Democratic Socialist Republic of Sri Lanka

FY2023 Ex-Post Evaluation Report of Japanese ODA Loan
"Greater Colombo Transmission and Distribution Loss Reduction Project"

External Evaluator: Katsunori Sawai, Global Group 21, Japan Inc.

0. Summary

The "Greater Colombo Transmission and Distribution Loss Reduction Project" (hereinafter referred to as "the Project") was implemented with the aim of developing an electricity transmission and distribution network in the Greater Colombo[1], the metropolitan area of Sri Lanka, in order to strengthen transmission and distribution capacity, to reduce transmission and distribution loss and to improve the reliability of power supply, thereby contributing to the promotion of investment and economic development. The Project was highly consistent with Sri Lanka's policies and development needs in terms of efficient and stable power supply, both at the time of planning and at the time of ex-post evaluation. The Project was also consistent with Japan's aid policy at the planning stage, which was to support infrastructure development such as electric power infrastructure to promote economic growth. However, although it was consistent with the successor-related projects of JICA and Asian Development Bank (ADB), no specific collaboration or synergistic effects could be confirmed during the project implementation. Therefore, the relevance and coherence of the Project is high. Since the Project required coordination with related organizations that own infrastructure facilities for the project approval, etc., the project implementing agency, the Ceylon Electricity Board (CEB), established the steering committee from the beginning and frequently shared information and held discussions. However, since there was no central or authorized coordinator, it took a lot of time and effort for CEB to make changes of construction work and obtain the permits. The outputs were almost as planned, and the project cost was within the plan, but the project period was much longer than planned, so the efficiency of the Project is moderately low. Since 2020, after the project was completed, the Sri Lankan economy has been in a slump due to new coronavirus, COVID-19, and economic crisis with default. While it is expected that power demand will increase as the economy recovers in the future, but at the time of the ex-post evaluation, the external factors such as COVID-19 and the economic crisis had significant impact, and power demand was lower than expected at the time of planning. That is why the project effectiveness and impact could only be confirmed to a certain extent. Therefore, effectiveness and impact are moderately low. Regarding the operation and maintenance of the Project, there are no problems with the organizational, structural, technical, or financial aspects of CEB, which is currently responsible for the operation and maintenance of

[1] Regarding the "Greater Colombo" in the project name, there is no administrative definition of the "Greater Colombo" and the "Greater Colombo" in this ex-post evaluation report refers to the "Colombo city" classified by the CEB distribution and area boundaries.

the Project. Since the operation and maintenance status is also satisfactory, the sustainability of the Project is high. However, the Sri Lankan government has revised the Electricity Act, dissolving the CEB, separating the power generation, transmission, and distribution sectors, and establish new organizations, including private capital. The system transition is scheduled to take place over the next two years or so, but the details were unknown at the time of the ex-post evaluation.

In light of the above, the Project is evaluated to be partially satisfactory.

1. Project Description

Project Location
(Source: prepared by the evaluator)

Port (L) 220/132/22kV Transformer
(Source: photo by the evaluator)

1.1 Background

The growth rate of Sri Lanka's Gross Domestic Product (GDP) has been steadily increasing at around 7% a year since the end of the conflict[2] in 2009, with economic activities becoming more active. The Sri Lankan government set a target of an average GDP growth rate of 8% a year by 2016, and expected that the power demand would also increase by an average rate of around 7% a year.

In particular, the Greater Colombo, the metropolitan area of Sri Lanka, accounted for about 50% of the national GDP and served as the economic center of the country. Consequently, the growth in power demand was growing at about 10% a year, significantly exceeding the national average. Especially, waterfront development projects and large-scale development of tourist and commercial facilities were progressing rapidly in the port district and city center, and there was an urgent need to increase electricity transmission and distribution capacity to meet these demands. On the other hand, the development of the transmission and distribution network has not progressed in line with the growing demand, and there were many aging facilities, so the transmission and distribution loss rate was high at 13.0% in 2010.

[2] The government subdued the anti-government group, "Liberation Tigers of Tamil Eelam" in 2009 and ethnic conflicts ended.

Against this background, the Sri Lanka government requested a Japanese ODA Loan for project to enhance the electricity transmission and distribution network in the Greater Colombo area and to improve the transmission and distribution loss rate.

1.2 Project Outline

The objective of the Project is to construct the electricity transmission and distribution network in the Greater Colombo area in order to enhance the transmission and distribution capacity, to reduce the transmission and distribution loss and to improve the reliability of power supply, thereby contributing to the promotion of investment and economic development.

Loan Approved Amount/Disbursed Amount	15,941 million yen/15,594 million yen	
Exchange of Notes Date/ Loan Agreement Signing Date	March 2013/March 2013	
Terms and Conditions	Interest Rate	0.3% (0.01% for Consulting Service)
	Repayment Period (Grace Period)	40 years (10 years)
	Conditions for Procurement	General Untied
Borrower/ Executing Agency	Democratic Socialist Republic of Sri Lanka/ Ministry of Power and Energy[3]	
Project Completion	October 2019	
Target Area	Colombo city	
Main Contractor(s) (Over 1 billion yen)	Mitsubishi Corp. (Japan)/J-Power Systems (Japan)/CEYLEX Engineering (Pvt) Ltd. (Sri Lanka) (JV), ABB (Germany), Hyosung (South Korea)	
Main Consultant(s) (Over 100 million yen)	TPSCO (Japan)/Nippon Koei (Japan)/J-Power (Japan) (JV)	
Related Studies (Feasibility Studies, etc.)	"Data Collection Survey on Transmission and Distribution Loss Reduction in Democratic Socialist Republic of Sri Lanka" JICA, September 2011 "Project Feasibility Study" Ceylon Electricity Board (CEB), July 2012	
Related Projects	JICA: ODA Loan: "National Transmission and Distribution	

[3] The Ministry of Power and Energy (MOPE) is responsible for formulating power/energy policies, supervising projects, and allocating budgets. The Project was implemented by the Ceylon Electricity Board (CEB) as the project implementing agency.

