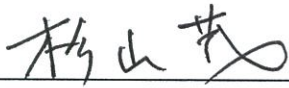


RECORD OF DISCUSSIONS
ON
PROJECT FOR LAE AREA POWER DEVELOPMENT
MASTER PLAN
IN
THE INDEPENDENT STATE OF PAPUA NEW GUINEA
AGREED UPON BETWEEN
PNG POWER LIMITED
AND
JAPAN INTERNATIONAL COOPERATION AGENCY

Port Moresby 13th February 2014

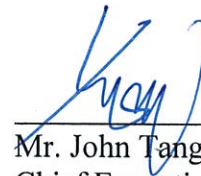
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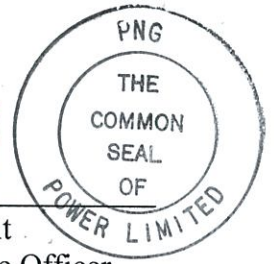
Mr. Shigeru Sugiyama
Chief Representative
PNG Office
Japan International
Cooperation Agency



Mr. Rendle Rimua
Secretary
Department of Petroleum
and Energy



Mr. John Tangit
Chief Executive Officer
PNG Power Limited



Witness:



Ms. Juliana Kubak
Acting Secretary
Department of National
Planning and Monitoring

Based on the minutes of meetings on the Detailed Planning Survey on the Project for Lae Area Power Development Master Plan (hereinafter referred to as “the Project”) signed on 12th December, 2013 between PNG Power Limited (hereinafter referred to as “PPL”), Department of Petroleum and Energy (hereinafter referred to as “DPE”), and the Japan International Cooperation Agency (hereinafter referred to as “JICA”), JICA held a series of discussions with PPL, DPE and relevant organizations to develop a detailed plan of the Project.

JICA and the Independent State of Papua New Guinea (hereinafter referred to as “PNG”) side agreed the details of the Project and the main points discussed as described in the Appendix 1 and the Appendix 2 respectively.


JICA and PNG side also agreed that PPL and DPE, the counterpart to JICA, will be responsible for the implementation of the Project in cooperation with JICA, coordinate with other relevant organizations and ensure that the self-reliant operation of the Project is sustained during and after the implementation period in order to contribute toward social and economic development of PNG.

The Project will be implemented within the framework of the Colombo Plan Technical Cooperation Scheme and the Note Verbals exchanged on 20th September, 2012 between the Government of Japan (hereinafter referred to as “GOJ”) and the Government of the Independent State of Papua New Guinea (hereinafter referred as “GoPNG”)

Appendix 1: Project Description

Appendix 2: Main Points Discussed

Appendix 3: Minutes of Meetings on the Detailed Planning Survey

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PROJECT DESCRIPTION

JICA and PNG side confirmed that the contents stated in the Project Description agreed upon in the minutes of meetings on the concerning Detailed Planning Survey on the Project signed on 12th December 2013(Appendix 3) have been implemented and will be remained.

I. BACKGROUND

After inauguration of O'Neill government in 2012, the political situation of PNG has been stable. When it comes to economy, PNG has registered high GDP growth rate (6%-9%) since 2007, led by the robust growth in its agriculture and mining sector. Such growth rates are generally higher than those of South East Asian countries. Under these circumstances, it is anticipated that power demand in PNG continue to increase in the future. Based on the provisional calculation in the PNG POWER 15 Year Power Development Plan 2012-2026 (15YPDP) published by PNG Power Limited (hereinafter referred to as "PPL"), net system sales energy and peak power demand will increase from 869GWh and 210MW in 2012 to 1,142GWh and 347MW in 2026 respectively. Currently, the PPL owns power plants with total installed capacity standing at 278MW. However it is estimated that the PPL's actual total supply capacity stands at around 200MW only. It has been analyzed that the underperformance of PPL is due to the aging of power facilities, inadequacy of maintenance, among other reasons. As such, this has led to the problems of chronic power shortage in almost all parts of PNG.

