

Ex-Ante evaluation

1. Name of the Project

Country: Democratic Socialist Republic of Sri Lanka

Name of the Project: National Transmission and Distribution Network Development and Efficiency Improvement Project

Loan Agreement: August 11, 2015

Loan Amount: 24.930 billion yen

Borrower: The Government of Democratic Socialist Republic of Sri Lanka

2. Background and Necessity of the Project

(1) Current Status and Issues in the Power Sector in Sri Lanka

In recent years, the demand for electrical power in Sri Lanka has risen, showing an average of 3.9% growth over the last decade as it keeps pace with a rapidly growing economy of nearly 7% GDP growth. The country expects stable growth in peak demand going forward, with 3,920 MW predicted for 2021 versus 2,146 MW in 2012. Due to delays in upgrading the existing facilities, however, the aging transmission and distribution system as a whole has become an obstacle in catching up with the rapidly growing power demand. It is therefore essential that power transmission capacity be increased as quickly as possible. In relation to efforts towards energy efficiency, power losses in transmission and distribution are also challenges in the power sector. This can be improved by introducing high-voltage and low-loss wires, and the country is awaiting further efforts in this regard.

(2) Development Policies for the Power Sector in Sri Lanka and the Priority of the Project

The Ministry of Power and Energy (MOPE) that controls the country's power policies defined stable power supply and energy efficiency improvement as key policies under its National Energy Policy for Sri Lanka. Now, the country is working to construct and enhance power transmission and distribution facilities to satisfy its ever-growing power demands. For power transmission lines in particular, Sri Lanka has taken aggressive measures to reduce loss rate by reinforcing and rehabilitating aging transmission lines. Thanks to these efforts, the island has seen some improvements in power transmission and distribution losses. Specifically, the 2009 transmission and distribution loss rate of 13.90% was successfully lowered to 10.79% in 2013. Sri Lanka's transmission and distribution loss rate is still considered high compared to developed countries and the ASEAN countries (6.9% for Thailand and 6.4% for Malaysia in 2011), leaving room for further improvements. Accordingly, Sri Lanka is going to introduce Low-loss transmission lines for further reduction of transmission loss rate. This Project aims to stabilize power supply and improve energy efficiency throughout

the nation through construction, renewal, and enhancement of power transmission and distribution facilities in the targeted areas of the country, including Greater Colombo—the largest demand center. It is thus in line with Sri Lankan government's development policies.

(3) Japan and JICA's Aid Policy/Actual Performance for the Power Sector

The JICA Country Analytical Work for Sri Lanka provides an analysis that defines improvement in power supply reliability and energy efficiency as key challenges under the Power Conditions Improvement Program. Japan also defines "facilitation of economic growth" by stabilizing a low-cost power supply and improving basic power infrastructure as a key factor in the Country Assistance Policy for Sri Lanka; JICA's support in implementing the Project is thus highly relevant to these analyses and policies. JICA has approved a total of 172.1 billion yen in loans to the power sector in Sri Lanka (e.g. for power generation, transmission and distribution). This includes the Greater Colombo Transmission Distribution Loss Reduction Project (loan agreement for 15.941 billion yen in 2012). Japan's supports also include technical assistance and other programs, such as the Power Sector Master Plan (Development Study).

(4) Response from Other Donors

The Asian Development Bank (ADB) supports improvements in power transmission and distribution in Sri Lanka. However, there is no overlapping with the JICA's project. Instead, ADB's projects and JICA's projects mutually support stable operation of the power network. Synergy effects can therefore be expected in terms of achieving a stable power supply.

(5) Necessity of the Project

The Project will stabilize Sri Lanka's power supply and result in energy efficiency improvements. Since this is in line with the country's power development policies, JICA's support in implementing the Project is highly relevant to the Japan's country assistance policy for Sri Lanka. In addition, Japanese cooperation has a comparative advantage in technology related to the low-loss power transmission lines that are scheduled to be introduced under this Project. Thus supporting the implementation of the Project is highly necessary and relevant.

3. Project Description

(1) Project Objectives

By expanding and improving efficiency in transmission and distribution lines by building them nationwide, including in the Greater Colombo area, the Project contributes to increased stability in power supply while stimulating economic activities in Sri Lanka.

