

Ex-Ante Evaluation

1. Name of the Project

Country: Republic of Peru

Project: Moquegua Hydro Electric Power Plants Construction Project

Loan Agreement: November 7, 2014

Loan Amount: 6,944 million yen

Borrower: Republic of Peru

2. Background and Necessity of the Project

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

Due to Peru's recent stable economic growth, the energy demand (final consumption) increased by an approximate annual average of 7 percent for 8 years up to 2011, which was dealt with by development of power resources mainly consisting of natural gas. The energy demand is expected to increase by 8.2% annually in 2013-2022, and it is necessary to triple the power generation/supply capacity by 2030 (Electricity Sector in Peru 2012, Ministry of Energy and Mines (MEM)). In terms of region, the power generation capacity in the central region centered on the Lima metropolitan area has been increased, making up for the demands in the northern and southern regions. Especially in the southern region, the operation rate of hydroelectric power stations declines during the dry season due to water shortage, which further increases the demand/supply gap. Approximately 430MW, which is more than half of the power demand, is supplied relying on the power transmission from the central region. While the power demand in the southern region is expected to increase approximately 1,107MW by 2016 and approximately 1,365MW by 2019 to meet mining resources development (Statistics 2012, Committee for the Economic Operation of the Electric System (COES)), the development plan of new power resources planned by 2016 is for no more than 1,046MW. Even if the new plants are completed as planned, the demand is still expected to surpass the supply (Moquegua Hydro Electric Power Plants Construction Project F/S 2013). Power generation plans to deal with the expected increase of power demand from 2017 has not been determined for reasons such as F/S is not finished, fundraising or implementation is not decided yet. Considering the above, it is an important issue to reinforce the power generation capacity in southern Peru on a medium-term basis.

(2) Development Policies of the Electric Power Sector/Southern Region in Peru and the position of the Project.

Peru introduces the policy objective of diversify power resources while focusing on renewable energy and energy efficiency in the "National Energy Policy for 2010-2040" (Presidential Decree in 2010). The Law on Encouragement of Power Generation Using Renewable Energy (2008) was also enacted, featuring the policy

to use renewable energy for 5% of all electricity consumption by 2018. Therefore, promotion of utilization of renewable energy resources with less greenhouse gas (GHG) emission such as small hydroelectric generation is necessary. In Moquegua Region located in southern Peru, “Pasto-Grande Special Regional Development Project” (hereinafter referred as “the PG Plan”) is also being implemented with the objective of constructing irrigation facilities to expand agricultural production. The “Moquegua Hydro Electric Power Plants Construction Project” (hereinafter referred as “the Project”) is intended to generate power using irrigation water downstream of the reservoir in the PG Plan targeted area and is prioritized as an important component of the second-stage construction of the PG Plan.

(3) Japan and JICA’s Policy and Operations in the Electric Power Sector/Southern Region in Peru

Japan’s country assistance policy for Peru and JICA Country Analysis Paper prioritize “improvement of the economic and social infrastructure and disparity reduction”, “environmental measures” and “disaster prevention measure”, and implementation of the Project is consistent with such policies and analyses. For the electricity sector in Peru, Japan has provided 9 ODA Loans totaling approximately 80 billion yen as well as provision of technical assistance including preparation of a master plan on geothermal development.

(4) Other Donors’ Activities

The World Bank is currently implementing a project to construct solar power generation plants and electrical distribution networks in remote areas as part of the rural electrification project. The IDB has provided four tranches of electricity sector program loan since 2009, contributing to improve the sector’s policy and system. Kreditanstalt für Wiederaufbau (KfW) is implementing a project of renewable energy and energy-saving through Corporación Financiera de Desarrollo, S.A.

(5) Necessity of the Project

As stated above, reinforcing the power generation capacity in the southern region of Peru is of urgent necessity. The Project is to support and promote diversification of stable power resources by promoting development of renewable energy prioritized by the Peruvian government, which is consistent with Peru’s development policy, Japan’s and JICA’s assistance policies. Accordingly, both the needs and relevance for JICA’s support in implementing this project are high.

3. Project Outline

(1) Project Objective(s)

The purpose of the Project is to construct hydroelectric power plants and related facilities in Moquegua Region in the southern part of Peru and thereby contributing to the region’s stable power supply as well as diversification of power resources and mitigation of climate change.

(2) Project Site/Target Area : Moquegua Region, Peru

(3) Project Component(s)

The Project is to construct two hydroelectric power plants totaling approximately 33MW and related facilities using irrigation water downstream of the existing Pasto-Grande reservoir.

- ① Construct two hydroelectric generation plants totaling approximately 33MW related facilities and transmission lines, (International Competitive Bidding)
- ② Consulting Services (detailed design, bidding assistance, construction supervision, etc.) (Short List)

(4) Estimated Project Cost

10,801 million yen (out of which ODA Loan Amount: 6,944 million yen)

(5) November 2014-January 2021 (75 months). The project will be completed upon start of operation (after the expiration of the guarantee period) (January 2021).

