

Ex-Ante Evaluation (for Japanese ODA Loan)
Southeast Asia Division 2, Southeast Asia and Pacific Department
Japan International Cooperation Agency

1. Name of the Project

- (1) Country: Kingdom of Cambodia (Cambodia)
- (2) Project Site / Target Area: Phnom Penh City
- (3) Project: Phnom Penh City Transmission and Distribution System Expansion Project (Phase 2) (III)

Loan Agreement: September 23, 2024

2. Background and Necessity of the Project

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

During the 10-year period prior to the pandemic (2010-2019), the real GDP in Cambodia achieved a remarkable growth rate, averaging over 7% per year. In 2020, due to the impact of the pandemic, it slumped to -3.1%, but it recovered to 5.5% in 2023 and is projected to continue growing by around 6% per year going forward (Asian Development Bank (hereinafter referred to as "ADB"), 2023). The main drivers of this growth are the export-oriented textile industry and the service industry, especially the tourism sector. Furthermore, since 2010, there has been an increase in manufacturing sites for industries other than the textile industry, such as automotive parts based on Thailand, Vietnam, or China plus one strategies¹. Along with this robust economic growth, the demand for electrical power has also rapidly increased. It grew approximately 4.2 times or by an average of 15.6% per year during the ten-year period from 2012. Establishing a stable power supply system to accommodate this demand is therefore a pressing issue.

Following the Rectangular Strategy – Phase IV implemented by the previous administration, the new Royal Government of Cambodia announced the Pentagonal Strategy – Phase I in September 2023. This positions the energy sector as a priority field and states that Cambodia will work to enhance connectivity and efficiency and to improve the business and investment

¹ A business strategy whereby companies, with a view to dispersing risks and reducing labor costs, pursue investment and business operations by dispersing their investment and production sites across countries and regions near their current production sites such as in China or Thailand.

environment. Furthermore, the power sector was also positioned as a priority field in the National Strategic Development Plan (2019-2023). In this context, the Royal Government of Cambodia has prioritized further expansion of low-cost, advanced power resources development and enhancement of the power transmission and distribution system in order to achieve an ample and stable supply of electricity, which is required for the country's growth.

The capital city of Phnom Penh in particular, which is the center of Cambodia's economy, with a high concentration of population and industrial sites, accounts for around 50% of domestic electricity demand. Due to the insufficient capacity of its transmission and distribution facilities, the city is affected by power outages and accidents, and the fact that it takes a long time to restore power after those outages and accidents. Based on these conditions, the Phnom Penh City Transmission and Distribution System Expansion Project (hereinafter referred to as "Phase 1") (L/A signed in July 2014) was launched to build and expand substations and install transmission and distribution lines and communication cables to create a transmission loop system in central Phnom Penh. In order to accommodate the subsequent robust growth in electricity demand, the Royal Government of Cambodia asked the Government of Japan to fund the Phnom Penh City Transmission and Distribution System Expansion Project (Phase 2) (hereinafter referred to as "the Project") in September 2014, and loan agreements were signed for the Project (I) in March 2015 and the Project (II) in May 2018. By further reinforcing transmission and distribution facilities, the Project will help provide a stable supply of electricity and support continued development and industrial diversification in the capital. It is therefore positioned as a high-priority project.

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

In Japan's Country Assistance Policy for Cambodia (July 2017), "promoting and supporting industry" is positioned as a priority field, and the policy states that Japan will "work to develop the investment environment, ensure a stable supply of energy, which is indispensable to promoting industry, and cultivate industrial human resources." According to the JICA Country Analysis Paper for Cambodia (March 2014) as well, since power generation development is promoted mainly by independent power producers (IPPs), JICA should keep focus on enhancing transmission and distribution lines and capacity building for power facility operation and maintenance to improve the stability of the power supply, especially in the capital city area, where electricity demand is growing. In addition, JICA's

Global Agenda for “Energy Mining” states that it will work to establish an electric utility system which can provide ample, stable power that is affordable and sustainable, especially by strengthening the transmission and distribution network. This Project, which will contribute to stabilizing the electricity supply through strengthening the transmission and distribution network, is consistent with these policies and analyses.

