Internal Ex-Post Evaluation for Grant Aid Project

conducted by Palau Office: February 2016

Country Name	**The Project for Introduction of Clean Energy by Solar Electricity Generation System**
Republic of Palau	

I. Project Outline

Background	In Palau, because almost all of the power supply in the country depended on diesel power generation, and there were consideration for environment and concerns for crude oil prices and transportation costs, departure from the fossil fuel dependence in the energy and electricity sector was considered an urgent task, and development of systems using renewable energy such as Photovoltaic (PV) generation was considered as a priority issue in the development policy. Japan had supported developing countries which were willing to contribute to climate stability and in 2008, Japan announced a new funding mechanism in the amount of 10 billion dollars in five years. As part of the mechanism, a new grant aid scheme named "Program Grant Aid for Environment and Climate Change" was created in 2008 to promote clean energy including renewable energy and to utilize Japanese advanced technology.				
Objectives of the Project	To increase power generation capacity, diversify power sources, and raise awareness of Palau people for renewable energy by providing PV system and related equipment in Palau International Airport and by providing technical assistance for capacity development of technical personnel, and thereby contributing to publicity of Japan's initiative for promoting measures for climate change both by developed and developing countries.				
Outputs of the Project	1. Project Site: Palau International Airport 2. Japanese side (1) PV generation system (Meters, Junction box, Cubicle, Transformer, Cables and Conduits, Data management and monitoring system, display board and others), Mounting Structure for PV Module on the roof of parking lot (Changes from the original outputs includes: expansion of power generation capacity, capacity expansion of the transformer and main switchgears, additional procurement of a display board and others) (2) Technical assistance (soft component) :Training on basic knowledge, operation and maintenance, and troubleshooting of grid connected PV system 3. Palau side: To secure land, to procure and install meters equipped with a reverse prevention function, to implement final connections of low voltage distribution cables and existing distribution panel and others.				
Ex-Ante Evaluation	2009	E/N Date	December 24, 2009	Completion Date	April 2, 2012
Project Cost	E/N Grant Limit: : 480 million yen			Actual Grant Amount: : 473 million yen	
Implementing Agency	Palau Public Utilities Corporation (PPUC)				
Contracted Agencies	Japan International Cooperation System (The procurement under the project is done by the Japan International Cooperation System), Yachiyo Engineering Co., Ltd, Icons, Inc. Shikoku Electric Power Co., Inc., Itochu Corporation, EKO Instruments Co.,Ltd.				

II. Result of the Evaluation

1 Relevance

Consistency with Palau's development policy at the time of ex-ante evaluation and ex-post evaluation

This project has been highly consistent with Palau's development policy as increase of power supply by renewable energy (20% of power is supplied by renewable energy by 2020) is set in policy documents such as Joint Declaration on Energy Policy Priorities (announced in June 2009) and Palau National Energy Policy (approved in August 2010) .

Consistency with Palau's development needs at the time of ex-ante evaluation and ex-post evaluation

The project has been also highly relevant with Palau's development needs for renewable energy as Palau has been dependent on diesel power generation which is very much vulnerable to the fuel price and Palau has needed to shift from the status of heavily dependent on fossil fuel.

Consistency with Japan's ODA policy at the time of ex-ante evaluation

The project was also consistent with Japan's ODA policy at the time of ex-ante evaluation as the prioritized areas of assistance to Palau included strengthening of base of economic growth. Further, at the 5th Pacific Islands Leaders Meeting held in May 2009 at Tomamu, Hokkaido, Japan announced assistance in the amount of 50 billion yen to Pacific Islands and the one of the areas for assistance included environment and climate change.

Evaluation result

In light of the above, relevance of this project is high.

2 Effectiveness/Impact

Effectiveness

The project has achieved its objectives of increase in power generation capacity and diversification of power sources. Indicators of quantitative effects, such as net power generation as well as reduction in CO2 emission, and reduction in diesel fuel consumption which would have been produced under the existing power plants have achieved the targets.

As to the raising awareness for renewable energy among the all section of the society, the PV power generation is demonstrated well.