	Network Development and Efficiency Improvement Project" (L/A 2015) Technical Cooperation: "The Project for Capacity Development on Power Sector Master Plan Implementation Program" (2020 - 2023) Asian Development Bank (ADB): "Green Power Development & Energy Efficiency Improvement Investment Program Tranche 2 (L/A 2014) "Power System Reliability Strengthening Project" (2018 - 2020)

2. Outline of the Evaluation Study

2.1 External Evaluator

Katsunori Sawai, Global Group 21, Japan, Inc.

2.2 Duration of Evaluation Study

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

Duration of the Study: November 2023 - January 2025

Duration of the Field Study: February 10 - 23, 2024 & June 24 - 28, 2024

2.3 Constraints During the Evaluation Study

The revised Electricity Act was approved by Sri Lankan Diet in June 2024. According to that, the CEB will be dissolved and new organizations will be respectively established to be in charge of power generation, transmission, distribution, etc. However, the details are unknown, and at the time of the ex-post evaluation, there was no operational experience of the new organization, so it was not possible to analyze the "Sustainability" of the Project by assuming the new system in the future. Therefore, the evaluation on sustainability of the Project was conducted based on the existing organization, CEB.

3. Results of the Evaluation (Overall Rating: C[4])

3.1 Relevance/Coherence (Rating: ③[5])

3.1.1. Relevance (Rating: ③)

3.1.1.1 Consistency with the Development Plan of Sri Lanka

At the planning stage of the Project, the national development plan "Mahinda Chintana" (2010 - 2016) emphasized the continuation of sustainable power generation for stable power supply. Along with a focus on the efficient use of energy including utilization of renewable energy and the reduction of electricity transmission and distribution losses, etc. Additionally, "National

[4] A: Highly satisfactory, B: Satisfactory, C: Partially satisfactory, D: Unsatisfactory

[5] ④: Very High, ③: High, ②: Moderately Low, ①: Low

Energy Policy and Strategies" (June 2008) also included policies such as improving energy use efficiency and setting appropriate energy tariffs.

Even at the time of the ex-post evaluation, "National Policy Framework" (2020 - 2025)[6] stated to ensure energy security by promoting the development of renewable energy and the construction of efficient smart grid aimed at maximizing the use of electricity. Therefore, the stable power supply remains an important national policy. The new "National Energy Policy and Strategies" (November 2021) also shows no change to the basic policy from the tome of planning. Moreover, the government has been working to improve profits commensurate with power supply costs by significantly raising electricity tariffs in 2022 and 2023.

In this way, Sri Lanka has emphasized and promoted policies such as stable and efficient power supply and the development of electricity transmission and distribution networks, both at the planning stage and at the time of ex-post evaluation. Therefore, the Project is consistent with the country's development policy.

3.1.1.2 Consistency with the Development Needs of Sri Lanka

Sri Lanka's real GDP growth rate was over 8% a year before the ODA loan was extended for the Project, but it has shown a declining trend since then, with an average annual growth rate of 1.6% from 2013 to 2022 (-2.3% in the last 5 years). This is attributed to several factors, including the easing of post-conflict reconstruction demand around 2012, political instability after the change of government in 2015, drought damage in 2016, political crisis in 2018, serial terrorist bombing in 2019, the impact of COVID-19, etc.[7]. In addition, external debt has increased enormously, and the Sri Lankan government declared a default in April 2022. The International Monetary Fund (IMF) provided the Extended Fund Facility in 2016 and 2023 to support Sri Lanka's macroeconomic stabilization policies and institutional and economic structural reforms. It is predicted by IMF that the GDP growth rate is expected to be around 1.5% in 2024, 2.6% in 2025, and 3% in 2026[8].

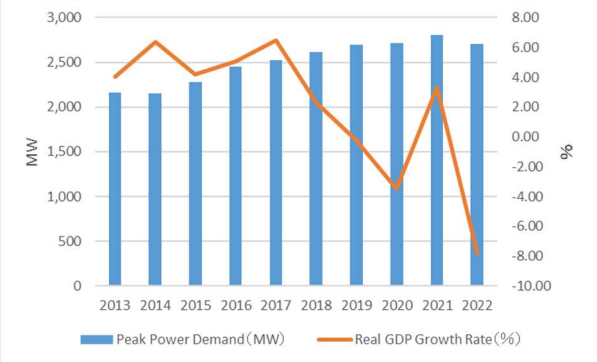

Figure 1: Peak Power Demand and GDP Growth Rate
(Source) IMF Economic Outlook Database, CEB Statistical Digest Base

Peak power demand increased at an average annual rate of 3.5% between 2013 and 2019, but

[6] The previous government prepared "National Policy Framework" (2020 - 2025) which was presented by the CEB, so there is currently no explicit national development plan.
[7] "Risks of Siri Lankan Economy and Policy", Reiko Ushioda, Institute for International Monetary Affairs, September 4, 2018, "Sri Lanka Development Update, Time to Reset". The World Bank, April 2023, etc.
[8] "REQUEST FOR AN EXTENDED ARRANGEMENT UNDER THE EXTENDED FUND FACILITY" IMF, March 6, 2023.

has stagnated since 2020, similar to the GDP growth rate. Furthermore, the actual peak power demand in 2021 was 2,802MW, compared to the projected 4,258MW at the time of planning. While, it cannot be optimistic how quickly economic recovery, according to the CEB "Long Term Generation Expansion Plan" (2023 - 2042), it is predicted that power demand for the next 10 years starting from 2023 will increase at an average annual rate of about 6.0%.

As for Colombo city, according to "National Policy Framework" (2020 - 2025) and the CEB "Long Term Generation Expansion Plan" (2023 - 2042), the new Colombo of the 21st century will be an international commercial and financial hub. There are future plans such as the Colombo Port City Development Plan, the Light Rail Transit Project in the Western province, and the Colombo Metro Project. Considering its growth potential, the power demand in Colombo city is expected to increase steadily. Along with this, there are plans to increase the capacity of transmission line and transformer facilities.

As mentioned above, both the recent GDP growth rate and the power demand have been lower than expected at the time of planning. However, this is largely due to the impact of external factors such as COVID-19 and the economic crisis with the declaration of default since 2020, and the situation at the time of ex-post evaluation does not negate the development needs. Considering the growth potential of Colombo city, the future increase in power demand and the planned expansion of transmission and distribution facilities, it is believed that the investment in the Project will certainly be utilized in the near future. Therefore, consistency with development needs is high both at the time of planning and the ex-post evaluation.

