

Ex-Ante Evaluation(for Japanese ODA Loan)

Private Sector Investment Finance Division, Private Sector Partnership and Finance Department

1. Name of the Project

- (1) Country: Federal Republic of Brazil (“Brazil”)
- (2) Project: Project for Rehabilitation of Distribution Network in Northeastern Area
- (3) Project Site / Target Area: Pernambuco, Brazil
- (4) Loan Agreement: March 30th, 2023

2. Background and Necessity of the Project

- (1) Current State and Issues of the Electric Power Sector in Brazil

In the Brazilian electric power sector, the introduction of renewable energy has been promoted and it accounts for 84% of the total power generation capacity (Brazilian Electricity Regulatory Agency (hereinafter referred to as “ANEEL”), 2022) and 87% of the total final energy generated in 2022 (ANEEL). Meanwhile, most of renewable energy generation relies on hydroelectric power(60%), therefore severe drought causes power shortages and power prices soar frequently.

Responding to this issue, the Brazilian government has a policy to strengthen the stable power supply by expanding the use of renewable energy other than hydropower in the power supply mix(National Energy Plan 2050).

On the other hand, the burden on the transmission and distribution system is increasing and the deterioration of existing facilities is accelerating due to the diversification of power sources. These factors are raising concerns about the impact they will have on the ability to provide a stable and efficient power supply. These are regarded as urgent issues up to 2030 (National Energy Plan 2050).

The project site, the state of Pernambuco, is located in the northeastern part of Brazil. Its population is 9.675 million (2021), and is expected to reach 10 million in 2028 and continue to increase until 2042 (Brazilian Institute of Geography and Statistics (hereinafter referred to as “IBGE”), 2018). Also Pernambuco is home to the largest number of poorest segment of the population. The state’s poverty rate is particularly high, at 42.2%, the fourth highest among all Brazilian states (IBGE, 2020). In addition, the GINI index is the highest in the northeastern region (0.578 (IBGE, 2016)), and the state's unemployment rate is 19.9%, the highest in Brazil(IBGE, 2021).

The state is therefore working to attract foreign companies, as well as those from neighboring regions, to invest as a measure against poverty and intends to promote economic growth through industrial diversification by enacting the Pernambuco State Development Program (PRODEPE) in 2010 as an anti-poverty measure. The program contributes to improve the average annual GDP growth. The growth rate was improved

averagely 1.2% from 2010 to 2019, exceeding the national average of 0.7% in Brazil. Going forward, the Pernambuco intends to continue promoting economic growth by industrial diversification through this program, and anticipates an increase in electricity demand accompanying economic growth (14,608 GW in 2021 → 18,649 GWh in 2032 (borrower forecast)). In this context, an increase and stabilization in the power supply through an expansion of the power system is also important.

The borrower, Companhia Energetica de Pernambuco (hereinafter referred to as "CELPE"), is a company responsible for power distribution in the state. They actively promote climate change countermeasures, such as increasing procurement amount of renewable energy power by issuing green bonds, for maintaining the amount of CO₂ contained in procured and distribute power at 100g/kWh or less). On the other hand, as described above in the nationwide issues of Brazil, if the composition ratio of renewable energy power increases in the future, it would cause instability on power distribution and power loss ratio, power outage duration and frequency will worsen. In addition to the active use of renewable energy, aging facilities, theft and long-distance power transmission from the major hydroelectric power generation areas in the country (Southeastern and Northern regions of the country), have caused increase of power loss ratio of 19.8% (2020) in Pernambuco, it is higher than the national average of 14.8% (2020), and does not meet regulated limit for the state (16.00%) set by ANEEL. In addition, power outages were confirmed 18 times for total 25 to 50 hours per year. (June 2021-May 2022). In order to deal with this issue, it is necessary to introduce facilities that protect the grid and flexibly respond to changes in power supply and demand, such as smart grids, high-quality transformers and substations.

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

This project aims to promote energy conservation in Pernambuco by expanding and renovating power distribution facilities, and introducing equipment which stabilize power distribution network. In doing so, it will contribute to the stabilization of the power distribution system, improvement of electric loss ratio caused by the expanded use of renewable energy and to the achievement of SDGs (Sustainable Development Goals) Goals 7 (Affordable and clean energy), 10 (Reduced inequalities), 13 (Climate action), and 17 (Partnerships for the goals). It also contributes to a priority area of the Japanese government's Country Development Cooperation Policy for Brazil (April 2018), "Urban Problems and Environment and Disaster Planning," and the Cooperation Program's "Climate Change Countermeasures Program." The Project is consistent with the Country Analysis Paper (January 2016) that considers cooperation with the power transmission and distribution field, as JICA deals with the issues of the increase of technical losses (losses due to resistance and leakages during transmission of electricity) and frequent power outages.