(2) Project Site/Target Area

Western Province, Central Province and North Central Province, among others

(3) Project Description

- 1) Construction and expansion of the transmission and distribution system (400 kV, 220 kV, 132 kV) and construction of new substations and substation expansions (220/33 kV, 132/33 kV, etc.) (International Competitive Bidding)
- 2) Reinforcement and improvement to transmission lines and construction of substations (International Competitive Bidding)
- 3) Consulting services (basic design, construction management, maintenance training, etc.) (Shortlist method)
- (4) Total Project Cost
31.430 billion yen (including Yen Loan Amount: 24.930 billion yen)
- (5) Project Implementation Schedule
From August 2015 to April 2020 (total of 57 months). The project will be completed when all facilities start operation (April 2019).
- (6) Project Implementation Structure
 - 1) Borrower: The Government of the Democratic Socialist Republic of Sri Lanka
 - 2) Executing Agency: The Ministry of Power and Energy
 - 3) Operation and Maintenance System: The Ceylon Electricity Board (CEB)
- (7) Environmental and Social Considerations, Poverty Reduction, and Social Development
 - 1) Environmental and Social Considerations
 - a) Category: B
 - b) Reason for Categorization: This project will not have substantial undesirable impact on the environment given the characteristics of the sector and the characteristics of the project area under the JICA Environmental and Social Guidelines (established in April 2010).
 - c) Environmental Permits: Initial Environment Examination (IEE) reports were prepared by executing agencies, and were approved by the Central Environmental Authority.
 - d) Anti-Pollution Measures: During construction, measures will be taken to address air quality, water quality, noise, and similar factors in order to satisfy Sri Lanka's emissions criteria and environmental requirements. Measures for air quality include spraying water to alleviate dust during drilling. Measures for surface water pollution include controlling construction workload during the monsoon season. To mitigate noise, measures such as notifying local residents of the construction schedule beforehand and having contractors carry out construction during daytime hours are expected. Waste (bark and lumber) will be properly managed throughout the construction period and after handover, and are expected to be disposed of in the future.
 - e) Natural Environment: The project site is not located in or around sensitive

areas such as national parks and world heritage sites, in addition to adverse impact on the natural environment is assumed to be minimal. A portion of the transmission and distribution line passes through the forest reserve (Tumbikulama, Angunakolapalassa, Karawilahena districts) registered by the Forest Department. The area where lines pass is made up of agricultural estates where cash crops are grown on a large scale with existing transmission and distribution lines; therefore, adverse impact on the environment will be minimal. The approval for project implementation in the area was obtained from the Forest Department. Consideration for minimizing unwanted impacts on the environment will be taken, including minimizing tree felling and planting trees if necessary.

- f) Social Environment: The Project requires no resettlement; however, about 7.57 ha of land will be acquired. The acquisition will take place based on the land acquisition plan prepared and approved under the JICA Guidelines and Sri Lanka's national laws.
 - g) Other/Monitoring: During the construction period, the CEB will monitor surface water pollution and noise in neighboring areas as well as airborne dust and other factors. After the handover, the CEB will carry out monitoring to track the impact on animals and plants, the impacts of vegetation and deforestation, safety of the substations, and more.
- 2) Promotion of Poverty Reduction: N/A
 - 3) Promotion of Social Development (e.g. Gender Perspective, Measures to Prevent Infectious Diseases Including AIDS, Participatory Development, Consideration for the Handicapped, etc.): N/A
- (8) Collaboration with Other Schemes and Donors: N/A
- (9) Other Important Issues: The Project will reduce transmission and distribution loss and is thus expected to reduce greenhouse gas emissions. The expected amount of climate change (GHG gas emission) mitigation is 33,659 tons of CO₂ per year.

4. Project Benefits

(1) Quantitative benefits

1) Evaluation Indicators (Operation and Effect Indicators)

Indicators	Baseline (2014 actual)	Target (2021) Two years after completion
Transmission line availability factor (%)*	-	46
Transmission transformer facility availability factor (%)*	-	34
Transmission loss factor (%)*	-	0.55

Distribution transformer facility availability capacity (MVA)*		8.1	38.7
Distribution loss factor (%)*	Dehiwala-Mount Lavinia Area	1.70	1.62
	Battaramulla Area	2.06	0.65

*Simple average of overall transmission and targeted transformer facilities. During the Project period, target values shall be defined for each facility and actual values shall be monitored.

2) Internal Rate of Return: Based on the following preconditions, the Economic Internal Rate of Return (EIRR) will be 16.16%. The Financial Internal Rate of Return (FIRR) will not be calculated due to the difficulties* in doing so appropriately.

*Ensuring accuracy in FIRR calculations for power transmission in transmission parts alone using the power selling price is difficult due to the large number of transmission components. Also, unbundling of the power authorities has not been achieved, causing additional difficulties in calculating revenue and expenditures for transmission and distribution of power respectively.

EIRR:

Cost: Project cost (excluding tax), operation and maintenance expenses

Benefits: Economic and other effects brought by reduced transmission and distribution losses and expanded power supply capacity.

Project Life: 30 years

(2) Qualitative benefits: Improved reliability through stabilized power supply

5. External Risk Factors and Risk Control

N/A

6. Lessons Learned from Past Projects

(1) Evaluations Results of Similar Past Projects

From Ex-Post Evaluation results and other data from the Phu My-Ho Chi Minh City 500 kV Transmission Line Project in Vietnam, it was learned that additional training was required for operating the 500 kV transmission line, as the necessary training was not provided on how to operate the new facilities.

(2) Lessons for the Project

This Project also includes Sri Lanka's first 400 kV transmission line. Therefore, sufficient training before starting operation will be provided through consultation services and the like, in order to ensure appropriate and smooth operation and maintenance of the new facilities.

7. Plan for Future Evaluation

(1) Indicators for Future Evaluation:

- 1) Transmission line availability factor (%)
- 2) Transmission transformer facility availability factor (%)

- 3) Transmission loss factor (%)
 - 4) Distribution transformer facility availability capacity (MVA)
 - 5) Distribution loss factor (%)
 - 6) Economic Internal Rate of Return (EIRR) (%)
- (2) Timing of Next Evaluation:
Two years after completion