays in the bidding period led to delays in the project. Also, in general, there are many instances in the loan projects where delays in bidding were factors in prolonged project periods. In the future, when planning projects in this country, those in charge of project planning in JICA and the executing agency should examine the times required for the bidding processes in past projects and set a realistic time frame for the process, as well as consider ways to reduce project delays related to bidding. In addition, during the project implementation, it is recommended looking into ways to reduce project delays related to bidding, such as by expediting the bidding process.

(end)

Comparison of the Original and Actual Scope of the Project

Item	Plan	Actual
<b>1. Project Outputs</b>		
Gas combined power plant development	1) Installation of 360 MW gas combined power plant and related facilities 2) Long term service agreement (LTSA) 3) Relocation and dismantling of existing substation in the proposed power plant construction site 4) Installation of gas pipeline	1) Installation of 412 MW gas combined power plant and related facilities 2) As planned 3) As planned 4) As planned
Consulting services	5) Engineering service consultant · Detailed design of power plant development and relocation of substations, follow up on procurement, construction supervision (including the measures for HIV/AIDS) · Follow up on tendering and contract negotiation for LTSA. 6) Management service consultant · Support for the establishment and revitalization of the operation and maintenance system for new and existing power plant under the project, upon the introduction of the Business Unit (SBU), which is an independent accounting system.	5) As planned               6) Implemented only for the new Haripur power station (Existing power plants are out of scope of this project.)
<b>2. Project Period</b>	October 2007 – September 2015 (96 months)	December 2007 – June 2020 (151 months)
<b>3. Project Cost</b>		
Amount paid in foreign currency	34,976 million yen	37,193 million yen
Amount paid in local currency	19,433 million yen (11,706 millions taka)	833 million yen (664 millions taka)
Total	54,409 million yen	43,690 million yen
ODA loan portion	34,976 million yen	38,076 million yen
Exchange rate	1 taka = 1.66 yen (As of September 2006)	1 taka = 1.33 yen (Average between December 2007 and June 2020)
<b>4. Final Disbursement</b>	March 2013 (I) June 2018 (II)	

(end)

People’s Republic of Bangladesh

FY2020 Ex-Post Evaluation of Japanese ODA Loan

“Financial Sector Project for the Development of Small and Medium-sized Enterprises (SMEs)”

External Evaluator: Hirofumi Azeta, Ernst & Young ShinNihon LLC

## **0. Summary**

The objective of this project was to improve the financial intermediation for small and medium enterprises (hereinafter referred to as ‘SMEs’) and increase the production and investments of SMEs in Bangladesh by providing medium- and long-term funds through Participating Financial Institutions (hereinafter referred to as ‘PFIs’) and strengthening the capacity of PFIs, thereby contributing to the sound development of the country’s industry and economy as well as to employment generation.

This project has been highly relevant to the country’s development plan and development needs, as well as Japan’s ODA policy. Therefore, its relevance is high.

In the aspect of project implementation, the amount of investments by SMEs, which was one of the project outputs, exceeded the plan because the share of contributions by SME borrowers exceeded the plan at the time of appraisal. Similarly, the project cost exceeded the plan, but this was commensurate with the project output, which also exceeded the plan. On the other hand, because some official procedures, such as effectuation of the ODA loan agreement and selection of PFIs, took time, the project period exceeded the plan. Therefore, efficiency of the project is fair.

As for the quantitative effects, the targets of all indicators were achieved as the sales turnover and profits of SME borrowers increased as well as the total loan outstanding to SMEs and its proportions to the total loan outstanding of PFIs increased. Generation of qualitative effects were also confirmed as the capabilities of financial institutions in SME lending and access to funds for SMEs improved. In addition, sub-loans financed by the Two-Step Loan (hereinafter referred to as ‘TSL’) funds of this project were considered to have supported economic growth and job creation, and thus effectiveness and impacts of the project are high.

As for the operation and maintenance of this project, there were no problems in the institutional or organizational aspect, because sufficient personnel were assigned in the department in charge in Bangladesh Bank (hereinafter referred to as ‘BB’) and PFI accreditations were renewed every year. No problems were identified in the technical and financial aspects either. It can be said that the status of operation and maintenance did not have any problems because sub-loans were made to SMEs from the revolving fund even after project completion, and the revolving fund was not damaged. In summary, no major problems have been observed in the institutional and organizational aspect, technical aspect,

or financial aspect, or even the current status of the operation and maintenance; thus, sustainability of the project effects is high.

In light of the above, this project is evaluated to be highly satisfactory.

## 1. Project Description



Project location



A laundry plant that received financing under this project

### 1.1 Background

Bangladesh was maintaining a high rate of economic growth at 6% per year before this project was started. At that time, industrial diversification, especially in the manufacturing sector, and the enhancement of domestic private investment were deemed necessary for further growth, productivity improvement, and income expansion in the future. Besides, as the SME sector had been largely contributing to the generation of employment and added value in Bangladesh, its sound development was expected to contribute significantly to economic growth and poverty reduction.

On the other hand, lack of electricity, corruption, and lack of financial access were regarded as major constraints for private investment. Among them, lack of financial access had been identified as a serious constraint for SMEs. In Bangladesh, loans by financial institutions, especially banks, were concentrated in large companies, while microfinance institutions provided financial services only to micro and cottage enterprises. In addition, because loans financial institutions provided to SMEs were mainly short-term loans for the commercial sector, SMEs, especially in the manufacturing industry, were unable to receive sufficient loans, including medium- and long-term loans, for capital investment.

Therefore, it was essential to encourage SMEs' capital investment by providing medium- and long-term funds, especially to SMEs in the manufacturing industry, to achieve stable economic growth in Bangladesh and ensure poverty reduction as a result of the growth.

## 1.2 Project Outline

The objective of this project was to improve the financial intermediation for SMEs and increase the production and investment of SMEs in Bangladesh, by providing medium- and long-term funds through PFIs and strengthening the capacity of PFIs, thereby contributing to the sound development of the country's industry and economy as well as to employment generation.

Loan Approved Amount / Disbursed Amount	5,000 million yen / 4,990 million yen
Exchange of Notes Date / Loan Agreement Signing Date	May 2011 / May 2011
Terms and Conditions	Interest Rate 0.01% Repayment Period 40 years (Grace Period 10 years) Conditions for Procurement General Untied
Borrower / Executing Agency	The Government of the People's Republic of Bangladesh /Ministry of Finance
Project Completion	May 2016
Target Area	Throughout Bangladesh
Main Contractor (s)	-
Main Consultant(s)	E. Gen Consultants Ltd. (Bangladesh) / Padeco Co., Ltd (Japan) (JV)
Related Studies (Feasibility Studies, etc.)	-
Related Projects	[ODA loan] Urban Building Safety Project (December 2015) Foreign Direct Investment Promotion Project (December 2015) Food Value Chain Improvement Project (August 2020) [Technical cooperation] Project for Capacity Development on Natural Disaster- Resistant Techniques of Construction and Retrofitting for Public Buildings (2011 - 2015) Project for Promoting Investment and Enhancing Industrial Competitiveness (2017 - 2022) [Asian Development Bank]

	<p>Implemented the following projects for refinancing schemes for SMEs:</p> <ul style="list-style-type: none"> <li>- Small and Medium-Sized Enterprise Development Project (2009)</li> <li>- Second Small and Medium-Sized Enterprise Development Project (2017)</li> </ul> <p>[World Bank]</p> <p>Financial Sector Support Project (2019)</p> <p>[International Finance Corporation and United Kingdom's Department for International Development]</p> <p>Supported the upgrading of the Credit Information Bureau in Bangladesh Bank (2009)</p>
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## 2. Outline of the Evaluation Study

### 2.1 External Evaluator

Hirofumi Azeta, Ernst & Young ShinNihon LLC<sup>1</sup>

### 2.2 Duration of Evaluation Study

This ex-post evaluation study was conducted with the following schedule.

Duration of the Study: November 2020 – January 2022

Duration of the Field Study: June 2021 – September 2021

### 2.3 Constraints during the Evaluation Study

As some part of information on the quantitative effects had not been collected by BB at the time of ex-post evaluation, the results of the interviews with 80 SME borrowers were used for the quantitative analysis instead. The interviewees were selected in a way so that their locational and industrial proportions came close to those of all SME borrowers. However, because SMEs were located in various places and engaged in many different industries, the interviewed SMEs did not necessarily represent all SME borrowers.

The field survey that the evaluator planned to conduct in August 2021 was not carried out due to the spread of COVID-19 in Bangladesh and worldwide. Therefore interviews with the executing agency, PFIs, and SME borrowers were held online. In addition, local associates visited the SME borrowers under the instructions of the evaluator.

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<sup>1</sup> Joined the evaluation team of Ernst & Young ShinNihon LLC as a team member from the Japan Economic Research Institute Inc.

### **3. Results of the Evaluation (Overall Rating: A<sup>2</sup>)**

#### 3.1 Relevance (Rating: ③<sup>3</sup>)

##### 3.1.1 Consistency with the Development Plan of Bangladesh

Before this project was started, the government of Bangladesh regarded SME development as a priority issue for economic growth in its “National Strategy for Accelerated Poverty Reduction II” (2008) and “Outline Perspective Plan of Bangladesh 2010 - 2021: Making Vision 2021 a Reality.” The Industrial Policy, revised in 2010, also identified the necessity for policy supports for SMEs, such as through refinance schemes.

BB, as the central bank, had also shown the direction for the expansion of SME loans, announcing “SME Credit Policies & Programmes” in March 2010, in addition to setting up a department specialized in SMEs in December 2009.

At the time of ex-post evaluation, the government of Bangladesh emphasized the necessity of SME development and removal of their financial constraints in “Vision 2041” (2020) and the “Perspective Plan of Bangladesh 2021 - 2041,” which presents the development strategies for “Vision 2041.” In addition, the “8th Five Year Plan” (2020 - 2025) referred to the importance of credit supports for cottage, micro, small, and medium enterprises. The Industrial Policy, revised in 2016, also indicated the necessity of SME development and improvement in SME finance. Besides, increasing the scope of access to finance in the SME sector was regarded as a goal of the SME Policy established in 2019.

The “SME Credit Policies & Programmes” by BB mentioned above was effective at the time of ex-post evaluation, and BB executed several refinancing schemes for the enhancement of SME loans.

Note that the eligible borrowers of “loans for the development of SMEs” under this project were determined at the time of appraisal as the SMEs defined by the Industrial Policy revised in 2010. The definition of SME was updated by the Industrial Policy revised in 2016, and the definition of SME by BB was also revised by its circular issued in 2017. However, the definition of SME was revised after the completion of this project, and the Steering Committee<sup>4</sup>, which had the authority to make decisions on policy issues relevant to the implementation and management of this project, did not hold a meeting after the project completion. As the result, the operating guidelines had not been updated since March 2016. Therefore, it was difficult to confirm that the eligible SME borrowers of this project were consistent with the SMEs defined by the Industrial Policy at the time of ex-post evaluation.

For the above reasons, it was confirmed that SME development and enhancement of SME

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<sup>2</sup> A: Highly satisfactory, B: Satisfactory, C: Partially satisfactory, D: Unsatisfactory

<sup>3</sup> ③: High, ②: Fair, ①: Low

<sup>4</sup> The Steering Committee, which was chaired by MOF, was composed of members from BB, Ministry of Planning, Ministry of Industries and Federation of Bangladesh Chamber of Commerce and Industry and others.



loans were emphasized in Bangladesh at the times of both appraisal and ex-post evaluation. Therefore, it can be said that the consistency between this project and the respective policies and plans, including national plans and sector plans, was confirmed at the times of both appraisal and ex-post evaluation.

### 3.1.2 Consistency with the Development Needs of Bangladesh

Before this project was started, it was said that the SME sector in Bangladesh was generating added value equivalent to 25% of its GDP and employment for about 31 million people; thus, its development was expected to play a vital role in the country's economic development and poverty reduction. On the other hand, SMEs did not have good access to finance compared with large companies and micro and small enterprises, and SMEs could not receive sufficient medium- and long-term funds necessary for capital investment. The reasons include strict collateral requirements, high interest rates, short loan terms, and complexity in loan procedures.

Although information on the amounts of added value and employment generated by SMEs was not available at the time of ex-post evaluation, it was found that the Industrial Policy issued in 2019 aimed to increase the contribution of added value by SMEs to GDP from 25% to 32%.

The proportion of SMEs among the borrowers of commercial banks was 4.7% at the time of appraisal (2011), and it increased and reached 7.0%<sup>5</sup> at the time of ex-post evaluation. This suggests that financial access of the SMEs improved. Nevertheless, as this proportion is smaller than the share of small and medium establishments among the total establishments (over 99%<sup>6</sup>), SMEs in Bangladesh seem to have faced challenges in terms of financial access even at the time of ex-post evaluation. In the interviews, SMEs pointed out that they could not easily obtain loans from financial institutions, because of (i) high interest rates, (ii) strict collateral requirements, and (iii) time required for loan appraisals.

For the above reasons, it was confirmed that SME development was a critical issue at the times of both appraisal and ex-post evaluation, as the necessity for increasing the contribution of added value by SMEs to GDP was recognized in those times. In addition, many SMEs still faced problems in access to finance, although the access was improving. Therefore, it was concluded that this project was highly consistent with the development needs at the times of both appraisal and ex-post evaluation.

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<sup>5</sup> *Financial Access Survey*, International Monetary Fund, <https://data.imf.org/?sk=E5DCAB7E-A5CA-4892-A6EA-598B5463A34C> (Accessed on July 15, 2021)

<sup>6</sup> *Economic Census 2013*, Bangladesh Bureau of Statistics (pp. 81)

### 3.1.3 Consistency with Japan's ODA Policy

The '*Country Assistance Program for Bangladesh*', established by the Japanese government in 2006, recognized "economic growth" as a priority area and "private sector development" as a priority sector. It also emphasized SME development from the viewpoint of poverty reduction through job creation. Among the "private sector development" mentioned above, JICA regarded "improvement of the trade and investment climate" as its priority sector and aimed to improve of the financial access of SMEs and others<sup>7</sup>.

As the project aimed to improve the financial intermediation for SMEs and increase their production and investment in Bangladesh, it was confirmed that the project was consistent with the priority area and priority sector indicated in Japan's Country Assistance Program for Bangladesh mentioned above. Therefore, it can be said that this project was consistent with Japan's ODA policy.

In light of the above, this project has been highly relevant to the country's development plan and development needs, as well as Japan's ODA policy. Therefore, its relevance is high.