In addition, this project will contribute to the priority area of "Urban issues and environment/disaster prevention measures" in the country development cooperation policy for Brazil (April 2018) and the cooperation program "Climate change countermeasure program". In addition, in the JICA country analysis paper (January 2016), consideration is being given to cooperation in the field of power transmission and distribution while addressing issues such as an increase in technical losses (losses due to resistance and leakage during power transmission) and frequent power outages.

(3) Other Donors' Activities

BNDES (Brazil's National Bank for Economic and Social Development) financed CELPE.

3. Project Description

(1) Project Description

① Project Objective

The objective of the Project is, by expansion and renovation of electric power grid, to increase grid capacity and promote energy efficiency through the reduction of electric power losses, thereby contributing to stable power distribution in the state of Pernambuco in Brazil.

② Project Components

Rehabilitation and renovation of substations and other equipments for electrical grid.

(2) Estimated Project Cost

21 billion Yen (JICA financing amount: 12 billion Yen)

(3) Schedule

April 2023 - December 2025 (33 months)

(4) Project Implementation Structure

1) Borrower: CELPE

2) Guarantor: Neoenergia S.A.

3) Executing Agency: CELPE

4) Operation and Maintenance System : CELPE

(5) Environmental and Social Consideration

① Category: FI

② Reason for Categorization: This project's categorization is based on the "JICA Environmental and Social Consideration Guidelines" (January 2022, hereafter referred to as "JICA Guidelines"), as it's assumed that subprojects cannot be specified before JICA's loan agreement, and that those subprojects will have an effect on the environment.

③ Other/Monitoring: CELPE is going to categorize each subproject and take appropriate measures in line with CELPE's internal regulation for Environmental and social matters, Brazilian related law and JICA Guidelines. Also, CELPE has agreed with JICA not to develop Category A projects.

(6) Gender Category

Gender Informed (Significant) [GI(S)]

In this project, it has been confirmed that the borrower is implementing specific measures to contribute to the empowerment of women, such as increasing the ratio of female engineers and electricians, and the measures, target values, etc. have been confirmed and agreed between the borrower and JICA.

(7) Other Important Issues

GHG emission reductions are calculated based on the difference between emissions before and after efficiency improvements in transmission, and are assumed to be 22,552 tCO₂/year.

4. Targeted Outcomes

(1) Quantitative Effects

Outcomes (Operation and Effect Indicators)

Indicator	Baseline (Actual value in 2022)	Target (2027) [2 years after project completion]
Availability factor (%) = Maximum load (MW) / {rated capacity of the facility (MVA) × power factor}	61.1	58.9
Loss Ratio(%)	16.8	16
SAIDI (System Average Interruption Duration Index)	12.3	10.5
SAIFI(System Average Interruption Frequency Index)	5.6	5.1

(2) Qualitative Effects

Stimulation of industry by expansion of power distribution network and reducing the frequency of blackouts, improvement of the quality of life of local residents, and contribution to climate change countermeasures

5. Lessons Learned from Past Projects

The lesson learned in the ex-post evaluation of the ODA loan to Peru for the “Electric Frontier Expansion Project (III),” (2018) was the need to specifically understand and consider experiences from similar projects and the ability of the executing agency, in order to consider the appropriate form of contract for projects where supervising the implementation

is considered to be very difficult, due to the inclusion of factors like the procurement of large quantities of materials and equipment, and construction work being carried out at multiple remote locations. Regarding this project, procurement process is going to be managed based on the procurement policy and system of the major shareholder Neoenergia S.A., which has adequate experience in procurement and construction management in Brazil. In addition, CELPE has carried out their operation in Pernambuco more than 20 years. Therefore, there are no concerns about its experience and ability.

6 . Evaluation Results

As described above, the need for the Project has been recognized, there is an appropriate project plan with a sufficient likelihood of achieving it, the Project will contribute to the achievement of SDGs (Sustainable Development Goals) Goals 7 (Affordable and clean energy), 10 (Reduced inequalities), 13 (Climate action), and 17 (Partnerships for the goals), and thus this loan will be granted.

7 . Plan for Future Evaluation

(1) Indicators to be Used

As indicated in Sections 4.

(2) Future Evaluation Schedule

Ex-post evaluation:3 years after the project completion

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