(6) Project Implementation Structure

- 1) Borrower: Republic of Peru
- 2) Executing Agency: Empresa de Generación Eléctrica del Sur S.A. (EGESUR)
- 3) Operation and Maintenance System: Empresa de Generación Eléctrica del Sur S.A. (EGESUR)

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

1) Environmental and Social Considerations

① Category: B

② Reason for Categorization

Under the “JICA Guidelines for Environmental and Social Considerations” (April 2010) (herein after referred as “JICA Environmental Guidelines”), the Project is categorized as “B” because the Project is not considered to be of a large scale hydroelectric project, is not located in a sensitive area, and has none of the sensitive characteristics under the JICA Environmental Guidelines, it is not likely to have a significant adverse impact on the environment.

③ Environmental Permit

EGESUR will prepare the Environmental Impact Assessment (EIA) report on the Project in accordance with JICA Environmental Guidelines and Peru’s domestic laws, and the Ministry of Energy and Mines is scheduled to approve the Project by May 2015.

④ Anti-Pollution Measures

Concerning water pollution during the construction, water-quality tests will be executed downstream on a continuous basis, and drainage will be appropriately treated as needed in order to minimize the impact. The water quality of reservoirs and discharged water after start of operation is expected to meet Peru’s environmental criteria, but further measures to prevent deterioration of water quality will be taken such as discharge adjustment and water quality monitoring.

⑤ Natural Environment

The target sites of the project are not in the vicinity of any vulnerable areas such as national park. Adverse impact on natural environment is expected to be minimal.

⑥ Social Environment

The Project requires land acquisition of approximately 18.02ha, but it is not expected to involve any resettlement. Land acquisition will be handled by EGESUR and Regional Government of Moquegua in accordance with JICA Environmental Guidelines and Peru's domestic laws.

⑦ Other/Monitoring

EGESUR will monitor air quality, water quality, noise/vibration, soil erosion, waste, river flows, and growth and habitat of fauna and flora during construction and after start of operation. Concerning safety management during construction, excavation will be minimized, pollution prevention curtains, barriers and grit chambers will be incorporated based on geological survey result and using construction methods based on the topographical and geographical features of the relevant area and workers will be thoroughly educated. EGESUR will monitor the overall safety management.

2) Promotion of Poverty Reduction : None

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

Gender is irrelevant because no specific activities from the gender perspective are expected.

(8) Collaboration with Other Schemes/Donors

None

(9) Other Important Issues

For environmental considerations and maintenance cost reductions, the Project plans to incorporate electric controllers instead of oil-pressure ones for turbine inlet valves to adjust the water volume. A copper mine development project which a Japanese company has acquired some portion of its stake is planned to be implemented in Moquegua Region (the mining project is expected to start in 2019).

4. Targeted Outcomes

(1) Quantitative Effects

1) Operation and Effect Indicators

Indicator	Moquegua 1		Moquegua 3	
	【Baseline】 2014	Target (2022) 【2 years after completion】	【Baseline】 2014	Target (2022) 【2 years after completion】
Annual Power Production (GWh)	0	124.6	0	147.7
Maximum Output (MW)	0	15.1	0	17.7
Plant Factor (%)	0	94	0	95
Outage Hours (hr/year)	0	350.4	0	350.4

2) Internal Rate of Return

Based on the conditions indicated below, the Project's economic internal rate of return (EIRR) is 19.4%, and financial internal rate of return (FIRR) 11.6%.

【EIRR】

Cost: Project cost (tax excluded), operation and maintenance cost

Benefit: Reduction of operation and maintenance cost, Project life: 25 years

【FIRR】

Cost: Project cost, operation and maintenance cost

Benefit: Sales revenue, Project life: 25 years

(2) Qualitative effects

Improvement of the stability of power supply in Peru's southern region, promotion of diversification of power resources and mitigation of climate change

5. External Factors and Risk Control

Completion of the upstream irrigation facilities construction for securing additional flow

6. Lessons Learned from Past Projects

The ex-post evaluation of the "Hubei Small-sized Hydropower Project" in China, taught us the importance of coordinating in advance with the higher government of the region or the city, in case some project which could have impact on the relevant project is implemented such as dam construction upstream. Based on such lesson, the Project will monitor the progress concerning the construction of upstream irrigation facilities which will function as water resources, together with EGESUR and Regional Government of Moquegua through regular monitoring meetings, etc. in order to secure sufficient additional flow for the hydroelectric power plants.

7. Plans for Future Evaluation

(1) Indicators for future evaluation

As indicated in above 4. Targeted Outcomes, (1) Quantitative effects, 1) Operation and Effect Indicators

(2) Timing: Two years after project completion