

Ex-Ante Evaluation

1. Name of the Project

Country: Kingdom of Cambodia

Project: Phnom Penh City Transmission and Distribution System Expansion Project (Phase 2) (I)

Loan Agreement: March 30, 2015

Loan Amount: 3,816 million yen

Borrower: The Royal Government of Cambodia

2. Background and Necessity of the Project

(1) Current State and Issues of the Power Sector in Cambodia

In recent years, the Cambodia economy continues its steady growth, driven by textile manufacturing, tourism and agriculture. Real GDP growth reached 7.4% in 2013 and is expected to continue growing at a high rate in the future. Along with this economic growth, the demand for electrical power has also rapidly increased. The volume of generated and imported electricity increased an average of 19.4% annually from 2003 to 2013. Expansion of facilities in the power sector is a pressing issue. Of particular importance is Phnom Penh, the economic center of the country. With a population of 1.7 million, Phnom Penh accounts for approximately 70% of the domestic electricity demand. Electricité du Cambodge (EDC), the country's power company, has made ensuring the stable supply of power to this region its top priority. However, as current transmission and distribution facility, capacity is insufficient and a power control system has not yet been developed, the area affected by power outages is large and it takes a long time to restore power. In order to improve this situation and handle the increase in power demand, it is essential to reinforce transmission, substation and distribution facilities as quickly as possible.

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

In the Rectangular Strategy Phase III formulated by the Government of Cambodia, electrical power development is designated as a priority area in the development of physical infrastructure, which is one of the four main pillars of the strategy. Additionally, in the National Strategic Development Plan (2014-2018), the electric power sector was designated as a priority issue. As part of this, the government has prioritized further expansion of low cost, advanced power development and enhancement of the power transmission and distribution system.

(3) Japan and JICA's Policy and Operations in the Power Sector

In Japan's Country Assistance Policy for Cambodia (2012), the Development of Economic Infrastructure has been designated as one of the Pillars of Priority. The Project prioritizes assistance in developing a stable electricity supply system, which is a critical factor for attracting foreign direct investment. In the JICA Country Analysis Paper (JCAP) for Cambodia as well, new power development in the electric power sector is moving forward centered on independent power producers (IPP). As such, JICA analysis showed that ongoing assistance in enhancing the power transmission and distribution system and capacity building for operation and maintenance of power facilities is essential to improving the stability of power supply to meet the increasing power demand in the capital.

Regarding past assistance in the electric power sector, power grid transmission lines were constructed

between Kampot and Sihanoukville as part of the yen-loan Greater Mekong Power Network Development Project (completed November 2014). Also, in July 2014, a loan agreement was signed for the Phnom Penh City Transmission and Distribution System Expansion Project (Phase 1) for ensuring a stable power supply for central Phnom Penh. The transmission and substation facilities of central Phnom Penh will be enhanced in Phase 1. In this Project, transmission and substation facilities will be enhanced as in Phase 1, and also new high voltage 230 kV transmission lines will be installed for the first time from the outskirts of town to central Phnom Penh. These changes will improve electric power supply capacity and stability for greater Phnom Penh. Furthermore, a technical cooperation project entitled the Project for Improvement of Transmission System Operation and Maintenance (January 2013-September 2015) is currently underway.

(4) Other Donors' Activities

Through their Rural Electrification Fund (REF), the World Bank has provided rural electrification assistance for the Cambodian electric power sector. Additionally, Asian Development Bank (ADB), Germany, and China, etc. have also provided rural electrification assistance by expanding the power grid.

(5) Necessity of the Project

This Project is in line with the Cambodia's development agenda, its national policy, and Japan's assistance policy. Thus, the necessity and relevance for JICA's support in implementing this Project is high.

3. Project Description

(1) Project Objective

By building new substations, expanding existing substations, and installing transmission and distribution lines for the capital city of Phnom Penh, the Project will increase the stability of the electricity supply in the metropolitan area, and thus contribute to the economic development of Cambodia.

(2) Project Site/Target Area

Phnom Penh City

(3) Project Components

- 1) Construction of new substations and substation expansions (2 new, 2 expanded) and transmission and distribution system expansion (installing new 230 kV and 115 kV overhead transmission lines, installing new 230 kV underground transmission lines, installing new 22 kV distribution lines)
- 2) Consulting services (basic design, detailed design, tender assistance, construction management, etc.)

(4) Estimated Project Cost

26,587 million yen (amount of loan for the Project: 20,475 million yen; amount of this loan: 3,816 million yen)

(5) Project Schedule

Scheduled from March 2015 to January 2021 (71 months total). Project completion is defined as the start of the actual operation (February 2020).