A panel was placed in the airport to display the status of PV power generation.[1] In addition, a payment service window at PPUC headquarters also displays the status of the PV power generation at the airport, which appeals to the PPUC customers who come to the service window.

As a result of implementation of the soft component, PPUC's operation and maintenance capacity has improved. While there are cases that the facilities at other non-grid PV projects supported by other development partners failed, the facilities under this project are operational without any trouble as PPUC's capacity has been enhanced through the implementation of the soft component. Selecting PPUC as the implementing agency contributes to this good performance because PPUC acknowledges the importance of PV power generation instead of regarding it as the supplemental power as PPUC is responsible for planning and implementation of renewable energy power development based on the national energy development plan and aims at reduction in CO2 emission and in petroleum based fuel consumption.

Impact

The facilities under this project is still the largest PV generation facilities under a single project, and therefore, the facilities are presented in an operation brochure of the Energy Office, Ministry of Public Infrastructure, Industries and Commerce. The facilities were also presented as signature PV facilities in Palau at a working level conference of Pacific Environment Community (PEC) Fund in June 2014. Thus, the facilities of the project have shown their presence although other development partners also extend the same support.

No negative impacts on natural environment were observed and no land acquisition and resettlement occurred under this project.

Evaluation result

Thus, the project has increased the power generation and has diversified power sources, and awareness raising on the renewable energy and Japan's initiative on the climate change were observed to some extent. Therefore, effectiveness/impact of the project is high.

Quantitative Effects

	Before the project (2009)	Target figure at target year (2014)	Actual result (2012)	Actual result (2013)	Actual result (2014)
Indicator 1: Net power generation (MWh/year)	0	194 (*1)	302	312	304
Indicator 2: Reduction in CO2 Emission (t/year)	0	127 (*2)	221	229	223
Indicator 3: Reduction in fossil fuel consumption (litters/year)	0	49,000 (*3)	84,446	87,429	85,187

Note：The target figures are the one set in the ex-ante evaluation sheet. The calculation methods and assumed target values which incorporate the capacity expansion are as follows: (*1) Assumed target value is calculated based on 180 kW capacity set at the time of ex-ante evaluation. The assumed target value based on the actual installed capacity of 225 kW is 243 MWh/year. (*2) Reduction in CO2 emission is calculated as follows: CO2 emission factor of light oil 2.62kg-CO_2/litter × fossil fuel consumption. The target value was calculated based on the 160kW capacity assumed at a study before the ex-ante evaluation. The target value based on the 180kW capacity assumed at the ex-ante evaluation is 142t, and the assumed CO2 reduction amount based on the actual installed capacity of 225kW is 178t. (*3) Fuel consumption per unit generated-energy (kWh) was 0.28 litter/kWh calculated based on the actual power generation by the existing diesel power generation facilities. The target value is calculated based on the capacity of 160kW set in the study before the ex-ante evaluation. The assumed target value for the 180kW capacity set in the ex-ante evaluation is approximately 54,000 litters, and the assumed target value for the actual installed capacity of 225 kW is 68,000 litters.

Source：JICA internal documents, PPUC

3 Efficiency

Although the project cost was within the plan (ratio against the plan: 100%), the project period significantly exceeded the plan (ratio against the plan: 152%) because of delay in procedure for making contracts and expansion of the capacity of PV system. The outputs of the project were produced mostly as planned (with expansion of the capacity). Therefore, efficiency of this project is fair.

4 Sustainability

Institutional aspect

Operation and Maintenance (O&M) of equipment and facilities provided by the project have been carried out by Palau Public Utilities Corporation (PPUC), the implementing agency[2]. The division in charge of the facilities remains the Renewable Energy Division which was in charge at the time od project completion. Four individuals including a manager and a clerk are assigned for the Renewable Energy Division which can carry out O&M activities without any problem. However, currently the position of the clerk is vacant as the former clerk has been promoted. In addition, one mid-level technical staff member is to be resigned to go to a graduate school. Although addition of two staff members has been approved, those positions are still vacant. As the number of facilities the Renewable Energy Division is in charge is increasing, the shortage of the staff is a future concern.