Regarding past support in the power sector, as part of the Greater Mekong Power Network Development Project (L/A signed in March 2007), power grid transmission lines were constructed between Kampot and Sihanoukville (started operation in May 2014). The Southern Economic Corridor Distribution Expansion Project (Grant Agreement signed in September 2016) developed a distribution system connected to the core domestic system in a region that had been dependent on importing its power supply from a neighboring country. Furthermore, in Phase 1 of this ODA loan, substation facilities were strengthened for the purpose of looping the transmission system in order to improve the reliability of the power supply in central Phnom Penh. Besides these, the Project for Development of Clean Energy Transition Roadmap towards Carbon Neutral Society (April 2023 to April 2025, Technical Cooperation Project) is supporting the creation of an energy transition roadmap based on multiple energy supply and demand scenarios, with the aim of achieving carbon neutrality by 2050.

The Project will contribute to stabilizing the power supply through reinforcing the transmission and distribution network and will also contribute to SDGs Goal 7 (ensuring access to affordable, reliable, sustainable, and modern energy for all).

(3) Other Donors' Activities

ADB has supported the creation of an electricity development plan until 2040 for Cambodia's power sector. It has also supported the development of the transmission and distribution grid across a broad area centering on Phnom Penh, is planning the introduction of a battery energy storage system as a pilot project, and is considering supporting the construction of solar power plants. World Bank is planning development of the transmission and distribution grid, especially in Phnom Penh City and Kandal Province, and has already arranged the division of roles with the Project. Germany's KfW Development Bank is currently supporting development of the transmission and distribution grid, especially in Siem Reap Province. Agence Française de Développement is considering construction of substation facilities in northern Cambodia as well as the introduction of a more advanced load dispatching center system and a battery energy storage system.

3. Project Description

(1) Project Description

1) Project Objective

The objective of the Project is to enhance the stability of electrical supply in Phnom Penh, by providing new substations, transmission lines, distribution lines and related facilities, and augmenting the existing substations, thereby contributing to sustainable economic growth in Cambodia.

2) Project Components

- i) Substation construction (2 new, 2 expanded)
- ii) Transmission and distribution system expansion (installing new 230 kV and 115 kV overhead transmission lines, installing new 230 kV and 115 kV underground transmission lines, and installing new 22 kV distribution lines)
- iii) Consulting services (basic design, detailed design, tender assistance, construction management, etc.)

3) Project Beneficiaries (Target Group)

Residents of Phnom Penh City (population: approx. 2.28 million), large-scale power users such as factories, and private-sector companies

(2) Estimated Project Cost

26,558 million yen (7,988 million yen of which is covered by Japanese ODA loan for the Project (III))

(3) Schedule (Cooperation Period)

Scheduled from March 2015 to August 2028 (162 months total). The start of facility operation (scheduled for February 2027) is considered as the completion of the Project.

(4) Project Implementation Structure

- 1) Borrower: The Royal Government of Cambodia
- 2) Executing Agency: Electricité du Cambodge (EDC)
- 3) Operation and Maintenance System: EDC

(5) Collaboration and Sharing of Roles with Other Donors

1) Japan's Activity

In Phase 1 of this ODA loan, JICA strengthened substation facilities for the purpose of looping the transmission system in central Phnom Penh. The Project aims to improve the power supply's capacity and stability by

installing high-voltage 230kV transmission lines from suburban to central Phnom Penh for the first time and connecting them to a looped transmission grid in the city center. Furthermore, through the Project for Enhancement of Operation and Management of Cambodian Transmission System (2017-2024, Technical Cooperation Project related to ODA Loan), JICA provided support aimed at strengthening EDC's substation facility operation and maintenance capabilities, and it is expected that the outcomes will be applied to operation and management of the facilities developed in the Project.

2) Other Donors' Activity

Not applicable.

(6) Environmental and Social Consideration

① Category: B

② Reason for Categorization: The project is not located in a sensitive area, nor has it sensitive characteristics, nor falls it into sensitive sectors under the JICA guidelines for environmental and social considerations (April 2010) , and its potential adverse impacts on the environment are not likely to be significant.

③ Environmental Permit: The Initial Environmental Impact Assessment (IEIA) report for the Project has already been approved by the Ministry of Environment on January 6, 2016.

④ Anti-Pollution Measures: During construction, the contractor will take measures with regard to air quality, noise, etc., including spraying water to prevent dispersal of dust and using low-noise equipment and construction methods, in order to meet Cambodia's domestic emission standards and environmental standards. With this, the adverse impact on the environment is planned to be minimal.

⑤ Natural Environment: The target area for the Project is not in or near a sensitive area such as a national park, and the adverse impact on the environment will therefore be minimal.