## 3.2 Efficiency (Rating: ②)

### 3.2.1 Project Outputs

The outputs of the project were 1) loans for the development of SMEs, or the provision of medium- and long-term financing to SMEs through PFIs, and 2) consulting services for the operation of loans for the development of SMEs.

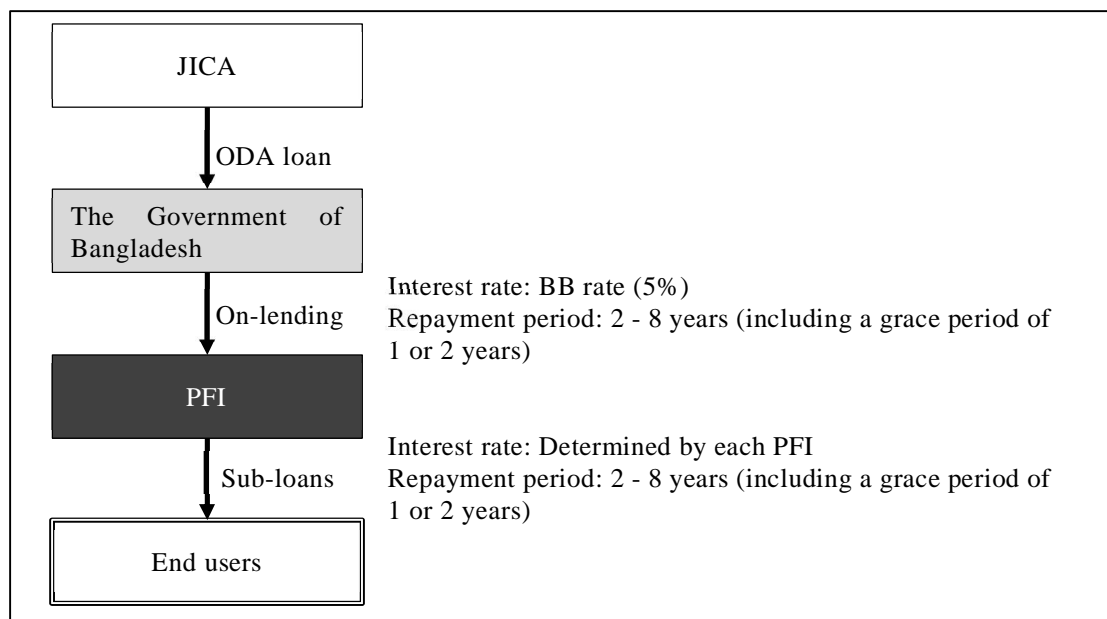
#### 1) Loans for the Development of SMEs

The framework of the loans for the development of SMEs was as described in Figure 1.

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<sup>7</sup> Source: Ex-ante evaluation

Figure 1 Framework of the loans for the development of SMEs



Source: Document provided by JICA.

Note: The BB rate, which had been 5% since 2003 was revised to 4% in July 2020.

The terms and conditions of sub-loans provided by the PFIs to end users (SMEs) were as follows:

- Eligible business sectors: Not specified
- Eligible end users: SMEs defined by Industrial Policy (2010)
- Eligible investments for financing: Fixed assets and initial working capital, associated with an investment loan
- Amount: 200,000 - 50 million taka per sub-loan (1 taka = 1.31 yen)<sup>8</sup>
- Term: 2 - 8 years (including a grace period of 1 or 2 years)
- Interest rate: Not specified (interest rates were independently set by PFIs considering the credit and other risks)

Out of the cost of a sub-project, or the investment by an end user, at least 10% was supposed to be covered by the end user, while the remaining amount was to be covered by a sub-loan by a PFI. For the sub-loan, the PFI could take on-lending loan funds (TSL funds) up to 75% of the sub-project cost, while the PFI was supposed to cover at least 15% of the cost by its own funds.

Sub-loans for end users were provided by 12 banks and 14 non-banking financial institutions (hereinafter referred to as 'NBFIs') out of the PFIs (25 banks and 21 NBFIs), which were accredited by the project implementation unit (hereinafter referred to as 'PIU')

<sup>8</sup> The amount per sub-loan, which was 500,000 - 50 million taka at the time of appraisal, was changed to 200,000 - 50 million taka so that micro enterprises could be the end users.

established in the SME & Special Programmes Department (hereinafter referred to as ‘SMESPD’) of BB<sup>9</sup>.

The number of sub-loans made in this project from the commencement of the project in 2011 to the project completion in 2016 was 512. The number of sub-loans, amounts, loan period, and interest rate by type of industry of the end users are as in Table 1.

Table 1 Sub-loans provided by PFIs by type of industry

Type of Industry	Number of Sub-loans	Amount (million taka)	Average Loan Period (months)	Average Interest Rate (%)
Manufacturing	380	698.8	44.3	16.9
Service	122	3,284.5	45.3	15.5
Commerce	10	65.5	41.4	17.8
Total	512	4,048.9	45.0	15.9

Source: Documents provided by JICA and BB.

PFIs were supposed to determine the interest rates of sub-loans for end users independently according to the plan at the time of appraisal, and the actual interest rates of the sub-loans by PFIs are presented in Table 2. The sub-loan interest rates of this project were slightly higher than the average loan interest rates in Bangladesh, because the borrowers of this project were SMEs and their credit risks were higher than those of large companies. The loan interest rates of this project were set at the same level as ordinary SME loans at the beginning of this project, but the gap between the average loan interest rates in Bangladesh and the sub-loan interest rates of this project decreased gradually. One reason for this was that SMEs started requesting PFIs to reduce interest rates, as the information of this project spread through such SMEs.

Table 2 Average loan interest rates

	2012	2013	2014	2015
Sub-loans of this Project	16.7%	15.6%	14.8%	11.9%
Average loan interest rate in Bangladesh	13.8%	13.7%	13.1%	11.7%

Source: Annual reports of BB and document provided by BB.

Considering the number of sub-loans by amount of loans, the shares of sub-loans smaller than 3 million and 5 million taka were 18.6% and 32.2%, respectively. Because many sub-loans of smaller amounts were made, compared with the maximum sub-loan amount of 50

<sup>9</sup> Out of the PFIs, 13 banks and 7 NBFIs did not disburse sub-loans. In the interviews with PFIs, the PFIs mentioned that they were not active in sub-loans because the processes to prepare documents to be submitted to the PIU were complicated, and SMEs could not prepare the documents to be submitted upon loan applications.

million taka, small-sized enterprises seem to have also received sub-loans in this project<sup>10</sup>.

Although many PFIs provided loans to mainly large companies before this project began, they also provided loans actively to small-sized enterprises, because PFIs could set interest rates independently and secure sufficient interest margins.

Table 3 Sub-loans provided by PFIs by type of industry and amount of loans

Type of Industry	Number of Sub-Loans	Number of Sub-loans: Smaller than 3 Million taka		Number of Sub-loans: Smaller than 5 Million taka	
		Number	Share	Number	Share
Manufacturing	380	76	20.0%	128	33.7%
Service	122	19	15.6%	37	30.3%
Commerce	10	0	0.0%	0	0.0%
Total	512	95	18.6%	45.0	32.2%

Source: Documents provided by JICA and BB.

At the time of appraisal, the total amount of sub-project costs by the end users of this project was expected to be 6,383 million yen, while the actual sub-project cost was 7,931 million yen, which was 24.2% larger than planned.

As mentioned above, a maximum 75% of the sub-project cost of an end user was supposed to be covered by the TSL fund and a PFI was supposed to cover at least 15%. Similarly, end users were supposed to contribute at least 15%.

However, end users actually bore 22.3% of the sub-project costs in this project. According to PFIs, they commonly requested end users to contribute 20 - 30% of the investment costs in order to increase the ownership of end borrowers and also to minimize credit risks.

As Table 4 describes, the total sub-project cost, which was one of the outputs of this project, exceeded the plan at the time of appraisal, mainly because the contribution by end users was much more than the planned amount, while the actual loan amount by TSL funds was almost the same as planned.

Table 4 Planned and actual amounts of sub-project costs

	Plan		Actual	
	Amount (million yen)	Proportion	Amount (million yen)	Proportion
Loans by TSL fund	4,788	75.0%	4,823	60.8%
Loans by PFI funds	958	15.0%	1,340	16.9%
Contributions by end users	638	10.0%	1,768	22.3%
Sub-project cost	6,383		7,931	

Source: Document provided by BB.

<sup>10</sup> Information on the number of sub-loans by size of enterprise could not be obtained.

## Examples of sub-loans of this project

### Expansion of the production facilities in an industrial oxygen factory

Before the capital investment, this factory produced only industrial oxygen and nitrogen. By enhancing the production facilities utilizing the sub-loan funds of this project, the factory started producing seven types of gas, such as argon, and the factory's sales revenue and profit increased as a result.



Recently, this factory started supplying oxygen for medical purposes in reaction to the spread of COVID-19.

Photo 1 Production facilities for industrial oxygen

### Development of a wastewater treatment facility at a laundry plant for export garments



Photo 2 Wastewater treatment facility

This laundry plant, which provided industrial washing services for export garments of overseas apparel makers, developed a wastewater treatment facility by utilizing the sub-loan funds, in response to requests from apparel makers.

Since this plant met the standards of overseas apparel makers, it acquired more clients. This plant also provided services to a Japanese company.

The terms and conditions of sub-loans of this project, which were as described above, were partly changed in October 2013 for the retrofitting and reconstruction of garment factories. The terms and conditions applied to such garment factories were as follows:

- Maximum loan amount: 100 million taka
- Loan term: Maximum 15 years (including a grace period of up to 2 years)
- Interest rate: On-lending rate to PFIs + maximum 5%

This was in reaction to the collapse of Rana Plaza, a tenant building that housed garment factories, causing many casualties. Because of this accident, there was an urgent need to enhance building safety and also improve the working environment of garment industry workers. Based on the memorandum of understanding signed by five parties - the Ministry of Housing and Public Works, BB, Bangladesh Garment Manufacturers and Exporters Association, Bangladesh Knitwear Manufacturers and Exporters Association, and JICA - in October 2013, this project started providing long-term and low-interest loans for the

enhancement of building safety. Further, a JICA technical cooperation project titled “Capacity Development on Natural Disaster Resistant Techniques of Construction and Retrofitting for Public Buildings” began providing technical support. During the project period, two sub-loan agreements were concluded, according to which a total of 220 million yen were provided.

In addition, the interest rates of sub-loans to women entrepreneurs were capped at an on-lending rate to PFIs + 5% in March 2016.

## 2) Consulting Services

This project’s consulting services were planned to provide support on project management, support on capacity development, public awareness activities and promotion, introduction of good practices in SME finance system in other countries, suggestions on the improvement of financial access, support on monitoring and evaluation of the project, and coordination and collaboration with other donor agencies and related institutions. These services were actually provided as planned.

As the support on the capacity building of PFIs provided in the consulting services, workshops were organized six times in total. In the workshops, guidance was provided on the sub-loan procedures of this project, such as the preparation of loan application and setting of JICA categories on environmental and social consideration. The workshops also included lectures on loan appraisal and supervision, loan practices not based on collaterals, and other topics. The number of participants of the workshops mentioned above was 320 from 46 PFIs.

As a part of the consulting services, promotional activities of this project were also conducted. Promotional seminars, which were organized 10 times in total for SMEs in several locations, including Dhaka and Chittagong, explained loan application procedures and other project related issues. Advertisement of this project was placed in several English and Bangla newspapers, and leaflets were also distributed.

A comparative analysis was also conducted with European countries, Southeast Asian countries, Japan, and other countries for the improvement of financial access. Further, study tours to Japan, South Korea, and several Southeast Asian countries were organized, in which BB personnel including PIU staff members participated. In the consulting services, sub-project monitoring activities, such as preparation of quarterly reports and data collection on quantitative effects, were also carried out. In addition, on-site inspections of 20 end users were conducted.

### 3.2.2 Project Inputs

#### 3.2.2.1 Project Cost

The actual project cost was 8,142 million yen (of which the ODA loan amount was 4,990

million yen), and this exceeded the project cost planned at the time of project appraisal (115% of the plan), which was 7,097 million yen (of which the ODA loan amount was 5,000 million yen). The project cost at the time of appraisal and actual project cost are as shown in Table 5.

Table 5 Planned and actual project cost

Item	Plan (million yen)			Actual (million yen)		
	Foreign Currencies	Local Currencies	Total	Foreign Currencies	Local Currencies	Total
1) Two-step loans (TSL)	4,788	1,596	6,383	4,823	3,108	7,931
TSL funds	4,788	0	4,788	4,823		4,823
PFI funds	0	958	958		1,340	1,340
Contribution of end users	0	638	638		1,768	1,768
2) Consulting services	156	57	213	104	64	167
3) Interest during implementations	2	-	2	-	-	-
4) Administration cost	-	500	500	-	44	44
<b>Total</b>	<b>4,945</b>	<b>2,152</b>	<b>7,097</b>	<b>4,927</b>	<b>3,216</b>	<b>8,142</b>

Source: Document provided by JICA, answers on the questionnaire by BB, and document provided by BB.

Note 1: The individual project costs and total value do not necessarily match due to rounding.

Note 2: Exchange rates: At the time of appraisal: 1 taka = 1.23 yen, 1 USD = 85.5 yen (November 2010); actual: 1 taka = 1.31 yen, 1 USD = 102.63 yen (average of 2012 - 2016; retrieved from the International Monetary Fund, *International Financial Statistics*).

The actual total project cost exceeded the plan because the project cost of TSL covered by the Bangladeshi side largely exceeded the amount planned at the time of appraisal. This was because the proportion of contribution by end users was bigger than the plan as described in Table 4 and Table 5.

The increase in the actual project cost, which exceeded the plan by 15%, is considered relevant to the increase in the investment amount by SME borrowers of this project, which also exceeded the plan by 24%. The proportion covered by PFI funds, which was 16.9%, was also bigger than the plan. However, this occurred due to fluctuations in the foreign exchange rate, and the proportion calculated in taka was almost the same as the plan.

### 3.2.2.2 Project Period

The planned project period was 59 months from May 2011 to March 2016, while the actual



project period was 61 months from May 2011 to May 2016, as described in Table 6. The actual project period slightly exceeded the plan (103% of the plan).

Table 6 Planned and actual project periods

	Plan	Actual
Project period	May 2011 - March 2016 (59 months)	May 2011 - May 2016 (61 months)
1) Selection of consultants	April 2011 - December 2011	March 2012 - August 2012
2) Consulting services	January 2012 - April 2016	September 2012 - March 2016
3) TSL	September 2011 - March 2016	April 2012 - May 2016

Source: Document provided by JICA.