Especially, in Ramu power system which supplies power to the provincial cities in MOMASE region such as Lae and Madang, the peak power demand is estimated to increase from 74.3MW in 2012 to 104.8MW in 2026. In Lae city, which has the second largest population and is generally considered as the commercial hub in PNG, the peak power demand is said to increase by two-fold from 37.9MW to 66.8MW.

At present, the Ramu power system is facing the challenge of unstable power supply. In 2010, unexpected power outages in the Ramu power system were reported to have occurred 1,932 times due to problems deriving from power supply capability and 1,706 times due to that from power network. Although large scale diesel power facilities are at work in Lae city, the unstable power supply poses a continuous threat to the city's economic activity, provided that the average blackouts amount to 83.5 hours per month. The blackouts are generally ascribed to the aging of the existing power-related facilities and troubles of distribution network among other factors.

Under such circumstances, PPL has taken measures to develop and upgrade hydropower plants. Regarding transmission network, JICA had conducted "Preparatory Survey on Expansion and Reinforcement of the Ramu power grid" (equivalent of Feasibility Study), in which middle and long term power demand forecast and power development plan were reviewed and necessary expansion plan of transmission network in Ramu power system were analyzed. Furthermore, based on the above preparatory survey, the Japanese yen loan project titled "Project for Reinforcement of Ramu

Transmission Network” (L/A was signed in August 2013) is to commence soon so that transmission lines connected to Lae city and the surrounding area as well as those fixtures and fittings is to be upgraded and reinforced.

However, regarding distribution system including small scale power facilities in Lae city and the surrounding area, it is necessary to identify problems and carry out the study to come up with remedial measures to improve the overall reliability of power supply of the Ramu system. The study is also expected to explore the possibility of adopting alternative measures to the current power development plan which assumes continuous use of the aging and more or less uneconomic diesel power facilities in Lae city. It is also of interest of the study to investigate the implications of new power plants development in the Ramu power system. Furthermore, given improvement of distribution system is an urgent issue, it is necessary to take measures to prevent earth faults, enhance distribution capacity, improve control system, prohibit illegal connections and so on.

II. OUTLINE OF THE PROJECT

1. Title of the Project

Project for Lae Area Power Development Master Plan

2. Expected Goals which will be attained after completion of the Project

(1) Goals of the Project

Ramu System Power Development Master Plan and Lae Area Distribution Network Improvement Plan will be developed for the year between 2016 and 2030, thereby contributing to stabilization of future power supply.

(2) Goal which will be attained by utilizing the outcome of the Project

To meet rapid power demand growth, power supply will be stabilized in Ramu system and Lae area by promoting suitable power development

3. Outputs

(1) Power development master plan for the Ramu power system composed of power generation development plan, power network (transmission) expansion plan for the year between 2016 and 2030 is developed.

(2) Distribution network improvement Plan in Lae area for the year 2016 and 2030 is developed.

4. Activities

The Project shall consist of two components and be carried out as follows.

(1) Study on power development master plan of Ramu power system

1-1 Collecting and Analysing basic data and information

- To collect and analyse data and information on progress of GoPNG Development Strategic Policy (DSP) and Economic performance
- To collect and analyse data and information on population growth rate trend and