Technical Aspect

As explained in the "Effectiveness" above, O&M of the facilities have been carried out without any trouble. The senior volunteer dispatched to PPUC has given guidance to PPUC on O&M in accordance with the manual. Further, technical staff members have experiences of taking part in various training programs including JICA's Training and Dialogue Programs (on energy saving and mini-grids). Thus, the staff has sufficient technical capacity for O&M. However, there is no training system inside PPUC, and therefore, how PPUC can make a system for training is an issue.

Financial Aspect

PPUC incurs a loss because of the heavy burden of the diesel fuel costs and the operation of Water and Waste water Operations (WWO)

[1] A display panel which shows the power generation status was expected to be built. Currently the panel display switches from the power generation information to arrival/departure information when necessary.

[2] PPUC currently provide water supply and sewage services in addition to power supply and distribution after it amalgamated Palau Water and Sewer Corporation in August 2013 .

does not making a profit. Therefore, PPUC needs to reduce the burden of diesel fuel costs by introducing renewable power energy to improve financial conditions and the reduction in fossil fuel consumption and in the diesel fuel costs by the project are in line with the PPUC's direction. In addition, electricity tariff structure was revised in 2012 to raise the tariff to the appropriate level while giving special consideration to the lower end consumers. As a result, the financial conditions of PPUC are improving. Although the O&M budget of PPUC as a whole is limited, the facilities under the project was designed maintenance-free, and therefore, do not require a large amount of O&M expenses. Currently, no physical problem is observed due to this limited O&M budget.

Current Status of O&M

The equipment and facilities under the project is in good condition. PPUC dispatches the person in charge to the airport twice a week to carry out inspection and data recording. PPUC carries out O&M activities appropriately including regular operation of a backup power conditioner (biannually) which is recommended at the On the Job Training (OJT) and the soft component during the project period. However, spare parts and maintenance tools are not maintained/kept in a planned and consistent fashion.

Evaluation result

Thus, although there are problems in institutional, technical and financial aspects as the vacant positions are not filled, the training system has not been developed and financial situation is yet to be improved, there is no problem in the current status of O&M. Therefore, sustainability of effects of this project effect is fair.

5 Summary of the Evaluation

The project has achieved its objectives of increase in power generation capacity and diversification of power sources, as net power generation, reduction in CO2 emission and reduction in diesel fuel consumption are observed. As to the raising awareness for the renewable energy of all sectors of the society, PV power generation has been demonstrated to some extent. As for sustainability, there are problems in institutional, technical and financial aspects as the vacant positions are not filled, the training system needs to be developed and financial situation is yet to be improved. However, there is no problem in the current status of O&M. As for efficiency, the project period exceeded the plan. In light of the above, this project is evaluated to be satisfactory.

III. Recommendations & Lessons Learned

Recommendations to implementing agency:

1. It is recommended that PPUC carries out stock-take of maintenance tools and spare parts regularly and keeps its record accordingly so that the spare parts and maintenance tools will be purchased in a planned and consistent manner. In addition to the implementing maintenance plan which was revised with the support of senior volunteer, it is also recommended that PPUC draws up a productivity improvement plan which includes proper procurement/purchase of spare parts and maintenance tools.
2. PPUC is recommended to hire additional staff as planned by the 1st quarter of 2016 when the Peleliu seawater desalination plant is transferred to PPUC and carry out capacity development/technical transfer on maintenance for the newly hired staff.

Lessons learned for JICA:

In this project, the implementation agency carries out regular checkup activities with the senior volunteer, and thereby actually utilizes the skills and knowledge acquired by the soft component. In addition, staff dispatched to JICA Training and Dialogue Program not only acquired new knowledge but also appreciated how Japanese perform duties steadily. This understanding contributes to the synergetic effects with the cooperation with the senior volunteer as the staff understands the advices and guidance easily. Thus, support for a non-infrastructure aspect and coordination among different schemes such as utilization of senior volunteers and dispatching staff to JICA training programs can contribute to producing and continuing of project effects.

PV modules at the airport (on the roof of the parking lot)
「photo: JICA/Kaku Suzuki」

Power generation data is collected during the daily inspection
「photo: JICA/Kaku Suzuki」