As some official procedures, such as effectuation of the ODA loan agreement, selection of PFIs and approval of operating guidelines, took time, both consulting services and TSL started later than planned. However, the actual implementation period of TSL was 4 years and 2 months, which was shorter than 4 years and 6 months under the initial plan. As a result, the total delay in the project period was of 2 months. One reason why the implementation period of TSL was shorter than the plan was that the information on this project spread to SMEs through public relations activities; another reason was that SMEs became more willing to make capital investments due to the decline in market interest rates.

### 3.2.3 Results of Calculations for Internal Rates of Return (Reference Only)

As this project provided medium- and long-term funds to SMEs through PFIs and sub-projects were not specified before the start of the project, neither the economic internal rate of return (EIRR) nor financial internal rate of return (FIRR) was calculated at the time of appraisal. Therefore, they were not recalculated at the time of ex-post evaluation either.

In light of the above, both the project cost and project period exceeded the plan. Therefore, efficiency of the project is fair. However, the project cost, which exceeded the plan, was commensurate with the project output, which also exceeded the plan.

### 3.3 Effectiveness and Impacts<sup>11</sup> (Rating: ③)

#### 3.3.1 Effectiveness

##### 3.3.1.1 Quantitative Effects (Operation and Effect Indicators)

The effects expected by this project were improvement in the financial intermediation function on SME financing and increase in the production and investments of SMEs. Therefore, sales turnover and profits of SME borrowers, the total loan outstanding of PFIs to SMEs, and its proportion to total loan outstanding were selected as indicators to measure the effects, and targets were set on such indicators.

As the information of sales turnover and profits of all SME borrowers had not been updated at the time of ex-post evaluation, they were analyzed from the interview survey results of 80 end users.

Table 7 Sales turnover and profits of all SME borrowers

	Baseline	Target	Actual	
		2018	2016	2018
	Before Sub-Loan Disbursement	2 Years After Completion	Completion Year	2 Years After Completion
Sales turnover of the benefited SMEs (million taka)	74.0	Bigger than baseline	100.8 (+36.3%)	112.2 (+51.6%)
Profit of the benefited SMEs (million taka)	6.9	Bigger than baseline	9.2 (+32.7%)	10.2 (+48.1%)

Source: Documents provided by JICA and BB and the interview survey.

Note: The figures as of 2016 and 2018 are estimated based on the interview survey results.

The interview survey mentioned above gave the result that the sales turnover of 80 end users increased by an average of 36.3% from the baseline to 2016, and 51.6% to 2018 on a real basis after the adjustment of inflation. Assuming that the sales turnover of all SME borrowers increased at the same rate, the total sales revenue of all SME borrowers was estimated to have increased from 74.0 million taka before the disbursement of sub-loans to 112.2 million taka at the time of ex-post evaluation as shown in Table 7.

Similarly, the interview survey gave the result that the profit of 80 end users increased by an average of 32.7% from the baseline to 2016, and 48.1% to 2018 on a real basis. Assuming that the profits of all SME borrowers increased at the same rate, the total profits of all SME borrowers were estimated to have increased from 6.9 million taka before the disbursement of sub-loans to 10.2 million taka at the time of ex-post evaluation.

<sup>11</sup> Sub-rating for Effectiveness is to be put with consideration of Impacts.

Table 8 Loan outstanding of PFIs to SMEs and its proportion

	Baseline	Target	Actual	
		2018	2016	2018
	Before Sub-Loan Disbursement	2 Years After Completion	Completion Year	2 Years After Completion
Total loan outstanding of the PFIs to SMEs (million taka)	371,861	Bigger than baseline	474,148 (+27.5%)	978,730 (+163.2%)
Ratio of SME lending in total loan outstanding of the PFIs (%)	17.68%	Bigger than baseline	17.64% (-0.04%)	19.81% (+2.13%)

Source: Documents provided by JICA and BB.

The total loan outstanding of the PFIs to SMEs increased by 163.2% from the baseline to 2018 (83.3% after the adjustment of price level), and the ratio of SME lending in total loan outstanding also reached 19.81%, increasing by 2.13% from the baseline as in Table 8.

In light of the above, it is concluded that all indicators on the quantitative effects achieved their targets.

### 3.3.1.2 Qualitative Effects (Other Effects)

At the time of the appraisal of this project, 1) improvements in the capabilities of financial institutions in SME lending, 2) improvements in access to funds for SMEs, and 3) job creation and the development of the private sector were expected as the qualitative effects. As job creation and the development of the private sector are regarded as “impacts” because of their characteristics, this is explained in section 3.3.2.

#### 1) Improvements in the Capabilities of Financial Institutions in SME Lending

In this ex-post evaluation, an interview survey was conducted with 12 PFIs out of 26 PFIs<sup>12</sup> that had a track record of financing in this project. In the interview survey, all PFIs responded that they enhanced the understanding of the application procedures of this project as a result of the workshops held under the consulting services, and this led to the promotion of sub-loan disbursements. The PFIs also mentioned that they were not familiar with the environmental and social consideration procedures before this project was started, and they deepened the understanding on them through participating in workshops and carrying out loan procedures.

<sup>12</sup> A total of 14 PFIs were not interviewed, mainly because the personnel involved in this project did not remain, and also because they provided a limited number of sub-loans in this project.

However, as 20 PFIs out of the 46 accredited PFIs did not disburse loans to SMEs under this project, it is not certain to what extent their capabilities mentioned above improved.

## 2) Improvements in Access to Funds for SMEs

In the interview survey, all PFI institutions (12 institutions) with a track record of financing in this project responded that they became active in lending to SMEs after the start of this project. This is because it became easier for PFIs to provide loans to SMEs because of this project and similar projects by other donor agencies. In addition, it was confirmed that some PFIs used to target only individuals or large companies but newly entered into SME financing by utilizing the funds of this project to diversify profit opportunities and loan targets. Note that the proportion of SMEs among the borrowers of commercial banks in terms of number of accounts increased from 4.7% in 2011 to 7.0% in 2019<sup>13</sup>. Therefore, it can be said that more SMEs have access to funds at the time of ex-post evaluation.

### 3.3.2 Impacts

#### 3.3.2.1 Intended Impacts

##### Industrial and Economic Development

From the time of appraisal of this project to the time of ex-post evaluation, GDP increased by 6.94% per year on a real basis (2011 price) as in Table 9. During the same period, the domestic credit outstanding increased by 6.91% per year and the loan outstanding to SMEs increased by 6.59% per year on a real basis. It is considered that the increase in the domestic credit, including loans to SMEs, supported the economic growth in Bangladesh.

As the loans provided by the TSL fund of this project also partially contributed to the increase in the domestic credit outstanding, it can be considered that this project supported the economic growth of the country.

Table 9 Change in GDP and domestic credit  
(Unit: billion taka, at 2011 price)

	Real GDP	Domestic Credit Outstanding	Loan Outstanding to SMEs
2011	9,158	3,907	811
2012	9,756	4,171	932
2013	10,342	4,191	1,000
2014	10,969	4,528	1,112
2015	11,688	4,854	1,147
2016	12,519	5,221	1,245
2017	13,431	7,265	1,376
2018	14,487	6,057	1,172
2019	15,668	6,671	1,351
Average growth rate	6.94%	6.91%	6.59%

Source: Documents provided by BB and the World Bank *World Development Indicators*.

<sup>13</sup> *Financial Access Survey*. International Monetary Fund. <https://data.imf.org/?sk=E5DCAB7E-A5CA-4892-A6EA-598B5463A34C> (Accessed on July 15, 2021)

### Job Creation

The interview survey mentioned above gave the result that the number of employees of the 80 end users increased by 37.6% from the baseline to 2018 as presented in Table 10.

Since the number of employees of SME borrowers was 15,341 before the implementation of sub-loans, it was estimated that 8,497 jobs had been created during the period between the baseline and 2018, assuming that the number of employees of all SME borrowers increased at 37.6% too.

Table 10 Change in the number of employees of SME borrowers

	Baseline	Actual	
		2016	2018
	Before sub-loan disbursement	Completion Year	2 Years After Completion
Number of employees of SME borrowers (persons)	15,341	21,557 (+40.5%)	21,103 (+37.6%)

Source: Document provided by JICA and interviews with SMEs.

Note: The figures as of 2016 and 2018 are estimated based on the interview survey results.

In addition, it was confirmed that the number of employed population increased by 6.7 million from 2010 as in Table 11, before the implementation of this project, to 2017, following the economic growth in Bangladesh. Although the number of jobs created by the companies that received loans through this project was limited, because the number of employed population in Bangladesh increased, following the economic growth, this project is also considered to have supported job creation in the country.

Table 11 Number of employed population in Bangladesh

(Unit: million persons, aged 15 or older)

	2010	2013	2015	2017
Labor force	56.7	60.7	62.1	63.5
Employed population	54.1	58.1	59.5	60.8

Source: Bangladesh Bureau of Statistics.

#### 3.3.2.2 Other Positive and Negative Impacts

##### 1) Impacts on the Natural Environment

In this project, BB and PFIs were supposed to examine the environmental and social consideration aspects of sub-projects based on the domestic law in Bangladesh and JBIC Guidelines for Confirmation of Environmental and Social Considerations (April 2002), and any sub-projects that fell under Category A were supposed to be regarded as non-eligible.

When a PFI of this project received a loan application from an end user, the PFI confirmed the categories of the sub-project under the Environment Conservation Rules in Bangladesh based on the type of industry of the sub-project. In case the sub-project was classified as “Red,” which means a project that can potentially have a significant negative impact on the environment, the sub-project was regarded as non-eligible. If the sub-project fell into other categories, the PFI received an environmental clearance certificate from the end user and confirmed that there were no environmental issues. In the interview survey, it was confirmed that PFIs actually determined the categories based on the JBIC Guidelines for Confirmation of Environmental and Social Considerations, examining the social consideration aspects of sub-projects such as resettlement and child labor through on-site visits in addition to the environmental aspects mentioned above. As the result, any sub-projects that fell into Category A, which might have significant adverse impacts on the environment, did not receive any financing under this project.

It was also confirmed that PFIs regularly monitored that end users had obtained necessary permits, receiving copies of factory licenses and fire certificates from them at the time of renewal. In addition, PFIs regularly visited end users to examine whether sub-projects were making any negative impacts on the natural environment. According to interviewee PFIs, they did not recognize any sub-projects under this project that caused negative impacts on the natural environment. Moreover, no sub-loans that caused negative impacts on the natural environment were identified through on-site inspections conducted under the consulting services of this project nor through field visits of the ex-post evaluation. Therefore, it can be said that appropriate mitigation measures were taken against the negative impacts on the natural environment, and such negative impacts were minimal as a result.

## 2) Resettlement and Land Acquisition

From the answers to the questionnaire by BB, the interviews with PFIs, and the interviews with end users, it was confirmed that there were no sub-projects with land acquisitions that were followed by migration of population, including illegal dwellers. It was also confirmed that PFIs examined that end-borrowers were going through land ownership transfer processes following the domestic laws, and that PFIs did not accept loan applications if there were any issues in the land ownership transfer process, even when end users acquired land using funds that were not provided under this project. Therefore, it is concluded that any negative impacts related to resettlement and land acquisition were not caused in this project.

## 3) Other Positive and Negative Impacts

As mentioned above, following the collapse of Rana Plaza, a tenant building that housed garment factories, and the resultant casualties, the terms and conditions of the sub-loans of

this project were partially changed so that this project could provide long-term (up to 15 years) and low-interest (on-lending rate +5%) financing for the retrofitting and reconstruction of garment factories. During the project period, two sub-loan agreements were concluded, under which a total of 220 million yen were provided. Through this change in the terms and conditions, this project was able to react to the urgent issues related to improvement in the working environment for garment industry workers.

In addition, through loans for the enhancement of the building safety of garment factories in this project, the operational issues in financing were identified. The necessity of financing at lower interest rates than usual was also identified for the enhancement of building safety. Based on the above experience obtained from this project, an ODA loan project titled “Urban Building Safety Project” (loan agreement signed in December 2015; 12.086 billion yen), which provides low-interest loans for the enhancement of building safety in urban areas, was promptly formulated.

In addition, the terms and conditions of sub-loans were revised so that 100% of the sub-project cost could be covered by a sub-loan in case the end user was a women entrepreneur (90% of the sub-project cost was financed by TSL funds). By the end of 2018, 12 sub-loans of 156.4 million taka were provided from the revolving fund of this project to women entrepreneurs, and the average interest rate of the sub-loans was set slightly lower at 11.2% as presented in Table 12.

Table 12 Sub-loans provided from the revolving fund to women entrepreneurs

Type of End Users	Number of sub-loans	Amount (million taka)	Average Loan Period (months)	Average Interest Rate (%)
Women entrepreneurs	12	156.4	51.0	11.2
SMEs other than women entrepreneurs	359	2,997.3	42.9	12.2

Source: Document provided by BB.

In light of the above, it was confirmed that the quantitative effects were generated because the sales turnover and profits of SME borrowers as well as the total loan outstanding to SMEs and its proportions to total loan outstanding of PFIs increased. Generation of qualitative effects was also confirmed as the capabilities of financial institutions in SME lending and access to funds for SMEs improved. In addition, sub-loans financed by the TSL funds of this project were considered to have partially contributed to the increase in the total loan outstanding to SMEs in Bangladesh, and they also supported economic growth and job creation. Further, sub-projects that received financing under this project did not cause any

negative impacts on the natural environment and related to resettlement and land acquisitions. When the collapse of a tenant building with garment factories occurred in 2013, the terms and conditions of sub-loans of this project were partially changed so that this project could provide long-term and low-interest financing for the retrofitting and reconstruction of garment factories. This led to the formulation of the ODA loan project titled “Urban Building Safety Project.” The terms and conditions of sub-loans for women entrepreneurs were also revised in May 2016, so that they could receive sub-loans up to 100% of sub-project costs, and sub-loans were provided at slightly lower interest rates than other SMEs. From the above, it is concluded that this project generated the effects as planned. Therefore, effectiveness and impacts of the project are high.