Table 1: Power Demand and Capacity of Transmission / Transformer in Colombo City

Colombo city	2019 (Actual)	2024~ (Plan)	2026 (Plan)	2027 (Plan)
Power Demand (MW)	313	342	380	393
Capacity of Transmission (MW)	962.55	1,019.25	1,181.25	1,209.60
Capacity of Transformer (MVA)	1,069.5	1,132.5	1,312.5	1,344.0

(Source) CEB Long Term Transmission Development Plan (2023 – 2032)

3.1.1.3 Appropriateness of the Project Plan and Approach

At the time of planning, it was pointed out that "when implementing a project that requires collaboration with multiple organizations, it was necessary to prevent project delays by closely coordinating with the relevant parties from the planning stage" as a lesson learned from similar projects. Based on this, in the Project, since it is necessary to coordinate with relevant organizations that own infrastructure facilities like ports or roads for project approval, etc. it was planned to establish a Steering Committee consisting of the relevant parties to regularly share information and hold discussions, and the 1st meeting for the Project was held in November 2012.

This approach, based on lessons learned from similar projects, was appropriate. The underground transmission and distribution line construction was carried out along major roads in Colombo city, and work for two 220kV lines crossed the site of Colombo Port. In addition, some route changes were required. Therefore, it was necessary to obtain construction approval from the relevant parties. However, it took a lot of time and effort for CEB to coordinate with the Road Development Authority, Colombo City Council, Sri Lanka Ports Authority, Urban Development Authority and Police. Although the CEB frequently communicated with the relevant organizations in the Steering Committee, there was no authorized organization to act as a coordinator, so CEB was forced to negotiate directly with the relevant organizations, and it took a lot of time to obtain the consent of all parties concerned, which was one of the reasons for the delay in the Project.

3.1.2 Coherence (Rating: ②)

3.1.2.1 Consistency with Japan's ODA Policy

One of the focal areas of Japan's "Country Assistance Program for Sri Lanka" (June 2012) was "promotion of economic growth," and Japan actively supported the development of infrastructure including the power sector that will contribute to the economic growth. JICA's "Country Analytical Work" (December 2012) also stated that it aimed to improve the reliability and efficiency of power supply as part of "Improvement of the Power Sector." Therefore, it is observed that it was consistent with Japan's development cooperation policy at the time of planning.

3.1.2.2 Internal Coherence

At the time of planning, collaboration with other JICA projects was not anticipated. JICA provided a Japanese ODA Loan for "National Transmission and Distribution Network Development and Efficiency Improvement Project" in 2015. This project aimed to expand and improve the efficiency of the electricity transmission and distribution network across the country including the Colombo city. In terms of developing an efficient and stable power supply network, it is consistent with the Project. In addition, technical cooperation was implemented for "The Project for Capacity Development on Power Sector Master Plan Implementation Program" (2019 - 2023), and its objectives included capacity building of CEB in relation to system operation measures, control of output fluctuations and improvement the reliability of power distribution, which also contributed to strengthening the operational capacity improvement for the Project. However, no specific collaboration or synergistic effects could be observed during the implementation stage of the Project.

3.1.2.3 External Coherence

At the time of planning, collaboration with other projects supported by international

organizations was not anticipated. ADB has been continuously supporting to improve the efficiency of electricity transmission and distribution system in the Colombo city as the main donor together with JICA. Currently, ADB is implementing "Green Power Development & Energy Efficiency Improvement Investment Program Tranche 2 (L/A signed in 2014), which aims to expand the electricity transmission network and reduce technical losses, including Colombo city, and is consistent with the Project in the sense of strengthening and improving the power supply network. In addition, ADB implemented technical cooperation "Power System Reliability Strengthening Project" (2018 - 2022), which contributed to improving the capacity of CEB thorough research on improvement of efficiency and reliability of power systems and staff training. It can be seen that this also helped the operation and maintenance works for the Project as well. However, no specific collaboration or synergistic effects could be observed during the implementation stage of the Project.

The Project is highly consistent with the development policy and development needs of Sri Lanka. It is also consistent with Japan's aid policy at the time of planning. In the project plan and approach, based on the past lessons learned, the Steering Committee was established to coordinate with relevant organizations during project implementation, but CEB required a great deal of time and effort for coordination, which indicates that there was room for improvement and strengthening of the coordination function. In addition, collaboration with other projects was not anticipated at the time of planning, and although the Project is consistent with the JICA and ADB projects implemented after the Project in terms of improving and enhancing the efficiency of the networked electricity transmission and distribution system in the Colombo city, no specific collaboration or synergistic effects could be observed during the implementation stage of the Project. Therefore, its relevance and coherence are high.

3.2 Efficiency (Rating: ②)

3.2.1 Project Outputs

Table 2 shows a comparison of the planned and actual project outputs. The relative locations of each substation and the route of the underground transmission lines are shown in Figure 2.

The main differences in the output are (1) the addition of modification of two substation (E/F), (2) the addition of distribution SCADA system[9] augmentation or extension, (3) the extension distance of 11kV underground cable, and (4) the addition of 12kV/1250A GIS Panels. Substation E and F began operation in 1984, but because it used oil cables that were difficult to maintain, it was decided to modify them as a result of detailed design and added to the project scope. The augmentation or extension of the SCADA system connecting each substation to the Colombo

[9] SCADA (Supervisory Control and Data Acquisition) is a system that centrally manages the monitoring, control, and data collection of equipment at each substation through a network.