- performance of rural electrification policy
 - To collect and analyse data and information on specifications, operation records including supply capability, rehabilitation plan and decommissioning plan of the existing power facilities such as generation, transmission, substation and distribution.
 - To collect and analyse data and information on manners of power system operation such as control of frequency / voltage / power factor and correspondence procedure, and protection relay.
 - To collect and analyse data and information on location, specification, cost and development conformation of on-going and under construction projects of power system facilities in Ramu power system.
 - To collect and analyse data and information on PNG energy policy and demand supply plan.
 - To collect and analyse data and information on assistance situations of other donor organizations relevant to the power and energy sector.
- 1-2 Forecast of demand and supply of primary energy and electricity
- To forecast macro power demand up to the year 2030 based on economic figures, population growth rate and rural electrification rate.
 - To evaluate primary energy development plan and supply cost.
 - To forecast micro power demand up to the year 2030 by summation method through the study on MOMASE economic corridor plan, new commerce township plan in Madang, industrial zone development plan in Lae city and mining development plan.
 - To assume change of daily load curve up to 2030.
- 1-3 Study on development candidates of each type of power plant
- To collect and analyse data and information on supply capability, unit capacity, construction cost, fuel supply plan and fuel price of new candidates of each power source such as hydroelectric, geothermal, gas fired and biomass.
- 1-4 Optimum power development plan
- To prepare several scenarios of power generation development plan based on primary energy development plan and generation cost of each type of power source, and the most economical fuel mix plan which ensures supply reliability in 2030.
 - To study economic efficiency of with or without of interconnection between Lae and Port Moresby power system.
 - To build up power generation project implementation plan of every year taking into consideration of development schedule and financial resource of each project aiming at achievement of the optimum power generation fuel mix in 2030.
- 1-5 Power system planning
- To carry out power system analyses of bulk power network based on power generation development plan, every areal power demand forecast.
 - To draw up optimum power network expansion plan every five year from 2016 to 2030 based on the above.
 - To clarify issues on power system control manners and protection relay and to make recommendations on improvement plan of power system control.
- 1-6 Environment and social consideration




- To collect and analyse data and information on development candidates for implementation of Strategic Environment Assessment (SEA).
 - To carry out comparative study on several alternative strategy or plan from the viewpoints of environmental and social consideration.
- 1-7 Organization and institution
- To collect and analyse data and information on current situation of O&M organization and institution of power stations, transmission lines and substations and make recommendation on improvement measures.
- 1-8 Long run marginal cost (LRMC) and long run investment plan
- To estimate long run marginal cost and prepare long run investment plan based on the above power system development plan.

(2) Study on distribution network improvement plan in Lae area

- 2-1 Collecting and analysing basic data and information
- To collect and analyse data and information on specifications, operation records including cost of the existing power network facilities such as transmission, substation and distribution in Lae area.
 - To collect and analyse data and information on causes of power loss and forced outages in Lae area.
 - To collect and analyse data and information on location, specification and cost of on-going and under construction projects of power system facilities in Lae area.
 - To collect and analyse data and information on operation and maintenance of power system facilities such as generation, transmission, substation and distribution in Lae area.
- 2-2 Clarification of issues on the power grid and distribution system and study on improvement plan
- To investigate cause of power loss and forced outage of distribution line and build up improvement measures.
 - To carry out actual condition survey on cause and effect of harmonics of distribution line and build up improvement measures.
 - To carry out power system analyses of bulk power system and clarify the problems.
- 2-3 Structural design of distribution system
- To study optimum distribution system structure from the viewpoints of supply reliability securement, decrease of power loss and O&M manageability.
- 2-4 Developing Lae area distribution network improvement plan
- To select priority areas for improvement, enhancement and renewal of distribution system in Lae area from the viewpoints of urgency and importance.
 - To build up Lae area distribution network improvement plan and carry out facility design.
 - To study on necessity and appropriate timing of introduction of new technologies such as distribution automation system, underground distribution line and smart grid.
 - To prepare implementation organization and schedule, and estimate project cost along with the Lae area distribution network improvement plan to be





- developed.
 - To conduct economical and financial analysis and evaluate feasibility of Lae area distribution network improvement plan.
- 2-5 Initial environmental examination
- To conduct initial environmental examination of the Lae area distribution network improvement plan in compliance with the environmental regulation of PNG and JICA environmental guidelines.
- 2-6 Implementing a pilot project within PPL's budget based on the distribution network improvement plan
- To select pilot project area and build up work plan
 - To offer advice on voltage control and power factor management, etc. indispensable for operation of substation and also instruct how to put priority order on each feeder in consideration of feeder load.
 - To instruct purpose of use and basic motion of every protection relay instruments.
 - To instruct concept of preventive maintenance and predictive maintenance.
5. Input
- (1) Input by JICA
- 1) Dispatch of mission (tentative only and assignment member is to be determined later)
- Leader/Power Development Planning
 - Power Demand Forecast
 - Primary Energy Demand
 - Power System Planning
 - Power System Analysis
 - Power System Operation
 - Distribution & Substation Planning
 - Distribution & Substation Designing
 - O&M of Distribution & Substation
 - Protection Relay Designing
 - Environmental and Social Consideration
 - Hydropower Generation Planning
 - Thermal power Generation Planning
 - Economical Financial Analysis
- 2) Equipment (tentative only)
- 3 phases relay tester and other relevant equipment
- 3) Others
- Bearing expenses necessary for security, provide international airfare and accommodation fee etc.
 - Means of transport and travel allowances for members of the JICA missions for official travel within PNG.
 - Technical training in Japan for PPL and/or DPE officers