### 3.4 Sustainability (Rating: ③)

#### 3.4.1 Institutional / Organizational Aspects of Operation and Maintenance

The agency responsible for the supervision of the overall operations of the project and its execution was the Ministry of Finance. Based on the Administrative Agreement concluded between the Ministry of Finance and BB, SMESPD of BB, as the institution carrying out the project, was supposed to conduct TSL loan administration and monitoring and also provide capacity building supports to PFIs. This arrangement remained unchanged at the time of ex-post evaluation. At the time of ex-post evaluation, eight persons assigned to the PIU, which was set up in SMESPD, managed the revolving fund of this project. According to BB, the number of persons assigned to the PIU was sufficient, and there were no problems arising from the lack of staff members, such as delays in operations.

PFI accreditation had been carried out based on the accreditation criteria specified in the operating guidelines of this project, and 22 banks and 19 NBFIs were accredited as PFIs in May 2012. After this, several PFIs were excluded from accredited PFIs due to the increase in their non-performing loan ratios, while four banks and three NBFIs were newly accredited as PFIs in response to their application for new entry. In addition, the PIU annually examined whether PFIs met accreditation criteria such as their financial conditions. Therefore, it can be said that no sub-loans were made by PFIs that did not meet the accreditation criteria.

In light of the above, it is concluded that there were not any problems in the institutional and organizational aspects of the operation and maintenance of this project.

#### 3.4.2 Technical Aspects of Operation and Maintenance

SMESPD of BB, which carried out project operations under the consignment of the Ministry of Finance, had been implementing the refinancing schemes funded by the World Bank and Asian Development Bank without any problems. As no operational problems have been identified in this project either, it can be said that there were no problems in the



technical aspect of the operation and maintenance of this project.

### 3.4.3 Financial Aspects of Operation and Maintenance

For the implementation of this project, as BB bore a part of the expenses for consulting fee (tax) and also paid the daily allowance for the participation in the study tour, there were no problems in the financial aspect of the project's operation and maintenance.

At the time of ex-post evaluation, the main cost covered by BB was the personnel expenses of PIU staff members. Because no significant decrease in salary expenses of BB could be identified and no problems including personnel shortage due to lack of budget arose as described in Table 13, there were no problems in the financial aspect of the operation and maintenance at the time of ex-post evaluation either.

Table 13 Number of personnel and amount of salary expenses of BB

Fiscal Year	Number of Personnel (person)	Salary Expenses (million taka)
2012 - 13	5,239	1,189
2013 - 14	5,468	1,321
2014 - 15	6,067	1,694
2015 - 16	5,726	1,759
2016 - 17	5,664	2,699
2017 - 18	5,741	2,722
2018 - 19	6,369	2,917
2019 - 20	6,391	3,072

Source: Annual report of BB.

### 3.4.4 Status of Operation and Maintenance

In this project, a revolving fund, which utilized the surplus funds generated from the difference between the repayment periods of sub-loans and the ODA loan, was created to provide new sub-loans under the same terms and conditions. The revolving fund started providing sub-loans to SMEs in 2015. By the end of 2018, the revolving fund had provided 371 sub-loans of 3,154 million taka to SMEs. The number and amount of sub-loans by industry are as given in Table 14.

Table 14 Sub-loans provided by the revolving fund by type of industry

Type of Industry	Number of Sub-Loans	Amount (million taka)	Average Loan Period (months)	Average Interest Rate (%)
Manufacturing	234	2,074.3	42.0	12.1
Service	135	1,064.1	45.2	12.3
Commerce	2	15.4	39.0	13.8
Total	371	3,153.8	43.1	12.2

Source: Document provided by BB.

At the time of ex-post evaluation, the revolving fund was still providing sub-loans to end

users. However, because the maximum amount of sub-loans remained at 50 million taka<sup>14</sup> from the start of the project, it had not reflected the increase in price levels since then. Some PFIs pointed out that the maximum sub-loan amount was not sufficient to meet the funding needs of SMEs at the time of ex-post evaluation.

The information on the repayment status of sub-loans provided from the revolving funds to SMEs was not available. Considering that the non-performing loan ratios of banks and NBFIs in Bangladesh were 5.8% and 11.9%, respectively, in 2019, and also that PFIs, whose non-performing loan ratio exceeded 10%, were excluded from accredited PFI, the non-performing loan ratio of the sub-loans provided from the revolving fund was estimated to be at the same or lower level than the ratios mentioned above.

Even if sub-loans to end users become non-performing, PFIs need to repay the TSL funds to BB in this project. As there were not any overdue repayments from PFI to BB at the time of ex-post evaluation, the revolving fund was not damaged. In addition, because banks and NBFIs with non-performing loan ratios exceeding 10% are excluded from accredited PFIs, as mentioned above, it can be said that there is low possibility that repayments from PFIs to BB became overdue.

BB had been receiving external audits every year on the operation and management status of the special account, project operating account, and revolving fund account of this project. As such audits did not make any special comments, it can be said that there were no problems in the management of the TSL funds.

In light of the above, no major problems were observed in the institutional and organizational aspect, technical aspect, or financial aspect, or even in the current status of the operation and maintenance. Therefore, sustainability of the project effects is high.

## **4. Conclusion, Lessons Learned and Recommendations**

### 4.1 Conclusion

The objective of this project was to improve the financial intermediation for SMEs and increase the production and investments of SMEs in Bangladesh by providing medium- and long-term funds through PFIs and strengthening the capacity of PFIs, thereby contributing to the sound development of the country's industry and economy as well as to employment generation.

This project has been highly relevant to the country's development plan and development needs, as well as Japan's ODA policy. Therefore, its relevance is high.

In the aspect of project implementation, the amount of investments by SMEs, which was

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<sup>14</sup> The maximum loan amount for the retrofitting and reconstruction of garment factories, applied from October 2013, was 100 million taka.

one of the project outputs, exceeded the plan because the share of contributions by SME borrowers exceeded the plan at the time of appraisal. Similarly, the project cost exceeded the plan, but this was commensurate with the project output, which also exceeded the plan. On the other hand, because some official procedures, such as effectuation of the ODA loan agreement and selection of PFIs, took time, the project period exceeded the plan. Therefore, efficiency of the project is fair.

As for the quantitative effects, the targets of all indicators were achieved as the sales turnover and profits of SME borrowers increased as well as the total loan outstanding to SMEs and its proportions to the total loan outstanding of PFIs increased. Generation of qualitative effects were also confirmed as the capabilities of financial institutions in SME lending and access to funds for SMEs improved. In addition, sub-loans financed by the TSL funds of this project were considered to have supported economic growth and job creation, and thus effectiveness and impacts of the project are high.

As for the operation and maintenance of this project, there were no problems in the institutional or organizational aspect, because sufficient personnel were assigned in the department in charge in BB and PFI accreditations were renewed every year. No problems were identified in the technical and financial aspects either. It can be said that the status of operation and maintenance did not have any problems because sub-loans were made to SMEs from the revolving fund even after project completion, and the revolving fund was not damaged. In summary, no major problems have been observed in the institutional and organizational aspect, technical aspect, or financial aspect, or even the current status of the operation and maintenance; thus, sustainability of the project effects is high.

In light of the above, this project is evaluated to be highly satisfactory.

## 4.2 Recommendations

### 4.2.1 Recommendations to the Executing Agency

None

### 4.2.2 Recommendations to JICA

None

## 4.3 Lessons Learned

### Calculation of End Users' Contribution in the Project Cost

In this project, up to 75% of the investment cost by an SME was supposed to be covered by TSL funds, while at least 15% and 10% were to be borne by a PFI and an end user, respectively, and the cost of this project was calculated based on this assumption at the time of appraisal. On the other hand, as PFIs required end users to bear more than 20% of

investment costs when they actually made sub-loans, the project cost exceeded the plan.

However, because financial institutions in Bangladesh normally require end users to bear about 20 - 30% of the investment costs, the project cost should have been calculated on the assumption that end users to bear about 20 - 30% of the investment costs at the time of appraisal, so that the planned project cost can be properly compared with the actual project cost.

#### Revision of the Terms and Condition of Sub-Loans to End Users

This project provided financing to end users for a long period of time during the project period, and even after that by utilizing the revolving fund. However, if the price level rises and the maximum sub-loan amount of a TSL project is fixed, the sub-loan amount might not fulfill the funding needs of end users.

If the terms and condition of sub-loans, including the amount of a sub-loan for an end user, are defined, for example, by operating guidelines, it is desirable to define how often and under which conditions they are revised. It is also recommended that consulting services of TSL projects include a review of the existing guidelines and drafting of revised guidelines.

In addition, if the revolving fund provides sub-loans to end user even after the project completion, it is also desirable to maintain the organizational structure which can continue updating the terms and conditions of sub-loans.

#### Independent Loan Interest Rate Setting by PFIs

Financial institutions tend to avoid making small-amount loans because they cannot secure sufficient profits. However, as PFIs were able to set sub-loan interest rates independently and secure sufficient interest margins in this project, PFIs made a number of sub-loans to small enterprises.

If TSL projects to be implemented in the future aim to distribute funds to small enterprises through PFIs, it is desirable that PFIs be able to determine sub-loan interest rates independently as well.

#### Revisions of Terms and Conditions of Sub-Loans in Response to Urgent Issues

Due to the collapse of the tenant building with garment factories that occurred during the implementation of this project, enhancement of building safety was urgently required. In response, the scope of this project was revised six months after the accident so that long-term and low-interest financing can be provided for the retrofitting and reconstruction of garment factories based on the agreement between stakeholders in Bangladesh and JICA. If an urgent and serious problem that was not envisioned at the time of planning arises during the implementation of other TSL projects in the future, it is desirable to take prompt action

by changing the terms and conditions of sub-loans without deviating from their project objectives.

(end)

Comparison of the Original and Actual Scope of the Project

Item	Plan	Actual
1. Project Outputs	<p>1) Loans for the development of SMEs: the provision of medium- and long-term financing to SMEs through PFIs</p> <ul style="list-style-type: none"> <li>- Eligible business sectors: Not specified</li> <li>- Eligible end users: SMEs defined by Industrial Policy (2010)</li> <li>- Eligible investments for financing: Fixed assets and initial working capital, which is associated with the investment loan</li> <li>- Amount: 500,000 - 50 million taka per sub-loan (1 taka = 1.31 yen)</li> <li>- Term: 2 - 8 years (including a grace period of 1 or 2 years)</li> <li>- Interest rate: Not specified (interest rates were independently set by PFIs considering the credit and other risks)</li> </ul> <p>2) Consulting services:</p> <ul style="list-style-type: none"> <li>- Support on project management</li> <li>- Support on capacity development</li> <li>- Public awareness activities and promotion</li> <li>- Introduction of good</li> </ul>	<p>1) Loans for the development of SMEs: the provision of medium- and long-term financing to SMEs through PFIs</p> <p>Almost as planned</p> <ul style="list-style-type: none"> <li>- Amount of a sub-loan was changed to 200,000 - 50 million taka per sub-loan</li> <li>- The terms and conditions for the retrofitting and reconstruction of garment factories, applied from October 2013, are as follows: <ul style="list-style-type: none"> <li>➤ Maximum loan amount: 100 million taka</li> <li>➤ Loan term: Maximum 15 years (including a grace period of up to 2 years)</li> <li>➤ Interest rate: On-lending rate to PFIs + maximum 5%</li> </ul> </li> <li>- The maximum interest rate for women entrepreneurs, applied from March 2016, is on-lending rate to PFIs + 5%</li> </ul> <p>2) Consulting services: As planned</p>

	practices in the SME finance system in other countries and suggestions on the improvement of financial access - Support on monitoring and evaluation of the project - Coordination and collaboration with other donor agencies and related institutions	
2. Project Period	May 2011 - March 2016 (59 months)	May 2011 - May 2016 (61 months)
3. Project Cost		
Amount Paid in Foreign Currency	4,943 million yen 2,152 million yen	4,927 million yen 3,216 million yen
Amount Paid in Local Currency	(2,647 million taka) 7,097 million yen 5,000 million yen	(4,213 million taka) 8,142 million yen 4,990 million yen
Total	1 taka = 1.23 yen,	1 taka = 1.31 yen,
ODA Loan Portion	1 USD = 85.5 yen	1USD = 102.63 yen
Exchange Rate	(As of November 2010)	(Average between 2012 - 2016)
4. Final Disbursement	March 2016	

(end)

People's Republic of Bangladesh

FY2020 Ex-Post Evaluation of Japanese ODA Loan

“Rural Electrification Upgradation Project”

External Evaluator: Hisae Takahashi, Ernst & Young ShinNihon LLC

## **0. Summary**

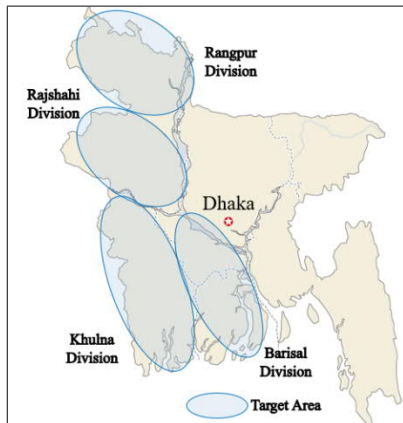
The project was implemented with aims to reduce power distribution loss and strengthen and stabilize the power supply systems, which make power supply efficient by constructing and rehabilitating the existing power distribution facilities, thereby contributing to the economic development and poverty reduction in the western and the southern part of Bangladesh and the greenhouse gas elimination.

The purpose of the project is in line with Bangladesh's development plan at the time of appraisal and ex-post evaluation, which has emphasized infrastructure development in the power sector, development needs to improve the demand-supply gap and distribution loss ratio and Japan's ODA policy, which has positioned the power sector as a priority area for assistance. Thus, its relevance is high. In implementing the project, although the project cost was within the plan, the project period exceeded the plan due to delays in consultant selection and bidding, as well as changes in the substation specifications and capacity. Therefore, efficiency of the project is fair. Implementing the project boosted the maximum output and power sales volume, reduced the extent of power outages and improved the distribution loss ratio, with targets mostly attained in all these areas. Moreover, thanks to various training, a change in the level of awareness of customers towards the need to use electricity efficiently and improvement of customer service by the Rural Electrification Society (Pali Bidyut Samity: PBS) was also apparent. The project also had an impact in terms of revitalizing the local economy and boosting the living environment and living standards of local residents, hence its effectiveness and impacts are high. In operation and maintenance terms, despite no problems in the technical aspect and the status of operation and maintenance, minor issues remain in the institutional/organizational and financial aspects. Therefore, sustainability of the project effects is fair.

In light of the above, this project is evaluated to be satisfactory.



