

## Ex-ante Evaluation (for Japanese ODA Loan)

### 1. Name of the Project

Country: The Kingdom of Bhutan

Project: Rural Electrification Project (Phase 2)

Loan Agreement: June 23, 2011

Loan amount: 2,187 million yen

Borrower: The Royal Government of Bhutan

### 2. Background and Necessity

#### (1) Current State and Issues of the Electric Power Sector in Bhutan

With its abundant water resources, Bhutan produces electric power at a level of 6,897GWh per year (2009). The vast portion of this electric power is exported to India, and is the main source of foreign exchange. On the other hand, annual domestic power consumption in Bhutan is only 1,372GWh (2009). However, in rural villages scattered throughout the mountainous areas where 70% of the total population live and 98% of poor people live, the household electrification rate is as low as around 54% (2008), and lack of access to electricity is a bottleneck to economic activities and improvement in the standard of living. According to the results of JICA's development study, the Rural Electrification Master Plan (2005), the highest need among residents in rural areas is for an increase in the household electrification rate, because electricity can support the use of agricultural machinery to boost agricultural productivity and domestic cottage industries after dark.

#### (2) Development Policies for the Electric Power Sector of Bhutan and the Priority of the Project

Advocating the development philosophy called "Gross National Happiness (GNH)," the Government of Bhutan has been pursuing, without placing too much emphasis on economic growth expressed in GNP, the establishment of a fair and happy society. In a long-term vision "A Vision for Peace, Prosperity and Happiness" which was established in 1999 for the realization of the above-mentioned philosophy, rural electrification is identified as an important objective along with road construction from the viewpoint of reducing the disparity between urban and rural areas, reducing poverty, and promoting industries. In line with the long-term vision, the new government inaugurated at the time of democratization of the country in 2008 made a public commitment to achieve "electrification for all" and planned to electrify about 44,000 households during the 10th Five-Year Plan (July 2008-June 2013). This project will support electrification of around 3,700 households in areas other than those already supported by existing aids, including Japanese ODA loan.

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

The Rolling Plan for Bhutan (2009) targets rural electrification as one of the country's development issues, and JICA conducted a series of efforts to contribute to poverty reduction through rural electrification projects: the above development study, the prior phase of this

Japanese ODA loan project, the Rural Electrification Project (2007, 3,576 million yen), and a technical cooperation project, the Rural Electrification Promotion Project (2008-2011). These projects were mainly focused on rural electrification through the establishment of power distribution networks. Therefore, this project is consistent with the assistance policy.

#### (4) Other Donors' Activity

Based on the Master Plan, the Asia Development Bank (ADB) and the Australian government have been supporting rural electrification projects on an ongoing basis. The ADB has started supporting follow-up projects since December 2010.

#### (5) Necessity of the Project

In the light of the above, reducing the disparity between urban and rural electrification rates in households is absolutely imperative to achieve equitable and sustainable development. Further, it is predicted that household electrification can eventually contribute to reduction in deforestation and GHG emissions by reducing the use of fossil fuels such as kerosene and wood fuel. Since the project is expected to bring environmental conservation and mitigation of climate change, the Bhutan government identified the improvement in electrification rate in households as the utmost priority issue of development. Therefore, the necessity and relevance of JICA's assistance in this project to help unelectrified households to gain access to electricity is considered to be high by using JICA's past experience.

### **3. Project Description**

#### (1) Project Objective(s)

This project aims to provide access to electricity for un-electrified households and other facilities by constructing distribution lines and related facilities in the rural areas of Bhutan, thereby improving living standard of local residents including the poor, promoting economic and social development, and mitigation of climate change in the concerned areas.

#### (2) Project Site/Target Area

Eleven Dzongkhags (districts) (Chukha, Dagana, Haa, Paro, Pemagatshel, Punakha, Samtse, Sarpang, Trongsa, Tsirang, and Wangduephodrang) (No overlapped villages which were supported by other projects including the prior phase of Japanese ODA loan assistance)

#### (3) Project Component(s)

1) Construction of power distribution networks (New installment of medium/low voltage distribution lines and equipment, installment of transformers, construction works, etc.)

2) Consulting services (supervision of construction works, operation/maintenance, etc.)

#### (4) Estimated Project Cost (Loan Amount)

2,574 million yen (Loan Amount: 2,187 million yen)

#### (5) Schedule

June 2011 - June 2014 (37 months) Project completion is defined as completion of construction work (June 2013).

#### (6) Project Implementation Structure

1) Borrower: The Royal Government of Bhutan

2) Project Executing Agency: Department of Energy, Ministry of Economic Affairs (DOE)  
Actual procurement and construction will be implemented by Bhutan Power Corporation (BPC).