Table 2: Comparison of Planned and Actual Outputs

	Plan	Actual
New Grid Substation		
220/132/11kV	1 place (Port (L))	As planned
132/11kV	2 places (M/N)	As planned
Augmentation or Extension of Existing Grid Substation	Augmentation: 2 places (A/I) Extension: 3 places (Kerawalapitiya / Kelanitissa / Kolonnawa GS)	As planned In addition, Modification (E/F)
33kV Gas Insulated Switchgear (GIS)	1 place (Kelanitissa GS)	As planned
Augmentation or Extension of distribution SCADA system	----	10 GSs above and CCCC
12kV/1250A GIS Panel	----	88 units
Construction of Underground Cable		
220kV	Approx. 22km	Approx. 20km
132kV	Approx. 15km	Approx. 13.7km
11kV	Approx. 92km	Approx. 28.6km
Special Vehicles for Electric Equipment Works		
Vehicle for High Lift Work	5 units	As planned
Hole Digging and Pole Standing Car	4 units	As planned
Digger	1 unit	Not procured
Cargo Crane	5 units	As planned

(Source) CEB Project Completion Report

City Control Center (CCCC) is an essential system for efficient and reliable electric distribution operations. It can be evaluated that the addition of SCADA system into the project scope was appropriate. Additionally, the actual length of the 11kV underground distribution cable was approximately 28.6km, down from the planned length of 98km, but this was due to construction work carried out in advance using CEB's own budget for the urgency of developing the distribution network. Furthermore, upon the request of CEB's distribution section, 88 units of 12kV/1250A GIS panels were installed at other substations in Colombo city, that were not initially covered by the Project. It can be evaluated that this additional

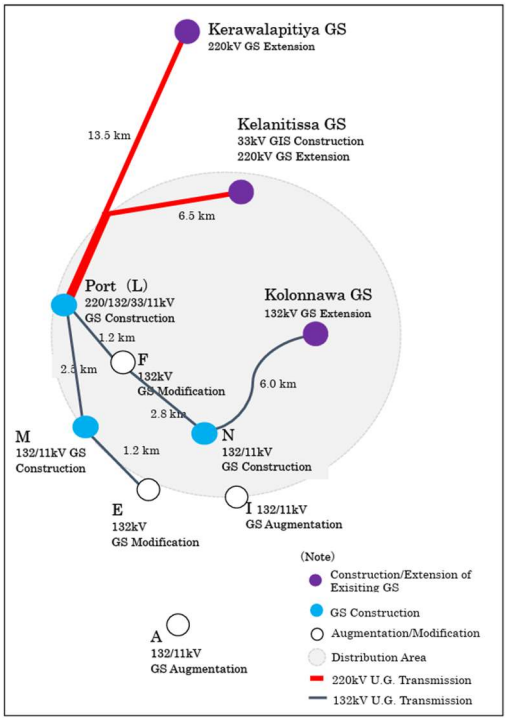

Figure 2: Grid Substation and Transmission Route under the Project

(Source) Made by the Evaluator from CEB document

panels were needed to improve and strengthen the stable and efficient power supply network more in Colombo city. Among the special vehicles, the digger was not procured because the bidding was unsuccessful with no bidders, but this does not affect the operation and maintenance (O/M) of the Project. At the time of planning, there was a strong requirement to procure highly reliable products of underground cables because it is difficult to maintain in the events of breakdowns after being buried. However, a Japanese company with proven track record in manufacturing them received the order and delivered the product. As mentioned above, although there were some additional scopes, it can be said that basically the original project at the time of planning was implemented.

3.2.2 Project Inputs

3.2.2.1 Project Cost

Although there were cost increases for construction and equipment due to the additional scope, etc., for consulting service due to an extension of construction period and exchange rate fluctuations, the overall project cost was kept within the plan (87.5% of the plan) by utilizing the contingency. The Sri Lankan share of the construction and equipment cost included the procurement of two additional GIS units for the substation Port (L).

Table 3: Planned and Actual Project Cost

(unit: Million Japanese Yen)

	Plan			Actual		
	ODA Loan	Sri Lanka	Total	ODA Loan	Sri Lanka	Total
Construction and Equipment	12,743	0	12,743	14,552	336	14,888
Consulting Service	782	0	782	879	0	879
Price Escalation	1,115	0	1,115	---	---	---
Contingency	1,109	0	1,109	---	---	---
Administration	0	1,732	1,732	0	479	479
VAT/Import Tax	0	1,166	1,166	0	75	75
Interest during Construction	113	0	113	89	0	89
Commitment Charge	79	0	79	73	0	73
Total	15,941	2,898	18,839	15,593	890	16,483

(Source) CEB Project Completion Report
(Plan) LKR=0.592 JYen, USD=78.2 JYen
(Actual) LKR=0.7258 JYen, USD=108.97 JYen (average exchange rate during project implementation, IMF statistics)

3.2.2.2 Project Period

The Loan Agreement was signed in March 2013, and the plan was for consultant selection procedures to begin in March 2013, and the Project would be completed with the start of facility operation in December 2016 (46 months in total). For actual result, the consultant selection procedures began as planned, but the project was completed in October 2019 (80 months in total), which was significantly longer than planned (173.9% of the plan). The main reasons for the

construction delays were as follows;

- ✓ There were many applicants for the pre-qualification examination for the bidding, and it took time to confirm the qualification requirements.
- ✓ The Port Authority could not agree on the site for the substation Port (L) as originally planned, and an alternative site was considered. But the handover to CEB was delayed almost one year due to the removal of buildings and materials.
- ✓ It took time to coordinate with relevant organizations in order to obtain construction permissions, etc. (See 3.1.1.3 Appropriateness of the Project Plan and Approach mentioned above)
- ✓ The 220kV underground cable route from the Kerawalapitiya GS to the Port (L) was initially planned to be laid along the waterway, but was changed to a route closer to land, and some routes of the underground cable were changed due to the site conditions. So, it took time to review the construction work and obtain another permission.
- ✓ The contactor for Package 1-Lot 1, which was involved in the construction and expansion of the substations, was unfamiliar with Sr Lanka's working environment and regulations, and there were problems such as a lack of human resources and inadequate construction plan. This affected the schedule for equipment installation and underground cable construction.
- ✓ The serial terrorist bomb attacks that occurred in April 2019 forced construction to be suspended for several weeks.

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

At the time of planning, the EIRR was calculated to be 10.11%. At the time of ex-post evaluation, the actual data required for recalculation, such as the increase in average electricity transmission volume or the reduction in power losses due to the Project, was not available, so the EIRR was not recalculated.