⑥ Social Environment: The Project involves acquiring around 4.8 ha of land, which will proceed according to the Resettlement Action Plan created in accordance with Cambodia's domestic procedures and the JICA Guidelines for Environmental and Social Considerations. Acquisition of around 4.5 ha of the land required for expansion of existing substations and overhead transmission towers has already been completed, and

acquisition of around 0.3 ha for part of a substation and the remaining overhead transmission towers is currently under way. With regard to the transmission line installation route (right of way), no involuntary resettlement is expected to occur, but since restrictions on use have been set for land under the lines from a safety perspective, compensation will be provided to landowners. The compensation details are being negotiated with the landowners, and progress will be monitored.

⑦ Other Aspects/Monitoring: During construction, the contractor will monitor air quality, noise, water quality, etc. under the supervision of EDC. Once operation begins, EDC will conduct monitoring of safety management, soil/water pollution, etc. EDC will also monitor the status of land acquisition.

(7) Cross-Sectoral Issues

The Project is expected to contribute to climate change mitigation (estimated CO₂ emission reduction for the project as a whole: 6,846 t/year).

(8) Gender Category: Not applicable ■GI (gender mainstreaming needs survey and analysis)

<Details of Activities/Reason for Categorization> While discussions were held with the executing agency when developing the plan for the Project (III), initiatives and targets that will contribute to gender mainstreaming was not established and planned. EDC plans to recommend that women apply for management positions.

(9) Other Important Issues

Since 2010, the presence of the Japanese manufacturing industry in Cambodia has advanced significantly, centering on Phnom Penh SEZ. Furthermore, the entry of the Japanese retail sector (AEON Mall, etc.) and service industry (restaurants and hotels) into Phnom Penh is also progressing. The Project will contribute these activities of Japanese companies by stabilizing the electricity supply.

4. Targeted Outcomes

(1) Quantitative Effects

1) Outcomes (Operation and Effect Indicators)

Indicator	Project Site	Baseline (Actual value in 2014)	Target (2029) [2 years after project completion]

Transformer availability factor (%)	GS3 (115/22 kV) (expanded)	73 (3 transformers)	60 (4 transformers)
	GS Toul Kork (115/22 kV) (new)	-	64
	GS Chba Ampov (115/22 kV) (new)	-	69
Electricity supply (MWh/year)	GS3 (115/22 kV) (expanded)	611,458 (3 transformers)	791,842 (4 transformers)
	GS Toul Kork (115/22 kV) (new)	-	279,176
	GS Chba Ampov (115/22 kV) (new)	-	302,834
Outage times of substation (times/year)	All substations	-	0

(Note) The table reflects changes in power system conditions and demand forecasts since the appraisal of the Project (II). Furthermore, since the power flow in interconnected 230/115 kV transformers and transmission lines will change based on the transmission system's operating status, no availability factor or electricity supply targets are set for GS5, which will expand its 230/115 kV facilities.

(2) Qualitative Effects

Stabilization of domestic power supply, promotion of investments, revitalization of the industry, etc.

(3) Internal Rate of Return

Based on the following preconditions, the Project's Economic Internal Rate of Return (EIRR) will be 40.0% and the Financial Internal Rate of Return (FIRR) will be 26.1%.

【EIRR】

Cost: Project cost (excluding tax), operation and maintenance expenses (including power purchasing costs)

Benefit: Reduction in alternate power procurement costs

Project Life: 25 years

【FIRR】

Cost: Project cost, operation and maintenance costs (including power purchasing costs)

Benefit: Electricity sale income

Project Life: 25 years

5. External Factors and Risk Control

- (1) Preconditions: The distribution grid from the new substations constructed in the Project will be developed by the executing agency without delay.
- (2) External Factors: Not applicable.

6. Lessons Learned from Past Projects

From ex-post evaluation results (ex-post evaluation year: 2009) for the Power Distribution System Reinforcement Project (Japanese ODA Loan Project) in Thailand, it was learned that as operation of the distribution system becomes more sophisticated, there is a greater need to enhance employees' technical skills, and it is therefore desirable to strengthen employee's capabilities to make better use of the infrastructure developed by the Project.

Based on the above learning as well as the future introduction of the distribution automation system, EDC will take care to ensure that the outcomes of strengthening system operation capabilities by the Project for Enhancement of Operation and Management of Cambodian Transmission System (2017-2024, Technical Cooperation Project related to ODA Loan) are applied to operation and management of transmission and distribution facilities developed in the Project.

7. Evaluation Results

The Project is consistent with development issues and policies in Cambodia and with Japan's and JICA's cooperation policies and analyses, it will contribute to stabilizing power supply in Phnom Penh City, where population and industrial sites are concentrated, through reinforcing transmission and distribution facilities, as well as it should contribute to SDGs Goal 7 (ensuring access to affordable, reliable, sustainable, and modern energy for all). Therefore, it is highly necessary to support the implementation of the Project.