3) Operation and Maintenance System: BPC

(7) Environmental and Social Consideration/Poverty Reduction/Social Development

1) Environmental and Social Consideration

i) Category: B

ii) Reason for Categorization

This project is not considered to have any significant negative impact on the environment, given the characteristics of the sector, the characteristics of the project and the characteristics of the project area, under the “Japan Bank for International Cooperation Guidelines for Confirmation of Environmental and Social Consideration” (established in April 2002). For this reason, this project is classified as Category B.

iii) Environmental Permit

Under the legal system of Bhutan, Initial Environmental Examination (IEE) report (Environmental Impact Assessment (EIA) for some area) is required. The executing agency and BPC will prepare the IEE (or EIA) report and National Environmental Committee will approve it by September 2011 for all target areas of this project.

iv) Anti-Pollution Measures

The contractor will take appropriate measures to mitigate noise, dust, and the like as necessary.

v) Natural Environment

Some distribution lines will cross Protected Area and Biological Corridor. However, the range of deforestation is thought to be minimized by the use of covered conductor. Therefore, the project is not likely to have significant negative impact on the natural environment.

vi) Social Environment

Due consideration will be given so that installation of distribution lines will not affect the land use even when distribution lines run through private land. The project does not involve land acquisition or resident relocation, and utility poles are installed with the land owner's permission.

vii) Other/Monitoring

The executing agency will monitor the sediment discharge, deforestation, and impact on livelihood during the implementation of the project.

2) Promotion of Poverty Reduction

The rural villages are heavily inhabited by the poor (40%) in comparison with the national average (23%) poverty ratio. Among these rural villages, the target areas of this project are the most remote areas among rural villages in particular. Therefore, a contribution to poverty reduction can be expected with the implementation of this project, as it improves living conditions at target households.

3) Promotion of Social Development (Gender Perspective, Measures for Infectious Diseases Including HIV/AIDS, Participatory Development, Considerations for the Persons with Disabilities, etc.)

In remote areas, BPC is planning to provide some residents of the target villages with technical training so that they will be able to perform maintenance on internal wiring in the future.

(8) Collaboration with Other Donors

This project will divide up the target area with other donors. ADB will provide assistance to six districts, the Australian government to one, and JICA to eleven.

(9) Other Important Issues

Electrification in rural areas can reduce the use of fossil fuels including kerosene and reduce GHG emissions, thereby helping to mitigate climate change. The project plans to apply the Clean Development Mechanism (CDM).

**4. Targeted Outcomes**

(1) Performance Indicators (Operation and Effect Indicators)

| Indicator  | Baseline<br>(Available Value in<br>2009)   | Target (2015)<br>[Expected value 2 years<br>after project completion] |
|--|--|---|
| Rural Household Electrification Ratio (%)<br>(contribution to rural household<br>electrification ratio by the Project) (%)<br>(number of households electrified by the<br>Project) | 54 (2008)<br>-<br>-  | 100<br>(4.2)<br>(3,728)   |
| Bill Collection Rate (%)   | 96.0   | 96.0  |
| Electricity Consumption (LV Consumer in<br>the targeted Dzongkhags) (excluding loss)<br>(GWh/yr)   | 126  | 189   |
| Removals by sinks in Greenhouse Gas<br>(t CO <sub>2</sub> equivalent)  | Wait for results of ongoing JICA's survey for assisting<br>CDM project registration conducted by the JICA<br>Global Environment Department |   |
| SAIDI (under ESD control in the targeted<br>Dzongkhags) (hours / customer/ year)   | 10.82  | 9.90  |

(2) Internal Rate of Return

Based on the conditions indicated below, the Economic Internal Rate of Return (EIRR) for the project is 8.1%.

**【EIRR】**

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

(b) Benefit: Willingness to pay by potential users, cost reduction for use of kerosene/battery/ firewood, revenues for power suppliers

(c) Project Life: 30 years

## **5. External Factors and Risk Control**

Increase in the project cost caused by a substantial rise in material prices and exchange fluctuations

## **6. Lessons Learned from Past Projects**

In the post evaluations of past projects involving rural electrification, lessons were learned that in a project involving the building and expansion of a power distribution network, review of the plan at any time and flexible handling are necessary. A project monitoring unit dedicated to this project is to be established in BPC and the management are planning to regularly check the progress of the project and discuss how to deal with problems if any.

## **7. Plans for Future Evaluation**

### (1) Indicators for Future Evaluation

- (a) Rural Household Electrification Ratio (%)
- (b) Contribution to rural household electrification ratio by the Project (%)
- (c) Number of households electrified by the Project
- (d) Bill Collection Rate (%)
- (e) Electricity Consumption (LV Consumer in the targeted Dzongkhags) (excluding loss) (GWh/yr)
- (f) Removals by sinks in Greenhouse Gas (t CO<sub>2</sub> equivalent)
- (g) SAIDI (under ESD control in the targeted Dzongkhags) (hours / customer/ year)
- (h) EIRR (%)

### (2) Timing of Next Evaluation

Two years after project completion