Input other than indicated above will be determined through mutual consultations among JICA, PPL and/or DPE during the implementation of the Project, as necessary.

(2) Input by PPL and/or DPE

PPL and DPE will take necessary measures to provide at its own expense:

- Services of counterpart personnel and administrative personnel as referred to in II-7.
- Suitable office space for JICA mission with necessary equipment.
- Supply or replacement of machinery, equipment, instruments, vehicles, tools, spare parts and any other materials necessary for the implementation of the Project other than the equipment provided by JICA.
- Information as well as support in obtaining medical service.
- Credentials or identification cards.
- Available data (including maps and photographs) and information related to the Project.
- Running expenses necessary for the implementation of the Project.
- Expenses necessary for transportation within PNG of the equipment referred to in II-5 (1) 2) as well as for the installation, operation and maintenance thereof.

6. Implementation Structure

The Project organization chart will be prepared immediately after the project starts. The roles and assignments of relevant organizations are as follows:

(1) PPL and DPE

- Project Director: Director, Strategic Planning & Business Development, PPL
- Project Manager: Manager, Strategic infrastructure, PPL
- EMC Secretariat Staff
- Generation Planning Officer
- Transmission Officer
- Distribution Officer
- Substation Officer
- PPL Project Coordinator
- Others if necessary

(3) Members of the JICA missions

The JICA missions will give necessary technical guidance, advice and recommendations to PPL and DPE on any matters pertaining to the implementation of the Project.

(4) Joint Coordinating Committee

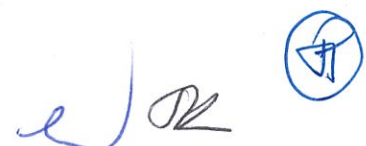
Joint Coordinating Committee (hereinafter referred to as "JCC") will be established in order to facilitate inter-organizational coordination. JCC will be held whenever deems it necessary. A list of proposed members of JCC is shown in the Annex 1.

7. Project Site(s) and Beneficiaries

Area covered by Ramu power system.

8. Duration (Annex 2)

The project duration is estimated to be 25 months as described in the Plan of Operation



in Annex 2.

9. Reports

The members of the JICA missions will prepare and submit the following reports to the PPL and DPE respectively in English.

- (1) hard copies and soft copy of Inception Report at the commencement of the first work period in PNG
- (2) 5 hard copies and soft copy of Draft Final Report at the end of the last work period in PNG
- (3) 5 hard copies and soft copy of Final Report within one (1) month after the receipt of the comments on the Draft Final Report

10. Environmental and Social Considerations

PPL and DPE agreed to abide by 'JICA Guidelines for Environmental and Social Considerations' in order to ensure that appropriate considerations will be made for the environmental and social impacts of the Project.




III. UNDERTAKINGS OF PPL AND GOVERNMENT OF PNG

1. PNG side will take necessary measures to:

- (1) ensure that the technologies and knowledge acquired by the PNG nationals as a result of Japanese technical cooperation contributes to the economic and social development of PNG, and that the knowledge and experience acquired by the personnel of PNG from technical training as well as the equipment provided by JICA will be utilized effectively in the implementation of the Project; and
- (2) grant privileges, exemptions and benefits to the members of the JICA missions referred to in II-5 (1) 1) above and their families, which are no less favorable than those granted to experts of third countries performing similar missions in PNG under the Colombo Plan Technical Cooperation scheme.
- (3) provide security-related information as well as measures such as police escort to the pilot sites to ensure the safety of the members of the JICA missions;
- (4) permit the members of the JICA missions to enter, leave and sojourn in PNG for the duration of their assignments therein and exempt them from foreign registration requirements and consular fees;
- (5) exempt from taxes and any other charges on the equipment, machinery and other material necessary for the implementation of the Project;
- (6) exempt from income tax and charges of any kind imposed on or in connection with any emoluments or allowances paid to them and/or remitted to them from abroad for their services in connection with the implementation of the Project; and
- (7) meet taxes and any other charges on the equipment, machinery and other material, referred to in II-5 (1) 2) above, necessary for the implementation of the Project.