## 1. Project Description



Project Locations



33/11kV Substation  
(Barisal Division, Patuakhali PBS, Golachipa Substation)

### 1.1 Background

At the time of the appraisal, power shortages were one of the biggest bottlenecks to economic growth in Bangladesh. In response to the increased electricity demand that accompanied the economic growth at the time, the installed supply capacity was only about 70% of peak demand, resulting in forced power outages. In the power distribution sector, the power distribution facilities were being expanded and streamlined, in accordance with the sector reform plan formulated by the Ministry of Electricity in Bangladesh, but the power distribution loss ratio (15.6%) remained high nationwide due to aging facilities, losses due to extending low-voltage lines over long distances, poor meter reading and so on. In rural areas, the demand for electricity to operate irrigation facilities is high, particularly during the dry season and responding to it was considered a priority from a food security perspective. For the electricity supply to rural areas, the government established the Rural Electrification Board (REB) in 1977 and has been developing an electrification program. The REB has established PBSs, comprising local residents who receive electricity in each region and has commissioned PBSs the operation of the power distribution services to expand the electricity supply. While closing the gap in electrification rates between rural and urban areas (31 and 83% respectively) remained key, limited upstream power generation capacity meant streamlining and stabilizing the power supply by rehabilitating and upgrading existing distribution network facilities and boosting agricultural productivity were also priorities. In the rural areas west of the Jamuna River in particular, the power supply from system facilities was unable to meet demand for electricity due to the lack of power distribution networks. In response, this project was implemented as part of efforts to meet the soaring demand for power for irrigation facilities, particularly during the dry season, and help reduce high levels of poverty in the west of the country, by constructing and rehabilitating a power distribution network in the area.

## 1.2 Project Outline

The objective of this project is to reduce power distribution loss and strengthen and stabilize the power supply systems, which make power supply efficient by constructing and rehabilitating the existing power distribution facilities, thereby contributing to the economic development and poverty reduction in the western and the southern part of Bangladesh and the greenhouse gas elimination.

Loan Approved Amount/ Disbursed Amount	13,241million yen/13,144million yen						
Exchange of Notes Date / Loan Agreement Signing Date	March 2010/March 2010						
Terms and Conditions	<table> <tr> <td>Interest Rate</td> <td>0.01%</td> </tr> <tr> <td>Repayment Period (Grace Period</td> <td>40 years 10 years)</td> </tr> <tr> <td>Conditions for Procurement</td> <td>General Untied</td> </tr> </table>	Interest Rate	0.01%	Repayment Period (Grace Period	40 years 10 years)	Conditions for Procurement	General Untied
Interest Rate	0.01%						
Repayment Period (Grace Period	40 years 10 years)						
Conditions for Procurement	General Untied						
Borrower / Executing Agency	Government of the People's Republic of Bangladesh / Rural Electrification Board						
Project Completion	June 2016						
Target Area	Rajshahi Division <sup>1</sup> , Khulna Division, Barisal Division						
Main Contractor (Over 1 billion yen)	—						
Main Consultants (Over 100 million yen)	SMEC International Pty Ltd. (Australia)/ACE Consultants Ltd. (Bangladesh) /Niaz & Associates Ltd. (Bangladesh) (JV)						
Related Studies (Feasibility Studies, etc.)	The Preparatory Survey Report for the Project for Rural Electrification Upgradation Project (2009)						
Related Projects	<p>[ODA Loan Project]</p> <ul style="list-style-type: none"> <li>• Area Coverage Rural Electrification Project (Phase IV-C) (1995)</li> <li>• Rural Electrification Project (5-B) (2001)</li> <li>• Power Distribution and Efficiency Enhancement Project (1999)</li> </ul> <p>[International Organization, Other Development Partners]</p> <ul style="list-style-type: none"> <li>• Asian Development Bank (ADB) : <ul style="list-style-type: none"> <li>- Power Sector Development Program (2003)</li> <li>- Power System Efficiency Improvement Project (2011)</li> </ul> </li> <li>• World Bank (WB) : <ul style="list-style-type: none"> <li>- Power Sector Development Technical Assistances Project (2004)</li> <li>- Bangladesh Power Sector Development Policy Credit (2008)</li> </ul> </li> </ul>						

<sup>1</sup> Since the Rajshahi district was divided into two districts, Rajshahi and Rangpur, in 2010, the area covered at the time of ex-post evaluation comprised the four districts of Rajshahi, Rangpur, Khulna and Barisal.

## 2. Outline of the Evaluation Study

### 2.1 External Evaluator

Hisae Takahashi, Ernst & Young ShinNihon LLC

### 2.2 Duration of Evaluation Study

This ex-post evaluation study was conducted with the following schedule.

Duration of the Study: November 2020 – January 2022

Duration of the Field Study: March and July 2021 (Conducted by the local assistant)

### 2.3 Constraints during the Evaluation Study

In this ex-post evaluation, the site survey could not be implemented by the evaluator due to the spread of COVID-19. For this reason, the site survey was implemented by local assistant under the direction of the evaluator, and the evaluator conducted a desktop evaluation based on the results of the information collected, beneficiary survey, and site inspections carried out by the local assistant.

## 3. Results of the Evaluation (Overall Rating: B<sup>2</sup>)

### 3.1 Relevance (Rating: ③<sup>3</sup>)

#### 3.1.1 Consistency with the Development Plan of Bangladesh

Bangladesh's development plan at the time of the appraisal, the *Moving Ahead: National Strategy for Accelerated Poverty Reduction II (PRSP)* (2008), noted the need for power sector reform and identified the sector as a key infrastructure for economic growth that would help reduce poverty. Moreover, to eliminate the gap in electrification rates between rural and urban areas, rehabilitating and reinforcing existing distribution network facilities was identified as a priority. The long-term vision of the power and energy sector at that time, *Policy Guideline for Electricity and Energy Sector Reform* (2000), also set out three points as the long-term vision of the electricity sector: (a) ensuring a power supply capacity for all people by 2020, (b) a highly reliable electricity supply and (c) an electricity supply whose tariff deemed appropriate<sup>4</sup>.

At the time of the ex-post evaluation, the country's development plan, the *Eighth Five-Year Plan* (FY2020-2025), has positioned the power and energy sector as one that underpins the country's economic growth and has identified boosting energy efficiency by further reducing transmission and distribution losses, as well as expanding power generation to meet demand, as a key strategy for the sector. Moreover, the *Revised Electricity and Energy Master Plan* (2016), a plan to develop the electricity and energy sectors, sets out a vision of how domestic resources

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<sup>2</sup> A: Highly satisfactory, B: Satisfactory, C: Partially satisfactory, D: Unsatisfactory

<sup>3</sup> ③: High, ②: Fair, ①: Low

<sup>4</sup> Source: *Eighth Five Year Plan* FY 2020 - FY 2025

can be used efficiently, large-scale power sources developed and high-quality and highly stable electricity provided to meet increasing demand for electricity in line with economic growth<sup>5</sup>. Moreover, under the Prime Minister’s initiative, a goal of extending access to electricity to all households has been set in Bangladesh, which REB is promoting<sup>6</sup> in all sub districts<sup>7</sup>.

As mentioned above, the national development plans of Bangladesh at the time of the appraisal and ex-post evaluation positioned the power and energy sector as a key field that boosts the country’s economic growth. It also indicates its focus on improving power distribution efficiency and rural electrification rates, underlining a consistency with the project’s objective, namely to ensure an efficient power supply by improving power distribution facilities in rural areas.

### 3.1.2 Consistency with the Development Needs of Bangladesh

At the time of the appraisal, the electricity supply in Bangladesh could not keep up with the increase in demand due to economic growth and the gap between supply and demand was widening, with electricity demand peaking at approximately 6,066 MW and installed capacity of approximately 4,037 MW in fiscal year of 2009. Moreover, although power transmission and distribution loss ratios were reduced by expanding and further streamlining facilities that had been promoted based on power sector reform, the need to improve the high power distribution loss ratio due to aging facilities, power distribution at low voltage, inspection flaws and theft of electricity remained issues to resolve.

Table 1 Transmission / Distribution Loss Rate (%) in Bangladesh as of the Appraisal

	2004	2005	2006	2007	2008
Transmission loss	3.5	3.6	4.5	4.1	3.5
Distribution loss	20.0	17.8	16.5	17.1	15.6

Source: World Bank “Project appraisal document for Siddhirganj Peaking Power Project” (October 2008), BPDB, Power Cell

Moreover, as well as the electrification rate in rural areas (31%) being lower than that in urban areas (83%) (2005), the electricity supply to urban areas such as Dhaka tended to be prioritized over that to rural areas, which ultimately highlighted the reduction in the electricity supply to rural areas as an issue. In the rural areas to the west of the Jamuna River, target of this project, supplying electricity to rural areas during the dry season has been prioritized, when the demand for electricity to operate irrigation facilities soars. However, the overload and high loss rate of power distribution had become hindrances to reducing the gap between supply and demand, as the aging and inefficient power distribution facilities were frequently overloaded, and the power supply had to be cut off.

<sup>5</sup> Source: *Power System Master Plan 2016 Final Report*

<sup>6</sup> Source: *REB Annual Report 2019-2020*

<sup>7</sup> In Bangladesh, it is known as Upazilla: an administrative unit under a district.

At the time of the ex-post evaluation, the gap between supply and demand had improved significantly (power demand at peak time is about 13,300 MW and the installed supply capacity is about 20,383 MW) and the transmission and distribution losses (transmission loss ratio : 2.9%, distribution loss ratio : 8.7%, in 2019)<sup>8</sup> have also improved compared to the time of the appraisal. The power distribution loss ratio in the area covered by the REB (mainly rural areas) has also been reduced from 14.8% (2009) at the time of appraisal to 9.9% (2019) at the time of ex-post evaluation<sup>9</sup>. The country has also been promoting electrification in rural areas to allow all citizens access to power, which has seen the rate of electrification in such areas soar (85.1%) (2018)<sup>10</sup>. However, as the country's economy continues to grow, peak demand is expected to increase in future and there is a need to secure a supply capable of meeting ever-increasing demand and providing a stable electricity supply. Accordingly, in addition to sufficient power capacity, it can be said that the need to develop power distribution network facilities capable of providing a stable power supply remains high.

### 3.1.3 Consistency with Japan's ODA Policy

At the time of the appraisal, the *Country Assistance Program for Bangladesh* (2006) highlighted inadequate capital investment, inefficient management, inappropriate electricity tariff levels and others as issues in the power sector and focused on “support for policy, management, operational and financial improvements in the sector as a whole,” “expansion of generation capacity to reduce the gap between supply and demand” and “support for reform efforts in the transmission and distribution sectors.” Moreover, in the *Country Assistance Strategy for Bangladesh* (2006), one of the priority targets for support to Bangladesh was economic growth and the power sector was identified as a priority area for developing economic infrastructure. This project aims to further streamline the electricity supply in rural areas of Bangladesh by developing a power distribution network, which is consistent with Japan's ODA policy.

### 3.1.4 Appropriateness of the Project Plan and Approach

Although some changes were made to the project output (the total extension of the power distribution network was reduced to 93% of the plan), the changes were within a scope that did not unduly affect the expected result. Therefore, it can be concluded that there are no particular problems in the planning, design, logic, and approach of the project.

In light of the above, this project has been highly relevant to the Bangladesh's development plan

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<sup>8</sup> Source: Questionnaire answers from the executing agency

<sup>9</sup> Source: REB *Annual Report* 2009, 2019

<sup>10</sup> Source: Bangladesh Bureau of Statistics, *Statistical Yearbook* 2020

and development needs, as well as Japan's ODA policy. Therefore, its relevance is high.

### 3.2 Efficiency (Rating: ②)

#### 3.2.1 Project Outputs

The planned major outputs of the project consisted of the upgradation and construction of medium- and low-voltage lines, construction and augmentation of substations and provision of consulting services. The major planned and actual outputs are shown in Table 2.

Table 2 Planned and Actual Output

	Plan	Actual
1. Upgradation and construction of medium- and low-voltage lines <sup>Note 1</sup>		
33kV line upgradation	1,184 km	882 km
11kV line upgradation	1,579 km	1,975 km
33kV line construction	885 km	852 km
11kV line construction	1,536 km	1,135 km
Total extension	<b>5,184 km</b>	<b>4,844 km</b>
2. Construction and augmentation of substations <sup>Note 2</sup>		
New construction	50 unit	As planned
Augmentation	30 unit	As planned
3. Foreign and local trainings		
Foreign trainings	46 persons	48 persons
Local trainings	183 persons	As planned
4. Consulting service		
DSM <sup>Note 3</sup> consultant	210 man-months Detailed design, follow up for tendering, construction supervision, formulation of operation and maintenance plan for distribution facilities, training implementation, baseline survey/monitoring/evaluation for socio-economic impact, training implementation for awareness of residents, etc.	477 man-months Scope of the support was as planned.
SDCS <sup>Note 4</sup> consultant	510 man-months Data collection/draft preparation of detailed design, area mapping, fields investigation, construction supervision, etc.	688 man-months Scope of the support was as planned.

Source: Documents provided by JICA and the questionnaire answers from the executing agency

Note 1 : Development of medium- and low-voltage lines includes installation and replacement of Automatic Voltage Regulator (AVR), circuit breaker for wiring, etc.

Note 2 : Development of substations include the installation of capacitors, Automatic Circuit Recloser (ACR), disconnecting switch, lightning arrester, etc.

Note 3 : Abbreviation of Design, Supervision and Management

Note 4 : Abbreviation of Survey, Design and Construction Supervision

As shown in Table 2, although local and overseas training proceeded mostly as planned, there were increases and decreases mainly in the total length of medium- and low-voltage lines and its upgrading and construction, and the number of man-months of consulting services assigned. The details of each change and reasons are as follows:

#### Total length of medium- and low-voltage lines upgraded and constructed

The preparatory survey for this project was conducted in 2009, followed by the construction work in earnest in 2013. Meanwhile, the lines which needed upgrading so urgently were constructed by leveraging other funding. At the same time, construction of sections that were outside the scope of this project but had a high degree of urgency at the time of start of construction was added. As a result of these adjustments, the total length of the upgradation and construction of medium- and low-voltage lines was shortened from the plan. This is because some of the urgent sections were constructed or upgraded with other funds after appraising this project and before commencing construction, meaning certain areas were excluded. The new section was also upgraded within the budget to meet local needs, which can be seen as a flexible response based on the urgency of the development of the power distribution network.