As mentioned above, although the project cost was within the plan, the project period significantly exceeded the planned period, so efficiency of the project is moderately low.

3.3 Effectiveness and Impacts[10] (Rating: ②)

3.3.1 Effectiveness

3.3.1.1 Quantitative Effects (Operation and Effect Indicators)

Among the operation and effect indicators, data related to reduction volume of transmission and distribution system losses could not be obtained because it would be difficult for CEB to extract and analyze only the effects of the Project. However, CEB highly evaluates the Project to be able to improve the system reliability by interconnecting existing substations and new

[10] When providing the sub-rating, Effectiveness and Impacts are to be considered together.

substations constructed under the Project, increasing the capacity of existing substations, and replacing aging cables and switches.

Table 4: Operation and Effect Indicators

Indicators	Original	Target	Actual	Actual	Actual	Actual
	2011	2018	2020	2021	2022	2023
		2 years after project completion	1 year after project completion	2 years after project completion	3 years after project completion	4 years after project completion
Transformer Availability Factor (%)	77	49	n.a.	n.a.	24	24
Transmission Line Availability Factor (%)	n.a.	34	n.a.	n.a.	41	40
Reduction Volume of Transmission System Losses (MWh)	n.a.	20,009	n.a.	n.a.	n.a.	n.a.
Reduction Volume of Distribution System Losses (MWh)	n.a.	4,005	n.a.	n.a.	n.a.	n.a.

(Source) Documents provided by JICA and CEB

The transformer availability factor is lower than planned, but this is because the power demand is smaller than planned. The Project was to provide equipment and reduce electricity loss by anticipating the power demand for development which would be implemented from 2015 to 2020, such as Galle Face area (electricity distribution from substation Port (L)), Slave Island area (distribution from substation M), Colombo Commercial Center (distribution form substation N), and Regal Theater district (distribution from substation Port (L)), etc.[11]. However, due to the recent economic downturn, import restriction, soaring prices for construction materials and equipment, lack of funds, etc., the development has been delayed for more than two to three years. In fact, in the current situation in Colombo city, there are many high-rise buildings under construction and sites where construction work has been suspended. Additionally, some hotels and shopping centers have opened, but due to sluggish economic activity, they have not been able to generate electricity demand as planned. Furthermore, due to the economic crisis that led toa shortage of foreign currency and made it difficult to import fuel, Sri Lanka has implementing planned outages (7 to 13 hours a day) for about a year since February 2022. As a result, the power demand in Colombo city after the completion of the Project has not reached what was anticipated in the plan, and it is difficult to say that the transformer equipment provided by the Project are being used sufficiently. However, as the economy recovers, it is expected that they will be utilized

[11] See Figure 2 for substation Port(L), M and N.

effectively.

Table 5: Peak Power Demand in Colombo City

	2019	2020	2021	2022	2023
Peak Power Demand (MW)	313	321	289	274	284

(Source) Documents provided by CEB

On the other hand, the electricity transmission line availability factor exceeds the target figure. This is mainly due to the fact that the power supply route to Colombo city has become from Kerawalapitiya and Kelanitissa GSs to the substation Port (L) as the main line, and it achieved higher transmission results than planned. Additionally, the development of the Colombo Commercial Center was almost completed in 2022 and the amount of electricity transmitted to the Port (L) =>F=>N substations has been increased from the planned figures.

Furthermore, since there is sufficient capacity and redundancy in the transmission and distribution facilities, it can be said that stable power supply through the transmission and distribution network is possible, even if the facilities are shut down due to failures or temporarily halted for maintenance[12].

3.3.2 Impacts

3.3.2.1 Intended Impacts

The impact of the Project was expected as promoting investment and economic development in Colombo city. Therefore, we attempted to obtain data such as recent private investment amounts, number of shops and factories, GDP growth in the area, but they were not available.

On the other hand, looking at the amount of electricity sold in Colombo City, it grew at 3.2 % annually until 2019, but decreased significantly in 2020, immediately after the project was completed. This is a result of the economic recession due to the effects of COVID-19 and the economic crisis, but it is also likely that consumers are becoming more conscious of saving electricity due to electricity tariff increases in 2022 and 2023. Although there is a slight recovery trend in 2023, the amount of electricity sold to industry and the general (including business and commerce) has not reached the level of 2018 before COVID-19, and it can be said that the effects of the economic downturn continue.

[12] When one (-1) of the many equipment (N) breaks down, it is called “N-1 failure”, and the idea providing equipment with redundancy is called “N-1 standard” so that even if an N-1 failure occurs, it will not disrupt the power supply. This is a concept widely used internationally to ensure a stable power supply, and CEB also maintains its electricity transmission system based on the N-1 standard.

Table 6: Electricity Sales by Major Consumers in Colombo City

(unit: GWh)

	2018	2019	2020	2021	2022	2023
Domestic, etc.	280	289	276	289	274	258
Industrial	182	181	178	188	178	164
General Purpose	879	910	775	769	775	859
Hotel	100	91	69	75	89	103
Government, etc.	50	52	49	61	46	49
Total	1,491	1,523	1,347	1,383	1,362	1,433

(Source) CEB Sales & Generation Data Book

The interviews were done with the Ceylon Chamber of Commerce and the Sri Lanka Board of Investment regarding the relationship between recent economic activities and the electricity supply condition. The main points were as follows;

- ✓ The business environment has remained extremely difficult due to the effects of COVID-19 and the economic crisis since 2020 after the Project was completed. The number of small and medium-sized enterprises going out of business is increasing. The planned power outage and the doubling of electricity tariff from 2022 to 2023 are also having a major impact[13].
- ✓ As well as other industries, the construction sector has been greatly affected. The development projects in Colombo City also have been way behind schedule due to lack of funds and rising material costs.
- ✓ Even in surveys related to management risks for small and medium-sized enterprises and exporters, there is a high level of interest in stable power supply and high electricity tariff[14].
- ✓ However, the reason for unstable power supply is that there were restrictions on fuel imports for thermal power generation due to the lack of foreign currency for the economic crisis. It is believed that this will improve as the economy recovers in near future.
- ✓ Exporters are optimistic about the business recovery from 2024 onwards[15].