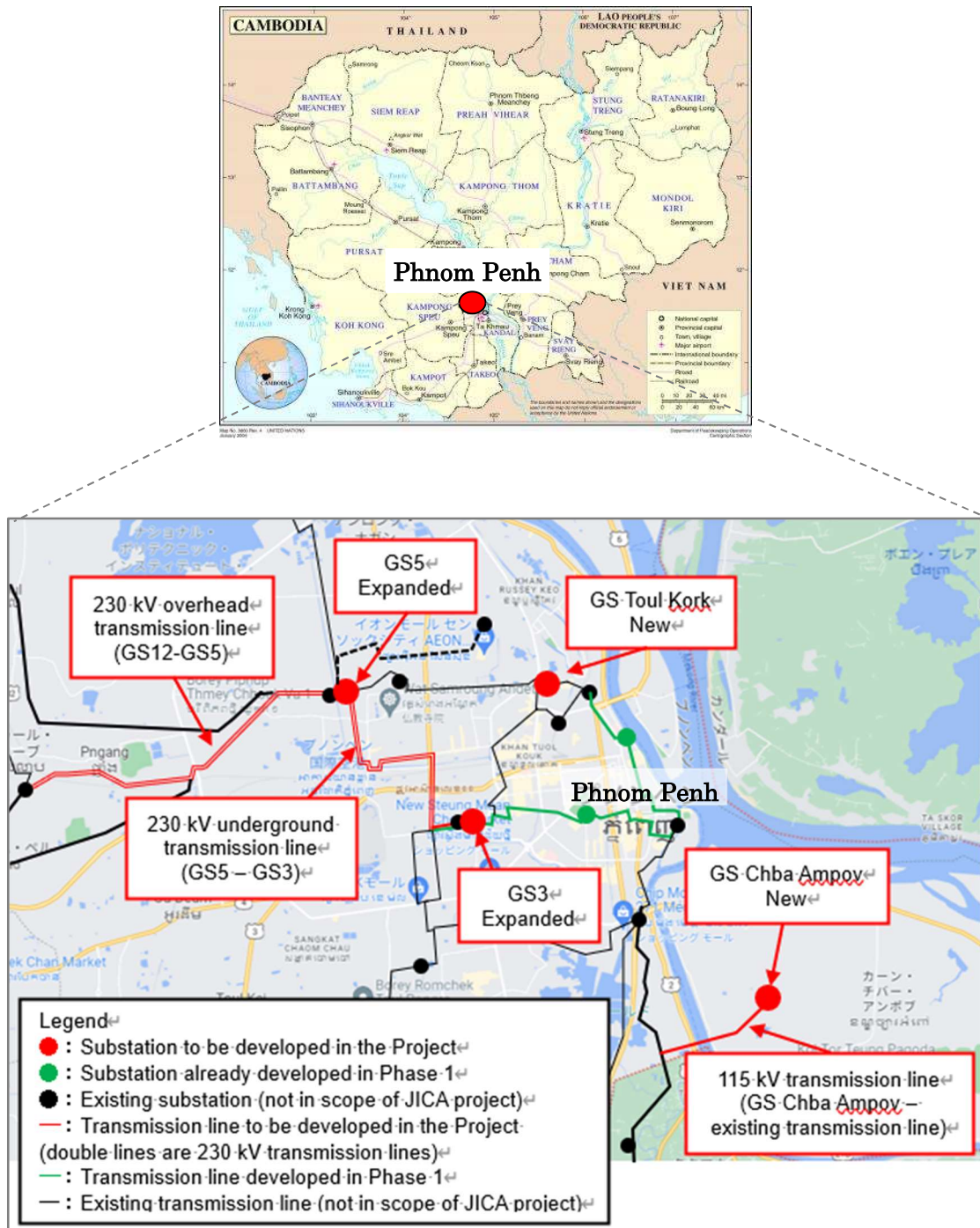
8. Plan for Future Evaluation

- (1) Indicators to Be Used
As indicated in Section 4.
- (2) Future Evaluation Schedule
Ex-post evaluation: 2 years after the project completion

END

Attachment: Map of Phnom Penh City Transmission and Distribution System
Expansion Project (Phase 2) (III)

Map of Phnom Penh City Transmission and Distribution System Expansion Project (Phase 2) (III)



Source: United Nations (<https://www.un.org/geospatial/content/cambodia>)

Created by JICA based on Google Maps (map data ©2023 Google)