#### Substation: Examine scope to introduce indoor models and boost capacity

In Bangladesh, although outdoor-type substations were normally used, the installation of and replacement by indoor-type substations was considered in this project with the approval of the Technical Specification Committee (TSC) when the Development Project Proposal (DPP) was formulated, with securing the security in mind. In fact, due to cost and space issues, the proposal to install indoor-type substations proved infeasible and only some substations were installed with semi-indoor-type substations. Furthermore, the economic growth and changes in people's lives have led to the increased electricity demand since 2009 when the preparatory survey was conducted, and the substation capacity was increased. Though this change delayed the progress of the project, the increase in capacity to meet demand was considered an appropriate change, in line with local conditions.

#### Increase in staffing for consulting services

- Increase in man-months of DSM consultants assigned

The actual number of man-months of deployed consultants more than doubled the planned number. One of the reasons for this increase is the fact that the work scope of the DSM consultant has been expanded to examine the installation of indoor-type substations instead of the outdoor type used in Bangladesh. Moreover, the contract for the DSM consultant was originally planned to last until June 2015, but along with the project postponement, the contract period was also extended until June 2016, which also affected the increase in man-months. In addition, the consultant had to coordinate, monitor and supervise the quality and proper

placement of equipment and materials at all sites (80 substations), which affected to increase their man-months<sup>11</sup>.

- Increase in man-months of SDCS consultants assigned

Initially, the project planned to assign a consultant to each of the 11 management zones. However, it is geographically burdensome for one consultant to manage multiple PBSs. Thus, consultants were assigned to each of the 33 PBSs rather than to each management zones to provide more precise follow up in each area. Consequently, although the number of consultant man-months increased, it facilitated more effective and smoother implementation of the project by assigning a consultant who was familiar with each PBS<sup>12</sup>. The change was made to support each region more effectively and was deemed appropriate, since effective support was actually provided.



Photo Newly Constructed Medium- and Low-Voltage Lines (33 kV Line)  
(Rangpur Division, Dinajpur PBS-2)

### 3.2.2 Project Inputs

#### 3.2.2.1 Project Cost

The total project cost was 17,184 million yen (of which the yen loan portion was 13,144 million yen), lower than the originally planned cost of 18,436 million yen (of which the yen loan portion was 13,241 million yen) (93% of the original plan).

Table 3 Planned and Actual Project Cost <sup>Note 1</sup>

(Unit: million yen)

	Plan			Actual		
	Total	Japanese portion	Bangladesh portion	Total	Japanese portion	Bangladesh portion
Material & construction	12,789	10,375	2,054	14,180	12,702	1,478
Vehicles for maintenance	60	60	0	57	57	0
Trainings	82	82	0	63	63	0
Consulting service	641	641	0	430	430	0
Price escalation	1,288	1,122	166	0	0	0
Contingency	711	600	111	0	0	0
Interest during construction	3	0	3	0		0
Land acquisition and compensation	71	0	71	46	0	46

<sup>11</sup> Source: Questionnaire answers from the executing agency and interview survey

<sup>12</sup> Source: Questionnaire answers from the executing agency



Administration cost	782	0	782	328	0	328
Tax	2,009	0	2,009	2,021	0	2,021
Total	18,436	13,240	5,196	17,125 Note1	13,253 Note1	3,873 Note1

Source: Document provided by JICA, questionnaire answers from the executing agency

Note 1: There is a difference between the data provided by the executing agency and that provided by JICA, but this is considered attributable to errors arising when converting the exchange rate and commission fees and so on. While the amounts shown in the table are the actual amounts provided by the executing agency, the data provided by JICA shows that the actual amounts for Japan and Bangladesh are 13,144 million yen and 4,040 million yen respectively, for a total project cost of 17,184 million yen.

Note 2: Exchange rate Plan: 1 taka = 1.33 yen, Actual: 1 taka = 1.29 yen (Average rate by International Financial Statistics of IMF during the project implementing period)

The main reason why the project cost was within the plan was due to exchange rate fluctuations and bid prices for training and consulting services that were lower than estimated. With regard to construction costs, the fact that some medium- and low-voltage line improvements were excluded from the project scope and no price escalation or contingency costs were incurred, also helped keep the project cost within the plan. As described in “3.2.1 Project Output,” while the number of DSM and SDCS consulting man-months doubled, the cost of consulting services was lower than planned. This was due to a lower bidding price than expected, as well as a significant increase in man-months for local consultants, the unit cost for whom was lower than that of the originally contracted consultants, because of the increased number of areas where consultants were assigned.

### 3.2.2.2 Project Period

The project period<sup>13</sup> was planned to be 58 months, from March 2010 to December 2014, as opposed to an actual 76 months, from March 2010 to June 2016, which was longer than planned (131% of the plan).

Table 4 Planned and Actual Project Period by Item

	Plan	Actual
L/A	March 2010	March 2010
Selection of consultant	January 2010 - September 2010	April 2010 - June 2011
Detail design	October 2010 - March 2011	August 2011 - March 2012
Tender and contract	October 2010 - December 2011	September 2011 - November 2012
Manufacture and construction	June 2011 - December 2014	September 2011 - June 2016
Consulting services	September 2010 - December 2014	July 2011 - June 2016
Project completion	December 2014	June 2016
Project period	58 months	76 months

Source: Document provided by JICA, questionnaire answers from the executing agency

<sup>13</sup> The project period is defined as the period from the month in which the L/A is signed to the month in which the facilities were provided.

The main reasons for the delays were delays in selecting consultants, delays in bidding for procurement and delays related to examining substation design changes. The details of each factor are as follows:

#### Delays in selecting DSM consultants

From the expression of interest stage to the contracting stage in selecting DSM consultants, all relevant documents, including the expression of interest, request for proposals, documents related to technical and financial evaluations, meeting minutes, including the recommendation of purchase proposals of the REB board, draft contracts, contracts, etc., had to be submitted to the JICA field office for approval and then to the headquarters for approval<sup>14</sup>. The approval process required considerable time than expected, which exceeded the planned period<sup>15</sup>.

#### Delays in bidding for procurement

- The selection of the DSM consultant was delayed because the bidding documents could not be agreed before the DSM consultant was assigned in JICA, hence REB had to wait a long time for the DSM consultant to be assigned.
- The upgrading and constructing the medium and low voltage lines were procured and constructed in seven packages, but no contractors in Bangladesh could handle the work for several of the packages, whereupon they had to be split up and re-bid for. Meanwhile, it took four months to obtain concurrence of JICA, which exceeded the expected period.

#### Delays related to examining the substation design and having to increase capacity

When installing the substation, scope to adopt indoor-type substations instead of the outdoor type usually used nationwide was examined as well as scope to increase capacity. When these changes were made, design was revised and civil works as well as electrical work were increased, which led to project delays.

### 3.2.3 Results of Calculations for Internal Rates of Return (Reference Only)

As for the internal rate of return calculated at the time of the appraisal, the details could not be confirmed from the calculation sheet and the basis for the calculation was unclear. Therefore, at the time of ex-post evaluation, it was recalculated on the basis described in the PCR<sup>16</sup>. Each internal rate of return and the relevant conditions are shown in Table 5 below.

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<sup>14</sup> Regarding the process of consent and application for hiring consultants explained by the executing agency, JICA pointed out that this was considered to be a factual error, as there is no institutional requirement to obtain further approval from JICA headquarters after consent from the local office.

<sup>15</sup> Source: Questionnaire answers from the executing agency and interviews with the executing agency

<sup>16</sup> The estimated rate shown in PCR are based on the revised outputs.

Table 5 IRR and Condition

	Financial Internal Rate of Return (FIRR)	Economic Internal Rate of Return (EIRR)
IRR	At the time of modification <sup>Note 1</sup> : 17.54% At the time of the ex-post evaluation: 38.1%	At the time of modification:23.0% At the time of the ex-post evaluation: 36.7%
Cost	Project cost, operation and maintenance cost	Project cost (excluding taxes), operation and maintenance cost
Benefit	Revenue from sale of energy	Revenue from sale of energy based on the expected power price
Project life	30 years	

Source: Prepared by the evaluator based on the documents provided by JICA and the executing agency, and PCR.  
Note 1: IRR estimate based on the plan described in PCR. Based on the plan after the output change.

#### (1) Financial Internal Rate of Return (FIRR)

The recalculated rate of FIRR at the time of ex-post evaluation was 38.1%, which was higher than estimated by the PCR<sup>17</sup>. This is because electricity sales increased significantly in all target areas, as described in “3.3.1 Effectiveness” below.

#### (2) Economic Internal Rate of Return (EIRR)

As for the EIRR, the concept of the cost is basically the same as the FIRR, except that taxes are excluded from the project cost and the recalculated rate at the time of ex-post evaluation is 36.7%, which exceeds the PCR estimate. This is due to a significant increase in electricity sales as well as FIRR, which confirms the high cost-effectiveness of this project.

In light of the above, although the project cost was within the plan, the project period exceeded the plan. Therefore, efficiency of the project is fair.

### 3.3 Effectiveness and Impacts<sup>18</sup> (Rating: ③)

#### 3.3.1 Effectiveness

##### 3.3.1.1 Quantitative Effects (Operation and Effect Indicators)

Table 6 summarizes the actual data since the year of project completion for each of the operation and effect indicators established at the time of the appraisal of the project. The target for the operation and effect indicators set at the time of the appraisal were expected to be achieved two years after the completion of the project. Since this project was completed in 2016, the achievement of the target is analysed based on the actual data in 2018.

<sup>17</sup> The electricity rate used in the recalculation is the average unit price of all PBSs. However, since the target area includes a large number of households as customers, the unit price of electricity charges is actually lower than the average, and the IRR is also expected to be lower than the IRR obtained in the recalculation.

<sup>18</sup> Sub-rating for Effectiveness is to be put with consideration of Impacts.

Table 6 Operation and Effect Indicators of the Project

Divisions Indicators	Baseline	Target	Actual				
	2008		2016	2017	<b>2018</b>	2019	2020
		2 years after completion	Completion year	1 year	<b>2 years</b>	3 years	4 years
after completion							
<b>Barisal (6PBS)</b>							
Maximum output capacity (MW)	96.0	162.9	182	222	<b>244</b>	276	323
SAIDI per household (minutes) <sup>Note1</sup>	8.25	3.02	N.A.	N.A.	N.A.	N.A.	N.A.
(Alternative indicator) SAIDI	N.A.	N.A.	13,620	10,344	<b>8,111</b>	3,944	4,136
Distribution system loss (%) <sup>Note2</sup>	19.0	13.0	16.2	13.8	<b>14.7</b>	14.9	12.1
Electricity sales (MWh)	27,619	50,774	605,459	727,161	<b>830,384</b>	1,000,901	1,153,837
<b>Khuluna (9PBS)</b>							
Maximum output capacity (MW)	273.9	484.7	366	456	<b>513</b>	537	595
SAIDI per household (minutes) <sup>Note1</sup>	8.25	3.02	N.A.	N.A.	N.A.	N.A.	N.A.
(Alternative indicator) SAIDI	N.A.	N.A.	7,864	6,858	<b>10,935</b>	5,842	5,163
Distribution system loss (%)	15.7	11.9	12.5	12.3	<b>11.7</b>	12.9	11.2
Electricity sales (MWh)	71,470	131,394	1,943,163	2,231,399	<b>2,542,672</b>	2,984,401	3,228,241
<b>Rajshahi (18PBS)</b>							
Maximum output capacity (MW)	892.2	1,025.2	1,122	1,331	<b>1,561</b>	1,708	1,827
SAIDI per household (minutes) <sup>Note1</sup>	24.2	13.3	N.A.	N.A.	N.A.	N.A.	N.A.
(Alternative indicator) SAIDI	N.A.	N.A.	15,595	15,252	<b>24,287</b>	13,074	11,469
Distribution system loss (%)	14.2	11.5	13.5	12.6	<b>12.6</b>	12.7	12.1
Electricity sales (MWh)	169,490	321,472	4,289,690	4,696,697	<b>5,203,039</b>	6,086,637	6,448,137

Source: Documents provided by JICA and the executing agency

Note 1: The System Average Interruption Duration Index (SAIDI) set at the time of appraisal was the SAIDI per customer at the target PBS. Since the SAIDI per customer were unavailable at the time of the ex-post evaluation, the total SAIDI hours were used as an alternative indicator.

Note 2: Although the target values have been set for each PBS, the average values for PBS in each division are shown for convenience.

The maximum outputs in 2018 (two years after project completion) exceeded the target in all three divisions. The distribution system losses for the same year were achieved in Khuluna division, 72% and 59% of the targets in Barisal and Rajshahi divisions respectively<sup>19</sup>. Subsequently, by 2020, the target was achieved in Barisal division and also reached 78% in Rajshahi division. Although it was slightly below 80% of the target, it can be said that supply

<sup>19</sup> The achieved value of the distribution system loss indicates the extent to which the actual reduction rate was achieved against the target value from the baseline. (Barisal: Target reduction rate  $(19 - 13) / 19 * 100 = 31.6\%$ , Actual reduction rate  $(19 - 14.7) / 19 * 100 = 22.6\%$ , Rajshahi: The target reduction rate  $(14.2 - 11.5) / 14.2 * 100 = 19\%$ , the actual reduction rate  $(14.2 - 12.6) / 14.2 * 100 = 11.3\%$ )

capacity was secured, and distribution losses were reduced as expected by installing and augmenting substations and developing 33/11 kV lines.

It was requested that the executing agency provide the actual data of the annual System Average Interruption Duration Index (SAIDI) per customer, which was set at the time of the appraisal, but this could not be obtained at the time of the ex-post evaluation. As available data, the annual data of SAIDIs at the target PBSs are used, but even for the same data, data before 2016 was unavailable in the executing agency. Since the month of completion of the construction work for this project was June 2016, it is thought that the effects of the project have already begun to appear in the same year. Accordingly, it is not possible to understand the effect strictly. In terms of SAIDI, however, data for 2016 and subsequent years helped confirm whether it had decreased by 2020. SAIDI in 2018, two years after project completion, decreased to 60% of 2016 and 30% in 2020 in Barisal division. In both Khulna and Rajshahi divisions, while it increased in 2018 due to the natural disaster, it subsequently declined, decreasing to 66% and 74% respectively in 2020. As described in “3.2.2.1 Intended Impact (2) Qualitative Effects” as below, beneficiaries reported a decrease in power outage hours after the project implementation, so a certain effect on the decrease in power outage hours can be confirmed.

In terms of electricity sales, the Barisal and Rajshahi divisions had achieved 16 times the target as of 2018, while the Khulna division achieved 19 times the target. As for the increase in electricity sales, which was far higher than originally expected, the executing agency cited that the per capita income in 2020 (US\$ 1,998) was 2.8 times higher than the same figure in 2009 (US\$ 702)<sup>20</sup> and that the amount of electricity used had increased significantly due to the change in people’s lifestyles. Furthermore, implementing this project has increased customer numbers, extended the power line development, boosted substation capacity and reduced distribution system losses, all of which have significantly boosted the electricity sales<sup>21</sup>.