In addition, the Free Trade Zone Manufacturers Association stated “The domestic industry has already seen its energy costs double due to tariff hikes in 2022, which has had a major impact on business competitiveness”, and protests over the electricity tariff revision were also taking place across the country[16]. Furthermore, according to a survey by Japan External Trade Organization (JETRO), the biggest management issue for Japanese companies in Sri Lanka is power shortages and outages[17], so it can be said that there is a high level of interest in the stable power supply in the industrial world.

[13] Of the 1,300,300 small and medium-sized enterprises in 2018, 108,100 businesses closed down due to the economic crisis and 155,000 businesses closed down due to other reasons such as COVID-19 by 2022. Impact of Economic Crisis on MSMEs 2022, Division of Census and Statistics, Ministry of Economic Policies and Plan Implementation, Sri Lanka

[14] Impact of multiple crises on Sri Lanka’ micro, small and medium-sized enterprises, 2023, ILO

[15] “EXPORT BAROMETER SURVEY Findings and Insight Report”, The Ceylon Chamber of Commerce, January 2024

[16] “Sri Lankan Power Tariffs to be Increased by 66%” Rakunar Warsalage and Yuki Oi, JETRO, March 1, 2023.

[17] “Sri Lankan Economic Crisis Worsening Business Environment” Hiroyuki Nitta, JETRO, May 18, 2023

It can be evaluated that the impact of the Project, which was to promote economic activity in Colombo City through stable electricity supply, has not been what was expected at the time of planning. This is largely due to external factors such as COVID-19 and the economic crisis, and the impact can be expected to become more apparent as Sri Lanka's economy recovers in near future.

3.3.2.2 Other Positive and Negative Impacts

1) Impacts on the Environment:

This project does not fall under the sensitive sectors, characteristics, or areas listed in the JICA Guidelines for Environmental and Social Considerations (April 2010), and as the Project is not expected to have significant adverse environmental and social impacts, it was classified as Category B.

Environmental monitoring reports during construction were submitted quarterly, and according to them, there were some cases in which nighttime noise and variation level exceeded Sri Lankan standard. But the impact was kept to a minimum by providing appropriate instructions to the contractors, using noise- and vibration-proofing mats, and adjusting equipment usage times. It is also said that the impact on traffic during construction of underground transmission and distribution cables was minimalized by carrying out some of the works at night when there is relatively little traffic and strengthening traffic control.

At the time of planning, the reduction in CO_2 emissions due to the power less reduction effect was estimated to be approximately 17,663 tons per year. The amount of CO_2 emissions reduced could not be recalculated since actual data on the amount of power saved by the Project was not available. However, CEB has been working to reduce CO_2 emissions as the organization, and the emissions have improved from 0.736 kg-CO_2/kWh in 2011 to 0.555 kg-CO_2/kWh in 2021. This may be a result of efforts to reduce the share of oil-fired power plants in power generation and to focus on developing renewable energy and improving the efficiency of electricity transmission and distribution systems.

2) Resettlement and Land Acquisition:

The Project did not involve people’s resettlement or land acquisition. The construction of the substation, except the substation Port (L), was carried out on land already owned by CEB, and the augmentation and extension works were implemented on the existing substation site. Regarding the substation Port (L), CEB leases the site from the Port Authority.

3) Others

There are no other specific matters regarding gender, marginal people, social systems and norms, people’s well-being and human rights, etc.

From the above, due to the large influence of external factors, the Project has achieved its objectives only to a certain extent. Therefore, effectiveness and impacts of the project are moderately low.

3.4 Sustainability (Rating: ③)

3.4.1 Policy and System

As mentioned in the "Relevance", in the policies in "National Policy Framework" (2020 - 2025), "National Energy Policy and Strategies" (2021), "Long Term Generation Expansion Plan" (2023 - 2042) and "CEB Long Term Transmission Development Plan" (2023 - 2032), the power sector is basically positioned as an important sector in Sri Lanka. Regarding the electricity tariff, as mentioned before, significant increases in 2022 and 2023 were implemented in order to improve the balance between costs and profits. Therefore, at present, there are no policy or system issues with the Project.

Meanwhile, a proposed revision of the Electricity Act[18] was approved by the Diet on June 2024. The revised Act aims to ensure improved performance of the power sector and establish an efficient and economical power supply system through independent and responsible enterprises. Therefore, the CEB will be dissolved and divided into several new organizations for hydropower, thermal power, renewable energy, electricity transmission, electricity distribution, etc.[19], and private capital will also be introduced. However, the details of how the transfer of assets and the succession of staffs and technology will be carried out are unclear. The process is expected to be finalized in two years after the Diet's approval. The revision of Electricity Act will have a direct impact on the sustainability of the Project, so it is necessary to closely follow up them.

3.4.2 Institutional/Organizational Aspect

The operation and maintenance of the 220kV/132kV transmission system are handled by Western Central Unit in CEB's Wired Operation Division. The operation and maintenance of the 33kV/11kV distribution system are handled by the Colombo City Branch. Although both organizations have some unfilled posts, this does not cause any particular problems on operation and maintenance. Additionally, manager, engineer, system operator, etc. are assigned to each substation to manage its operations. Data related to the operation status of each substation is monitored 24 hours a day by the National System Control Center for transmission and the CCCC for distribution network, and the SCADA system is used to adjust stable electricity transmission and distribution according to fluctuations in power demand. Therefore, there are no particular

[18] Draft Electricity Act, December 2023.

[19] Four companies for each type of power generation: hydropower, coal-fired power, oil-fired power and renewable energy (hydropower will be owned by the government), four electricity distribution companies, one electricity transmission company (majority owned by the government), and system operator (power system operation at real-time and long-term power system planning, etc.)

problems with the current CEB organization.

However, after the Electricity Act is revised, new organizations will be responsible for the operation and maintenance of electricity transmission and distribution facilities in Colombo City, but the details of that organization and structure are unknown at this stage. According to an interview with MOPE, the current CEB personnel will basically be utilized, but follow-up will be required after the establishment of the new organization.