Other privileges, exemptions and benefits will be provided in accordance with the Note Verbals exchanged on 20th September, 2012 between GOJ and GoPNG.

2. GoPNG will bear claims, if any arises, against the members of the JICA missions resulting from, occurring in the course of, or otherwise connected with, the discharge of their duties in the implementation of the Project, except when such

claims arise from gross negligence or willful misconduct on the part of the members of the JICA missions.

3. PNG side will bear claims, if any arises, against members of the JICA missions resulting from, occurring in the course of, or otherwise connected with, the discharge of their duties in the implementation of the Project, except when such claims arise from gross negligence or willful misconduct on the part of members of the JICA missions.

IV. EVALUATION

JICA will conduct the following evaluations and surveys to mainly verify sustainability and impact of the Project and draw lessons. The PNG side is required to provide necessary support for them.

1. Ex-post evaluation three (3) years after the project completion, in principle
2. Follow-up surveys on necessity basis

V. PROMOTION OF PUBLIC SUPPORT

For the purpose of promoting support for the Project, PNG side will take appropriate measures to make the Project widely known to the people of PNG.

VI. MUTUAL CONSULTATION

JICA and PNG side will consult each other whenever any major issues arise in the course of the Project implementation.

VII. AMENDMENTS

The record of discussions may be amended by the minutes of meetings among JICA, PPL and DPE.

The minutes of meetings will be signed by authorized persons of each side who may be different from the signers of the record of discussions.

Annex 1: List of Proposed Members of Joint Coordinating Committee

Annex 2: Tentative Implementation Schedule

List of Proposed Members of Joint Coordinating Committee

1. Chairperson
Director, Strategic Planning & Business Development, PPL (Project Director)
2. Members
 - 1) PNG Side
 - Deputy Secretary, DPE
 - EMC Secretariat Staff
 - Manager, Strategic infrastructure, PPL (Project Manager)
 - PPL Officer
 - Senior Portfolio Manager, IPBC
 - Foreign Aid Division, DNPM
 - Other representative(s), if necessary
 - 2) Japanese Side
 - Member(s) of JICA Mission
 - Representative(s) of JICA PNG Office

Note: Official(s) of the Embassy of Japan in PNG may attend the Joint Coordinating Committee as observer(s).

Abbreviations:

JICA : Japan International Cooperation Agency
IPBC : Independent Public Business Corporation
DNPM : Department of National Planning and Monitoring
DPE : Department of Petroleum and Energy
EMC : Electricity Management Committee
PPL : PNG Power Limited

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Tentative Implementation Schedule

Study Content	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
1. Data and Information Collection	█																							
2. Site Survey on Power Facilities	█																							
3. Power Demand Forecast Study				█	█																			
4. Primary Energy Supply Plan Study				█	█																			
5. Power Development Plan Study							█	█	█															
6. Power Plant Development Projects Study				█	█	█	█	█	█															
7. Power System Development Plan Study								█	█	█	█	█												
8. System Operation Study								█	█	█	█	█												
9. Preparation of Master Plan															█	█								
10. Distribution & Substation Plan Study																								
11. Pilot Project of Distribution & Substation																								
12. O&M Study of Distribution & Substation																								
13. Economical Financial Analysis																								
Report	△ Ic/R							△ Iu/R				△ Pr/R			△ Df/R								△ F/R	
Work Shop and Seminar		△ 1st WS						△ 2nd WS			△ Seminar				△ 3rd WS									
JCC	△ 1st JCC						△ 2nd JCC																	

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