(6) Project Implementation Structure

- 1) Borrower: The Royal Government of Cambodia
- 2) Guarantor: None
- 3) Executing agency: Electricité du Cambodge (EDC)
- 4) Operation/Maintenance/Management: Electricité du Cambodge (EDC)

- (7) Environmental and Social Considerations/Poverty Reduction/Social Development
- 1) Environmental and Social Considerations
 - (1) Category: B
 - (2) Reason for the Categorization: Since this Project does not include any sectors or characteristics that are liable to cause adverse environmental impacts nor sensitive areas specified in the JICA Guidelines for Environmental and Social Considerations (published in April, 2010), it is unlikely that the Project will have severe negative impact on the environment.
 - (3) Environmental Permit: The Initial Environmental Impact Assessment (IEIA) report for the Project has been written and submitted to the Ministry of Environment in March 2015 and is scheduled for approval in April 2015.
 - (4) Anti-Pollution Measures: During construction, the contractor will take measures in regard to air quality and noise, etc. including spraying water to alleviate dust and using low-noise equipment and construction methods. The contractor will dispose of waste materials generated after handover appropriately through a waste management company. With this, adverse impact on the environment is planned to be minimal.
 - (5) Natural Environment: The target area for the Project is not in a sensitive area such as a national park, nor in the surrounding area of such; therefore, adverse impact on the environment will be minimal.
 - (6) Social Environment: The Project will involve land acquisitions of 4.6 ha and involuntary resettlement of 3 households. There have been no dissenting opinions in particular during consultations with the residents and stakeholders, and so resettlement and land acquisition is scheduled to move forward according to JICA Environmental Guidelines and Cambodia domestic laws.
 - (7) Other Aspects/Monitoring: During the construction period of the Project, a contractor will monitor air quality, noise, etc. under the supervision of EDC. After handover, it is planned for EDC to monitor waste materials, etc.
 - 2) Promotion of Poverty Reduction: None in particular
 - 3) Promotion of Social Development: None in particular
- (8) Collaboration with Other Schemes and Donors: Through the technical cooperation, Project for Improvement of Transmission System Operation and Maintenance, the capacity of EDC for the operation and maintenance of substation and transmission equipment is being strengthened. It is expected that the results of this will be utilized in the maintenance management of equipment installed for this Project.
- (9) Other Important Issues: None in particular

4. Targeted Outcomes

- (1) Quantitative Effects
 - 1) Performance Indicators

Indicators	Facilities	Baseline	Target (2022) (Expected value 2 years after project completion)
Transformer availability factor (%)	National Control Center	-	98
	Toul Kork Substation	-	99
Electricity supply (MWh/year)	National Control Center	-	89,104
	Toul Kork Substation	-	90,119
Outage times of substation (times/year)	GS5 Substation	-	0
	National Control Center	-	0

2) Internal Rate of Return

Based on the following preconditions, the Economic Internal Rate of Return (EIRR) will be 15.4% and the Financial Internal Rate of Return (FIRR) will be 11.1%.

EIRR

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

Benefit: Reduction in alternate power procurement costs

Project Life: 25 years

FIRR

Cost: Project cost, operation and maintenance expenses

Benefit: Electricity sale income

Project Life: 25 years

- (2) Qualitative Effects: Stabilization of domestic power supply, promotion of investments, revitalization of the industry, etc.

5. External Factors and Risk Control

Power network malfunctioning due to aging of existing substation and transmission equipment. Natural disasters.

6. Lessons Learned from Past Projects

(1) Results of Evaluation of Similar Past Projects

From Ex-Post Evaluation results, etc. from the Power Distribution System Reinforcement Project in Thailand, it was learned that the need to enhance employees' technical skills is stronger when operation of the distribution system becomes more sophisticated. Therefore, based on distribution system automation, it is desirable to strengthen the capacity of employees to make better use of the infrastructure developed by the Project.

(2) Lessons for the Project

As further capacity building is required for EDC employees in the Transmission Department and Business and Distribution Department, a technical cooperation project entitled the Project for Improvement of Transmission System Operation and Maintenance was started in January 2013. With this, the capacity of EDC for the operation and maintenance of substation and transmission equipment is being enhanced. As of

November 2014, standards were enacted for equipment maintenance and inspection work was underway. Trainer certification standards have also been enacted, and trainer development and technology transfer implemented. Future aims are to build a system by which EDC can improve its own operations, review and discuss standards, and work to enhance the education system within the EDC organization.

7. Plan for Future Evaluation

- (1) Indicators to be Used
 - 1) Transformer availability factor (%)
 - 2) Electricity supply (MWh/year)
 - 3) Outage times of substation (times/year)
 - 4) Economic Internal Rate of Return (EIRR) (%)
 - 5) Financial Internal Rate of Return (FIRR) (%)
- (2) Time of Future Evaluation
Two years after project completion