3.4.3 Technical Aspect

CEB is a state-owned company established in 1969, and has carried out the implementation, operation and maintenance of many power generation, transmission and distribution projects, including projects financed by international institutions. So, CEB has sufficient technical capabilities. However, in the Project, CEB pointed out that after the project completion, the contractor did not provide sufficient technical support, especially for cable terminal work at the substation Port (L) and operation and maintenance of the 220kV/132kV GIS, and CEB had to deal with it on its own. Although this has not become a particularly big problem, in order to ensure smooth operation and maintenance, it was desirable that technical guidance from the contractor regarding operation and maintenance after installation of equipment be made clear in the contract from the beginning. Preventive maintenance and periodic inspection manuals are available at each substation, and in accordance with the manual, high-voltage cables are inspected every 3 years, major substation equipment every 6 months, and auxiliary equipment every 1 year. In addition, an inspection plan for each substation is created and implemented every year. Regarding the spare parts, the CEB's Asset Management Division has sufficient stock, and they will be supplied in response to request from each substation if necessary. No technical problems were pointed out by the staffs at each substation. Therefore, there are no particular problems with the current technical level of CEB.

However, regarding maintaining the technical level of the electricity transmission and distribution organizations after the CEB is dissolved, the policy is basically to inherit the current CEB's human resources and technology, but as the details have not been decided at the time of the evaluation, the follow-up is required.

3.4.4 Financial Aspect

A characteristic of CEB's finance is that it is highly dependent on financial costs associated with borrowing. In addition, because much of the fuel for thermal power generation and various spare parts are imported, it is also affected by exchange rates. In 2022, cost of sales increased due to increased fuel costs for thermal power generation and increased cost of purchasing electricity from Independent Power Producers (IPPs) that generate thermal power. Furthermore, although electricity sales revenue increased due to the increase in electricity tariff, CEB remains in the red,

including financial costs. This deficit is basically covered by government support, but the debt ratio varies greatly depending on the amount of support.

Table 7: CEB Financial Results

(units: Million LKR)

		2018	2019	2020	2021	2022
Sales	a	229,571	242,950	238,911	248,776	308,457
Cost of goods sold	b	-251,964	-322,521	-282,846	-266,596	-430,509
Gross profit	c=a+b	-22,393	-79,571	-43,935	-17,820	-122,052
Administration expenses	d	-5,832	-7,280	-7,131	-8,290	-16,354
Other operating revenues	e	9,450	10,307	8,817	11,465	11,581
Operating profit/loss	f=c+d+e	-18,775	-76,544	-42,249	-14,645	-126,825
Financial revenue/expenses	g	-11,570	20,775	-18,184	-19,299	-40,355
Income/loss before tax	h=f+g	-30,345	-97,319	-60,433	-33,764	-167,180
Corporate tax	i	-50	-39	-53	---	---
Current net income/losses	J=h+i	-30,395	-97,355	-60,486	-33,764	-167,180

Operating profit margin	-8%	-32%	-18%	-6%	-41%
Current ratio	70%	49%	56%	45%	40%
Debt ratio	162%	256%	261%	478%	200%

(Source) CEB Annual report and Financial Statements for The Year Ended December 31, 2022

Under the government policy, the electricity tariff remained unchanged from 2014 until recent years, but it was significantly increased by 75% in August 2022 and 66% in February 2023 with recommendation by IMF[20]. Therefore, CEB is continuously striving to improve its financial position. MOPE explained that due to revisions to the Electricity Act, the government would no longer provide subsidies for CEB in near future, and that the tariff increase was for that. It is expected that cash flow will improve significantly in the future.

In recent years, the share of power generated by hydroelectric power plants and wind power plants has been increasing, and the share of oil thermal power generation and the purchase of power from IPPs of which the average generation cost is high has been decreasing. This also contributed to improving the CEB's financial position[21].

The maintenance budget is allocated to each management unit based on the annual maintenance plan. The maintenance budget for the Project is allocated to the Western Central Unit and the Colombo City Branch, but there have been no particular budgetary constraints for the necessary work.

Based on the above, although CEB's financial position has been supported by government subsidies, the increase in electricity tariff is expected to significantly improve the cash flow, and the CEB's policy is to continue working to improve profits commensurate with costs. As a result,

[20] "Current Sri Lanka Economy" Embassy of Japan in Sri Lanka, June 2023.

[21] According to the CEB Annual Report, the CEB's generation costs were 9.90LKR/kWh in 2020 and 8.69 LKR/kWh in 2021. However, due to rising fuel prices and other factors, the total average generation costs, including IPPs, are expected to rise 23.01 LKR/kWh and 30.22 LKR/kWh in 2022 and 2023 43 respectively.

there are no apparent financial problems with the Project. The new organization after dissolution of CEB will need to have more sound financial structure as some private capital will be involved, but as the details have not been determined at the time of ex-post evaluation. So, the follow-up after the establishment of the new organization will be required.

3.4.5 Environmental and Social Aspect

No particular environmental or social problems were observed with the Project during post-project monitoring. There is no possibility of any negative impact on the environment or society in the future.

However, after the dissolution of the CEB, the current policy for environmental and social consideration of the electricity transmission and distribution organizations is expected to continue, which is to "incorporate and integrate environmental consideration into the CEB's activities". But as the details have not yet been determined at the time of ex-post evaluation, the follow-up is required after the establishment of the new organization.

3.4.6 Preventative Measures to Risks

Regarding future risks related to the Project, they may be 1) whether the economic recovery would proceed steadily because the facilities and equipment provided by the Project will be used effectively; and 2) what the operation and maintenance system would be like under the new organization established after the revision of the Electricity Act. Neither of these are within the CEB's control, and it is difficult to predict their prospects at the time of ex-post evaluation, so the follow-up is required.

3.4.7 Status of Operation and Maintenance

According to the CEB staffs in charge of operation and maintenance, no major repairs were required for the substation or electricity transmission and distribution lines involved in the Project, and no particular problems were identified when the evaluator conducted on-site inspections. As mentioned in 3.4.3 Technical Aspect above, inspections and preventive maintenance are being carried out in accordance with the manual, and there are no problems with the supply of consumables. If spare parts are required, each substation is supposed to request them from CEB Asset Management Division, but so far, no such repairs have occurred. Therefore, there are no particular problems with current status of operation and maintenance by CEB.