Furthermore, REB has also been implementing electrification projects in the target areas with the support of the Government and ADB with the aim of achieving 100% electrification rate<sup>22</sup>. Therefore, it is considered that the effects of the implementation of these projects have also affect the performance of the operation and effect indicators of this project, and the amount of electricity sales in particular is a factor in exceeding the target value.

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<sup>20</sup> Source: Documents provided by the executing agency

<sup>21</sup> Compared to the 30 years before implementing this project up to 2008 and in the 12 years thereafter from 2009 to 2020, customer numbers have increased eightfold, the number of power lines developed has increased by 3.5 times, the capacity of substations has increased by 5.5 times, the amount of electricity supplied has increased by 3.5 times and system losses have improved by 8%. (Source: Documents provided by REB)

<sup>22</sup> Rural Electrification expansion Program with support of the Government (2014 - 2019), Distribution Network Expansion for 100% Rural Electrification with support of the Government (2017 - 2021) and Upgradation Rehabilitation and Intensification of Distribution system with support of ADB (2016 - 2020)

### 3.3.1.2 Qualitative Effects (Other Effects)

At the time of the appraisal, the qualitative effects of this project were assumed to help develop the local economy, improve the living environment of residents and boost their living standards. Since these contents correspond to the impact of the project objectives, they are determined and analysed in the impact part rather than as qualitative effects of effectiveness.

In this project, local residents were given training sessions to raise awareness of their responsibilities and roles of residents/customers (PBS members), efficient use of electricity and energy conservation, while for REB/PBS staff, support was provided to strengthen their capacity in conducting these training sessions for local residents. Accordingly, interviews with local residents/customers were conducted around the PBS where the site visit was conducted to determine how their awareness of using electricity efficiently had changed, such as power saving and improvements in customer service by the PBS and the following changes could be confirmed<sup>23</sup>.

#### Changing understanding on efficient use of electricity

Through awareness activities such as meetings and distributing leaflets and posters for PBS members, a change on understanding of the efficient use of electricity was confirmed, with local residents and customers reporting changes in their daily lives that would contribute to energy conservation. In addition to the project's efforts, NGOs and local governments also conducted awareness-raising activities, so this cannot be considered the sole effect of this project. However, for example, some residents changed their behaviour such as using Compact Fluorescent Lamps (CFL)<sup>24</sup> instead of incandescent or fluorescent lamps, turning off unnecessary lights and fans and using energy-efficient home appliances. Moreover, efforts are being made to let in maximum daylight through windows and skylights. They are also promoting the use of electricity during off-peak hours when power pumps for irrigation and welding machines are not in operation.

#### Improving PBS's customer service

Thanks to the training, interviews with PBS staff received the following comments as feedback on the improvement of services: "applications for new connection procedures are handled within two to three days," "complaints (billing issues and inquiries about power outages) are answered within one to two hours," "maintenance manuals are followed up and maintenance work is

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<sup>23</sup> Site visits were conducted from March 14 to 22 and July 16 to 20, 2021 at Patuakhali PBS (Barishal division), Jessore PBS-1 (Khulna division), Joypurhat PBS (Rajshahi division) and Dinajpur PBS-2 (Rangpur division). In each division, interviews at PBSs and site visits at substations and other facilities were conducted, and interviews to a total of 36 customers were conducted. During the site visit in March, a lockdown was started to prevent the spread of COVID-19 in Bangladesh, thus it was temporarily suspended. When it resumed in July, it was difficult to conduct face-to-face interviews with customers, therefore, 21 staffs/customers of Joypurhat PBS, Rajshahi PBS and Dinajpur PBS - 2 were interviewed by telephone.

<sup>24</sup> Power consumption of CFL bulbs is about one-fifth that of conventional incandescent bulbs, thus the power saving effect is expected. In addition, they can be purchased at half the price of LED bulbs.

improved”. In interviews with residents, all respondents also indicated that customer service at PBS had improved compared to previous years. Moreover, according to the results of a survey conducted among approximately 21,000 customers of PBSs on completion of the project, 27% of the respondents were “very satisfied” and 48% were “satisfied” with the services. Although comparisons before and after implementing the project were not presented, these survey results are thought to indicate a high level of customer satisfaction on completion of the project.

### 3.3.2 Impacts

#### 3.3.2.1 Intended Impacts

##### (1) Quantitative impact: Increase in production of agricultural products

As mentioned above, the background to the implementation of this project was that it was assumed to help improve livelihoods in rural areas by addressing the soaring demand for electricity to operate irrigation facilities, particularly during the dry season. At the time of the ex-post evaluation, the yield of rice, a major crop in the target area, had increased significantly compared to before the project implementation and the rate of increase was high compared to the national rice yield, as shown in the table below. The stable electricity supply is thought to support the increase in rice production by providing the right amount of irrigation water at the right time by operating irrigation pumps during the dry season and increasing the amount of time spent on farming due to the lights.

Table 7 Rice Yield (Aus Season<sup>Note</sup>) in the Target Area (Estimated)

(Unit: million tons)

Division	① 2010 / 11	② 2017 / 18	③ 2018 / 19	Comparison before and after project implementation (③ / ①)
Barisal	268,736	443,921	474,172	1.76
Khuluna	46,626	407,612	409,957	8.79
Rajshahi	340,706	567,811	710,084	2.08
Bangladesh	1,739,278	2,709,643	2,775,478	1.60

Source: Bangladesh Bureau of Statistics, *Yearbook of Agricultural Statistics* 2012 and 2019

Note: It is planted in the pre-monsoon season (April - May) and harvested around July.

##### (2) Qualitative impact

[Revitalization of local economic activities]

After implementing this project, it was confirmed that the impacts contributing to the revitalization of local economic activities, such as promoting employment, expanding agricultural activities and boosting profits, by reducing the time of power outages and providing a stable electricity supply had been realized.

- Promotion of employment

By implementing this project, opportunities for both skilled and unskilled employment have

been expanded in 33 PBSs. For example, at Jessore PBS, 113 new jobs were created for operation and maintenance activities. They also reported an increase in employment, not only in PBS but also in the targeted areas by reducing the duration and frequency of power outages. For example, at the jute factory in Jessore, the number of staff has doubled with the increase in operating hours. The presence of home industries having expanded with the benefit of electricity has also helped create new jobs.

- Expansion of agricultural activities

As described in the Quantitative Effects section, access to stable electricity is available, then by using electric power pumps for irrigation and obtaining the necessary water after the implementation of the project, the cultivation pattern has been expanded, helping promote employment and boost crop production. It also paves the way to use lights at night, which increases working hours and helps increase production.

- Increased profits of shops and factories

With access to electricity, the opening hours of markets and stores and the operating hours of factories were extended by using lighting at night time after the implementation of the project. Most of the markets used to close at 20:00 in summer and 19:00 in winter, but the opening hours were extended to 23:00 after the project was implemented. Various factories have been able to work without downtime, due to reduced power outages and stabilized voltage, boosting both product quality and profits. For example, the interviewee reported an increase in operating hours due to fewer power outages<sup>25</sup> and an increase in profits of about 10% at the rice mill and about 13% at the jute mill.

[Improving the living environment and quality of life for local residents]

Through interviews with customers, the following impacts were reported: improved quality of life by using electrical appliances, evening and online learning made possible by using electricity, improved access to information and improved safety due to night lighting.

- Impact on daily life

The use of electricity, fans, refrigerators, washing machines, televisions, etc. has improved the quality of life and comfort of the local residents. Work formerly done manually has been mechanized and the comfort and productivity of household work has gradually been increased.

- Impact on education

An increased time spent studying in the evenings (about two hours on average) and taking online classes was also observed.

- Impact on security

The availability of lighting in the evenings has improved public safety. Women can now go

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<sup>25</sup> Before implementing the project, the rice and jute mills (Patuakhali and Jessore PBS) experienced power outages of two and four hours per day respectively, while in operation. However, there were no more power outages except for those planned for maintenance after the project was implemented. (Source: Interview survey)



out safely with peace of mind.

- Others

Access to wide-ranging information is now possible via TV and the Internet.



Electric Power Pump for Irrigation  
(Jessor PBS, Khuluna Division)



Rice Mill Factory  
(Patuakhali PBS, Khuluna Division)

### 3.3.2.2 Other Positive and Negative Impacts

#### (1) Impacts on the Natural Environment

In accordance with the *JBIC Guidelines for Confirmation of Environmental and Social Considerations* (April 2002), the project falls into Environmental Category B, with less significant undesirable effects on the environment. According to the documents at the time of the appraisal, the Environmental Impact Assessment (EIA) report was to be prepared primarily by the REB after the detailed design and approved by the Environment Department, Ministry of Environment and Forests before the civil works. Also planned were measures to deal with air quality, waste, soil contamination and noise, such as sprinkling water during work, recycling used electric wires, etc., soil sampling surveys when reusing land, development of residual soil and informing nearby residents during construction. However, EIA approval was not obtained in implementing this project. According to the executing agency, at the time of the appraisal of this project, to obtain EIA approval and to implement the above-mentioned measures were not mandatory under the national law and were not specified in the DPP. Therefore, it has not been implemented in this project. At the time of ex-post evaluation, it was mandatory for all projects implemented by REB to obtain EIA approval. However, it was confirmed by the REB and the PBSs visited that no negative environmental impact related to the implementation of this project has occurred either during construction or after completion. In addition, monitoring of air quality, waste, soil pollution and noise has been conducted at each substation at the time of the ex-post evaluation<sup>26</sup>.

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<sup>26</sup> Source: Interview with the executing agency

## (2) Resettlement and Land Acquisition

15.84 acres of land was acquired to construct new substations by implementing this project<sup>27</sup>. In the REB, the Deputy Commissioner (DC) office estimates the land cost and approval for site acquisition would be obtained after obtaining approval from the relevant government ministries and agencies. Subsequently, the DC office sends the estimate of the compensation amount to REB and REB pays compensation to DC office. According to that rule, land would be handed over to REB after the DC office finishes paying it to the landowner. The land acquisition for this project was also carried out in accordance with this rule. No resettlement occurred when implementing this project<sup>28</sup>.

## (3) Unintended Positive/Negative Impacts

### Gender considerations and promotion of employment opportunities for women

The target PBS was expected to maintain a certain percentage and status of women among the board members and promote female employment in the billing department. In fact, PBSs have women in billing and cashier positions, as well as appointing female managers<sup>29</sup>. Moreover, the stable electricity supply in rural areas helps increase in the hours that women spend engaged in income-generating activities (poultry farming, livestock rearing, handicraft, etc.) and promote women's employment by extending the operating hours of factories and stores. The reduction in household chores due to the use of home appliances has also increased employment opportunities such as harvesting crops. Moreover, 17 new contracts by female entrepreneurs were reported in the region after implementing the project<sup>30</sup>, which confirms how the project has helped create opportunities for women.

By implementing this project, it was confirmed that the maximum output had increased, and the distribution system loss ratio had decreased in the target areas and the target had been mostly reached. Although a rigorous analysis could not be conducted due to insufficient available data, the hours of SAIDI are on a downward trend and a certain level of effectiveness is deemed to have been generated, which means a stable electricity supply is now possible. Due to the increase in electricity consumption, the amount of electricity sold by the target PBSs after implementing the project also far exceeded the target. Changes in customer awareness of the efficient use of electricity through REB/PBS and customer training and improvements in customer service through PBS were also confirmed. Furthermore, thanks to the stable electricity supply, the impact in terms of improving the living environment and quality of life of residents, such as expanding agricultural activities, increasing profits of shops and factories, opening up employment,

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<sup>27</sup> Source: PCR

<sup>28</sup> Source: Questionnaire responses from the executing agency

<sup>29</sup> Source: Questionnaire responses from the executing agency and interview with PBS

<sup>30</sup> Source: Interview with Patuakhali PBS

revitalizing the local economy, utilizing home appliances and improving the learning and safety environment, were reported. In light of the above, this project has mostly achieved its objectives. Therefore, effectiveness and impacts of the project are high.

### 3.4 Sustainability (Rating: ②)

#### 3.4.1 Institutional/Organizational Aspect of Operation and Maintenance

Since the time of the appraisal, the system and roles whereby REB invests in facilities, provides technical guidance to PBSs and PBSs implement operation and maintenance activities have remained unchanged. The PBSs have a management committee elected by residents to serve as the decision-making body, while a general manager appointed by the REB oversees the operational practices. The composition of each PBS is generally the same (see Figure 1). As an example, the personnel setup and number of staff to be filled for the Patuakhali PBS, the target of this project, are shown (see Table 8).

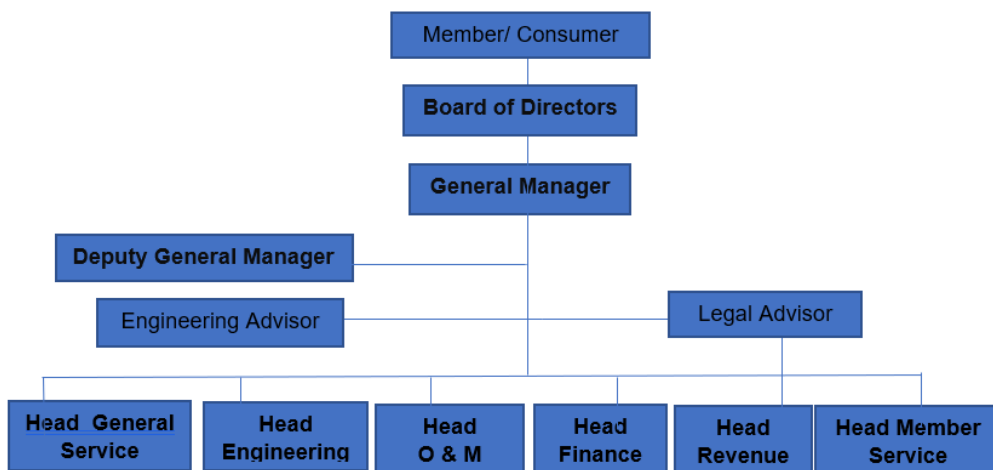


Figure 1 Organization Chart of PBS

Source: REB Website <http://www.reb.gov.bd/site/organogram/d6b216cd-6348-4525-8c3e-4cf3ebabb9f2/> (Confirmed on 3<sup>rd</sup> of September, 2021)

Table 8 PBS Personnel Setup and Staffing Number (Example)

Post	Setup post	Presently assigned post <sup>Note1</sup>	Vacant post
Assistant general manager (Operation & maintenance/engineering)	12	9	3
Junior engineer/assistant engineer	24	22	2
Meter testing supervisor	12	7	5
Meter tester			
Lineman / line Crew	243	177	66

Source: Documents provided by REB

Note1: Number of personnel as of June 2021

According to the questionnaires to the REB, the responses cited no problems with the staffing and operation and maintenance system of PBS since REB deploys additional manpower also

in crisis time as per the requirement of PBS. On the other hand, it was reported by interviewees at PBS that the configured number of staff were not deployed, and the number of technicians, particularly those with the right experience and skills, tended to be insufficient. Even in the overall situation of all PBS under the jurisdiction of REB, the number of personnel assigned was 35,961, while the number of people stipulated was 43,833 as of 2020<sup>31</sup>. According to PBS staff, the lack of staffing sometimes made it difficult to respond quickly, which proved challenging for operation and maintenance.