However, it is necessary to follow up on how the operation and maintenance of the Project will be carried out by the new electricity transmission and distribution organizations after the CEB is dissolved.

From the above, there are no problems with the current operation and maintenance of the

Project at CEB in terms of system, technology, finances and or situation, and the sustainability of the Project is high. However, it is necessary to follow up on the operation and maintenance system and status of the new organization that will be established due to the revision of the Electricity Act.

4. Conclusion, Lessons Learned and Recommendations

4.1 Conclusion

The Project was implemented with the aim of developing an electricity transmission and distribution network in the Greater Colombo, the metropolitan area of Sri Lanka, in order to strengthen transmission and distribution capacity, to reduce transmission and distribution loss and to improve the reliability of power supply, thereby contributing to the promotion of investment and economic development. The Project was highly consistent with Sri Lanka's policies and development needs in terms of efficient and stable power supply, both at the time of planning and at the time of ex-post evaluation. The Project was also consistent with Japan's aid policy at the planning stage, which was to support infrastructure development such as electric power infrastructure to promote economic growth. However, although it was consistent with the successor-related projects of JICA and ADB, no specific collaboration or synergistic effects could be confirmed during the project implementation. Therefore, the relevance and coherence of the Project is high. Since the Project required coordination with related organizations that own infrastructure facilities for the project approval, etc., the project implementing agency, CEB established the steering committee from the beginning and frequently shared information and held discussions. However, since there was no central or authorized coordinator, it took a lot of time and effort for CEB to make changes of construction work and obtain the permits. The outputs were almost as planned, and the project cost was within the plan, but the project period was much longer than planned, so the efficiency of the Project is moderately low. Since 2020, after the project was completed, the Sri Lankan economy has been in a slump due to COVID-19, and economic crisis with default. While it is expected that power demand will increase as the economy recovers in the future, but at the time of the ex-post evaluation, the external factors such as COVID-19 and the economic crisis had significant impact, and power demand was lower than expected at the time of planning. That is why the project effectiveness and impact could only be confirmed to a certain extent. Therefore, effectiveness and impact are moderately low. Regarding the operation and maintenance of the Project, there are no problems with the organizational, structural, technical, or financial aspects of CEB, which is currently responsible for the operation and maintenance of the Project. Since the operation and maintenance status is also satisfactory, the sustainability of the Project is high. However, the Sri Lankan government has revised the Electricity Act, dissolving the CEB, separating the power generation, transmission, and distribution sectors, and establish new organizations, including private capital. The system

transition is scheduled to take place over the next two years or so, but the details were unknown at the time of the ex-post evaluation.

In light of the above, the Project is evaluated to be partially satisfactory.

4.2 Recommendations

4.2.1 Recommendations to the Executing Agency

Currently, the Sri Lanka government is revising the Electricity Act. According to it, the CEB, which is in charge of operation and maintenance of the Project, will be disbanded, and new organizations will be established, including private capital, in charge of power generation, transmission, distribution, etc. Over the next two years, details such as how the CEB's assets will be transferred and how its human resources and technology will be utilized will be determined. According to MOPE, consideration will be given to basically ensuring that CEB's human resources and technology are utilized by the new organization. However, a detail study of the new system should be done to ensure that the operation and maintenance of the Project is not affected due to the revision of Electricity Act.

4.2.2 Recommendations to JICA

JICA has provided appropriate advice through technical cooperation and other means regarding the revision of the Electricity Act. In the process of determining the details of the new system, JICA should closely monitor trends and provide advice and support as necessary to ensure that there are no affects to the operation, maintenance and management of not only the Project but also other electric power projects in which JICA is involved.

4.3 Lessons Learned

<u>Coordination Function with Other Organization Related to the Project</u>

The lessons learned from the past ODA loan projects point out "When implementing a project that requires cooperation with multiple organizations, it is necessary to prevent project delays by coordinating closely with the parties involved from the planning stage." Based on that, a steering committee was established with relevant organizations in the Project, and held regular information exchanges and frequent discussions. However, it took a great deal of time to coordinate changes of constriction works and obtain construction permissions with related organizations, and it was one of the causes of project delays. This was because there was no central organization to play a coordinating role in the national project implemented in Colombo City, and although the steering committee was held several times, it can be thought that this is due to the fact that the CEB was forced to coordinate with related organizations individually. Therefore, one idea for promoting smooth implementation of projects is to designate in advance a government agency that plays a central role and has strong authority in coordinating with agencies related to national projects.

5. Non-Score Criteria

5.1 Performance

5.1.1 Objective Perspective

None.

5.2 Additionality

None.

(End)

Comparison of the Original and Actual Scope of the Project

Item	Plan	Actual
1. Project Outputs		
(1) Construction of Grid Substation	3 places	As planned
(2) Augmentation and Extension of Existing Grid Substation	5 places	As planned Modification 2 places
(3) 33kV GIS	1 place	As planned
(4) Augmentation or Extension of distribution SCADA system	------	10 GSs and CCCC
(5) 12kV/1250A GIS Panel	------	88 units
(6) Construction of Underground Cable		
220kV	Approx. 22km	Approx. 20km
132kV	Approx. 15km	Approx. 13.7km
11kV	Approx. 92km	Approx. 28.6km
(7) Special Vehicles		
Vehicle for high lift work	5 units	As planned
Hole Digging and Pole Standing Car	4 units	As planned
Digger	1 unit	Not procured
Cargo Crane	5 units	As planned
2. Project Period	Mar. 2012 - Dec. 2016 (46 months)	Mar. 2012 - Oct. 2019 (80 months)
3. Project Cost		
Amount Paid in Foreign Currency	13,147 million yen	12,725 million yen
Amount Paid in Local Currency	5,692 million yen (9,615 million LKR)	3,758 million yen (5,178 million LKR)
Total	18,839 million yen	16,483 million yen
ODA Loan Portion	15,941 million yen	15,593 million yen
Exchange Rate	1 LKR = 0.592 yen (As of November 2012)	1 LKR=0.7258 yen (Average between Jan. 2013 and Dec. 2020)
4. Final Disbursement	July 2020	