As mentioned above, the roles between REB and PBS regarding operation and maintenance were clear and there was a system in place to ensure appropriate coordination, with REB providing necessary support to PBS as required. Conversely, the PBSs, which are in charge of operation and maintenance activities, pointed out the shortage in the number of technically qualified staff, which is a concern from the institutional /organization perspective.

#### 3.4.2 Technical Aspect of Operation and Maintenance

Daily maintenance, such as inspection of distribution lines, is handled by the engineers of each PBS and all PBSs are capable of their own operation and maintenance. As for the operation and maintenance of newly installed facilities, trainings were conducted while implementing this project, including on-the-job training overseas and at substations. In particular, since the substations incorporated equipment and technologies that required new knowledge for REB and PBS staff, operation and maintenance training sessions were conducted for all installed substation staff, providing them with opportunities to learn about how to operate and maintain switchgear, power transformers, protection and control equipment, etc. Moreover, while installing facilities and equipment, manufacturers, contractors and consultants worked with REB and PBS staff at each substation, thereby fulfilling the function of on-the-job training. At the time of the ex-post evaluation, operation and maintenance activities are being continued without any problems by utilizing the technical skills learned through training sessions and OJT<sup>32</sup>.

Moreover, REB has conducted training sessions for PBS staff on operation and maintenance of the distribution system to maintain their competence in this area. In case of any disruption to facilities or equipment, REB assists PBSs in resolving these problems.

As mentioned above, there are no concerns about the technical capabilities of PBS, since PBSs does not have issues on their technical capacity and appropriate support can be also obtained from REB.

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<sup>31</sup> Source: REB, *Annual Report 2019/2020*

<sup>32</sup> Source: Questionnaire answer from the executing agency, interviews with PBS

### 3.4.3 Financial Aspect of Operation and Maintenance

#### (1) Financial Information of REB

The REB's profit and loss situation has been increasing for the past few years and has remained steady. The capital adequacy ratio in the balance sheet is also high at 75%. Although government capital has been invested in REB, the importance of rural electrification has been maintained as a government policy and will not affect the budget allocation in future.

Table 9 Financial Information of REB

(Unit: million taka)

	2016/17	2017/18	2018/19	2019/20
Total revenue	5,160	7,274	8,345	8,587
Interest loan to PBS	4,385	6,275	6,658	6,728
Other	775	998	1,687	1,859
Total operating expenses	1,375	1,572	1,786	1,941
Operating expenses	3,785	5,702	6,559	6,646
Interest expenses	832	817	1,015	1,023
Net margin	2,953	4,885	5,544	5,623

Source: Document provided by REB

#### (2) Financial information of PBS

According to the data provided by REB, all PBSs covered by the project have been in the red for the past three years. One of the reasons is considered to be the fact that the profit per kWh of the target PBSs is in the red (Table 10), which means it is not sufficiently profitable. According to the REB, the standard involves earning 45,000 taka on average from one kilometer of power distribution, but the current electricity tariffs do not sufficiently cover the cost of supply and at the time of ex-post evaluation, many PBSs have not been able to earn the standard income. In rural areas, which are the target areas of this project, most of the customers are the general households whose electricity price is set low (see Table 12), making it difficult to obtain sufficient profit from the system. However, REB explains that new export processing zones, factories, markets and small- and medium-sized enterprises (SMEs) have emerged in the vicinity of the PBS distribution system in recent years, which has sparked an increase in electricity sales with higher price unit and is expected to improve PBS revenues. Moreover, all PBS is considered as a single unit, thus REB can provide cross subsidy to cover deficit. REB explained that average profit of all PBSs in 2020/21 is turning in positive and it is expected to improve the situation in future. Since the REB's income is highly dependent on PBS interest payments, however, improving the balance of PBS is considered one of the future challenges for REB as well.

Table 10 Profitability of PBS: Profit per kWh

(Unit: taka)

	2017/18	2018/19	2019/20
Average of all PBSs	-0.07	0.02	-0.10
Average of the target PBSs of the project	-0.29	-0.16	-0.35

Source: Questionnaire answers from the executing agency

The following table shows the maintenance costs of the target PBSs. REB has allocating the operation and maintenance budget based on the yearly demand. REB stated that several PBSs are able to secure budget for the required operation and maintenance, but that some PBSs required a loan from REB. PBSs where the site visits were conducted also explained that they do not always ensure sufficient budget for operation and maintenance, but they have been dealing with operation and maintenance as far as possible.

Table 11 Operation and Maintenance Cost for the Target PBSs (Average)

(Unit: taka)

	2017/18	2018/19	2019/20
Operation and maintenance cost	298,554,426	346,522,496	357,524,285

Source: Questionnaire answers from the executing agency

As shown in Table 12, the electricity price at the time of the ex-post evaluation was set low for residential customers as a policy measure and high for large-scale industries and offices, so it can be said that the poor were considered. Pricing like this has also caused PBS's low profitability and the need to consider raising electricity rates in future is highlighted.

Table 12 Electricity Price Table

	Taka/kWh		Taka/kWh
Residential 0-50 unit (lifeline)	3.75	Small industry: flat	8.53
0-75 unit	4.19	off peak	7.68
76-200 unit	5.72	peak	10.24
201-300 unit	6.00	Construction	12.00
301-400 unit	6.34	Public facilities	6.02
401 – 600 unit	9.94	Roadside lamp	7.7
601 – unlimited	11.46	Office: flat	10.3
Irrigation	4.16	off peak	9.27
		peak	12.36

Source: Documents provided by the executing agency

#### 3.4.4 Status of Operation and Maintenance

At several substations managed by PBSs, damage to some facilities and equipment was observed during the site visits as follows<sup>33</sup>. However, the functioning of the power distribution

<sup>33</sup> Source: Questionnaire answers from the executing agency and site visits

lines and substations was unaffected, and all are operating and fulfilling their functions without any problems. PBSs are repairing of them or working to identify the issues to be addressed as needed.

- Patuakhali PBS (Barisal division): 11 kV capacitor (equipment damaged by lightning), ACR (equipment damaged by lightning), insulators for 33 kV line (crack)
- Jessor PBS (Khulna division): ACR (equipment damage due to short circuit failure), insulators for 33 kV line (equipment damaged by lightning), two 11 kV transformers (high tension coil of transformer burned by overload), lightning arrester (burst by high voltage lightning), potential transformer (high tension coil of transformer burned by short circuit)
- Dinajpur PBS - 2 (Rangpur division): Insulators for 33kV line (crack), lightning arrester (burst by high voltage lightning)
- Joypurhat PBS (Rajshahi division): Insulators for 11kV and 33 kV line (crack), insulator for 11 kV transformer (crack), ACR (equipment damage due to short circuit failure)
- Rajshahi PBS (Rajshahi division): Insulators for 11kV and 33kV (crack), insulator for 11 kV transformer (crack)

The distribution lines of the PBS are maintained quarterly in each of the four areas. The substations are maintained in November and January every year and each PBS has a plan to maintain its distribution lines and substations. On completion of the project, the utilization status of the installed facilities and equipment is checked and monitored by the REB and is utilized under the responsibility of each PBS. Moreover, replacement of consumables and wear items are carried out according to the schedule prepared and managed by REB and distributed to PBS and there were no problems in obtaining them. The manual for maintenance is also being used at PBSs<sup>34</sup>.

As mentioned above, although some of the equipment and materials newly installed or upgraded by the Project were damaged, the overall functions of the distribution lines and substations remain unaffected and they are being properly operated, maintained and fully utilized by REB and PBSs.

In light of the above, while no major problems have been observed in technical and current status of the operation and maintenance system, minor problems have been observed in terms of the institutional/Organizational aspect and financial aspect. Therefore, sustainability of the project effects is fair.

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<sup>34</sup> Source: Questionnaire answer from the executing agency, interviews with PBS

## **4. Conclusion, Lessons Learned and Recommendations**

### 4.1 Conclusion

The project was implemented with aims to reduce power distribution loss and strengthen and stabilize the power supply systems, which make power supply efficient by constructing and rehabilitating the existing power distribution facilities, thereby contributing to the economic development and poverty reduction in the western and the southern part of Bangladesh and the greenhouse gas elimination.

The purpose of the project is in line with Bangladesh's development plan at the time of appraisal and ex-post evaluation, which has emphasized infrastructure development in the power sector, development needs to improve the demand-supply gap and distribution loss ratio and Japan's ODA policy, which has positioned the power sector as a priority area for assistance. Thus, its relevance is high. In implementing the project, although the project cost was within the plan, the project period exceeded the plan due to delays in consultant selection and bidding, as well as changes in the substation specifications and capacity. Therefore, efficiency of the project is fair. Implementing the project boosted the maximum output and power sales volume, reduced the extent of power outages and improved the distribution loss ratio, with targets mostly attained in all these areas. Moreover, thanks to various training, a change in the level of awareness of customers towards the need to use electricity efficiently and improvement of customer service by the PBS was also apparent. The project also had an impact in terms of revitalizing the local economy and boosting the living environment and living standards of local residents, hence its effectiveness and impacts are high. In operation and maintenance terms, despite no problems in the technical aspect and the status of operation and maintenance, minor issues remain in the institutional/organizational and financial aspects. Therefore, sustainability of the project effects is fair.

In light of the above, this project is evaluated to be satisfactory.

### 4.2 Recommendations

#### 4.2.1 Recommendations to the Executing Agency

- Addressing the staff shortages for operation and maintenance

Staff shortages for operation and maintenance activities were reported by some PBSs. In particular, the shortage of skilled and experienced staff was highlighted, which may hinder the prompt implementation of operation and maintenance activities. Although the REB states that there is no shortage of staff in REB, PBS on the whole tends to be understaffed. Therefore, it is desirable that PBS and REB promptly identify the shortage of personnel engaged in operation and maintenance and consider assigning personnel as necessary.



- Examining the recommendations to improve the financial status of PBS

PBS has been running a deficit every year. In fact, PBS states that the operation and maintenance budget is insufficient and if it does not improve in future, there is concerns that it will hinder the implementation of proper operation and maintenance activities. Currently, REB's financial situation is strong, but most of its income comes from payments from PBS. Therefore, the financial condition of PBS may also affect REB in future. REB expects PBS's deficit to improve along with the increase in power sales. Conversely, although the amount of electricity sold has increased significantly, PBS's balance of payments remains in the red, so it is desirable for REB to provide support for financial improvement by reconfirming the trends in rate setting and capital investment to see if PBS's financial situation will improve due to increased electricity sales.

#### 4.2.2 Recommendations to JICA

None

#### 4.3 Lessons Learned

- Maintain operation and maintenance capacity of the staff through trainings during and after project implementation.

In this project, a substation requiring new knowledge and experience for REB and PBS staff in the operation and maintenance activities was constructed. Therefore, in this project, training sessions on operation and maintenance activities were provided to the staff of the executing agency as well as operation and maintenance institutions, both locally and overseas and they also collaborated in the actual field work as OJT. Accordingly, the project has helped improve the technical capacity of staff overseeing operation and maintenance on completion of the project and appropriate operation and maintenance activities have been implemented on an ongoing basis at the time of the ex-post evaluation. When installing facilities and equipment requiring new knowledge and experience for the executing agency as well as operating and maintenance institutions like this project, setting up a workplace with manufacturers, contractors and consultants as OJT would be a good opportunity to learn about the design, structure and operation and maintenance activities of the site, which will help ensure appropriate operation and maintenance.

- Implement a unique approach with a view to changing the understanding of electricity suppliers and users in rural areas

This project was implemented to supply efficient power within rural areas. Moreover, to support the development of facilities to ensure a stable power supply, the project also conducted awareness activities to enhance their understanding among local residents about the efficient use

of electricity and energy conservation. Trainings were also provided for REB/PBS staff to strengthen their capacity to conduct these awareness activities, and for PBS, which is entrusted with the operation of the power distribution services, to improve customer service. Through these activities and training sessions, the effects of PBS in improving customer service and changing residents' awareness of the efficient use of electricity were confirmed. In projects such as electricity supply, where support for users is expected to help ensure the sustainable effects, in addition to the development of facilities and equipment, it can be effective to involve service providers and users when designing the project.

(end)

Comparison of the Original and Actual Scope of the Project

Item	Plan	Actual
1. Project Outputs		
1) Upgradation and construction of medium- and low-voltage lines		
33kV Line upgradation	1,184 km	882 km
11kV Line upgradation	1,579 km	1,975 km
33kV Line construction	885 km	852 km
11kV Line construction	1,536 km	1,135 km
Total extension	5,184 km	4,844 km
2) Construction and augmentation of substations		
Construction	50 units	As planned
Augmentation	30 units	As planned
3) Foreign and local trainings		
Foreign trainings	46 persons	48 persons
Local trainings	183 persons	As planned
4) Consulting service		
DSM consultant	210 man-months	477 man-months
SDCS consultant	510 man-months	688 man-months
2. Project Period	March 2010 – December 2014 (58 months)	March 2010 – June 2016 (76 months)
3. Project Cost		
Amount Paid in Foreign Currency	5,857 million yen	8,728 million yen
Amount Paid in Local Currency	12,579 million yen (9,458 million taka)	4,414 million yen (3,421 million taka)
Total	18,436 million yen	17,184 million yen
ODA Loan Portion	13,241 million yen	8,728 million yen
Exchange Rate	1taka = 1.33 yen (As of November 2009)	1taka = 1.29 yen (Average between March 2010 and June 2016)
4. Final Disbursement	March 2018	

(end)