# The Project for Introduction of Hybrid Power Generation System in the Pacific Island Countries

Final Report (Attachment)

September 2023

Japan InternationalCooperation Agency (JICA)

Okinawa Enetech Co., Inc. Okinawa Electric Power Co., Inc.

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The Project for Introduction of Hybrid Power Generation in Pacific Is	
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#### Project Final Report

Contents of Attached Documents

#### **Annex D: Federated State of Micronesia Related Documents**

- 1 Training Schedule
- 2 PDM
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  - 4.1 1st JCC Meeting
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  - 4.5 5th JCC Meeting

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1 Training Schedule

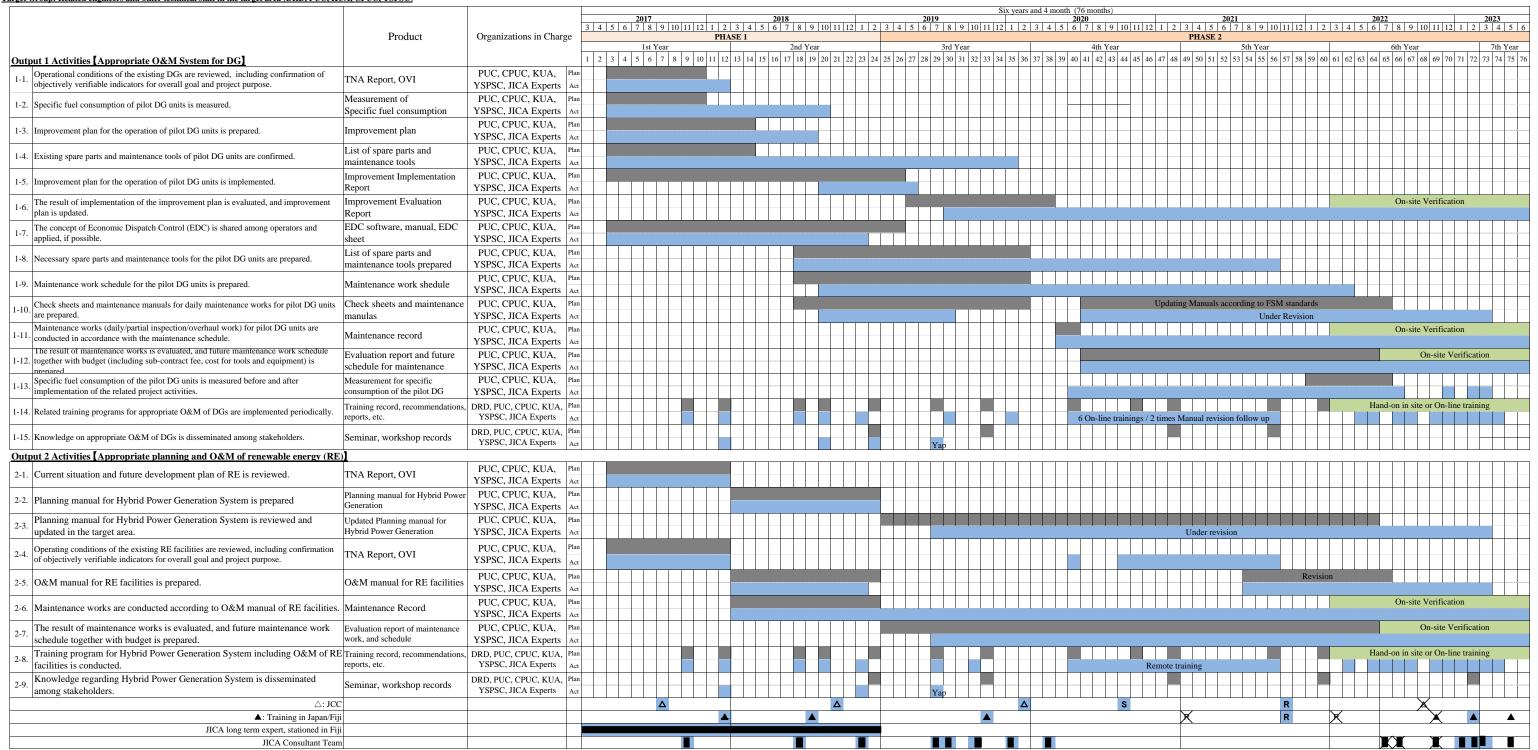
#### Plan of Operation (PO)

Project Title: The Project for Introduction of Hybrid Power Generation System in Pacific Island Countrie Project Term: March 2017 - June 2022 (Phase 1: March 2017 - February 2019 , Phase 2: March 2019 - June 2023

Country: Federated States of Micronesia

Target Area: Pohnpei, Chuuk, Yap and Kosrae

Target Group: Related engineers and other technical staff in the target area (DRD, PUC, KUA, CPUC, YSPSC)



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2 PDM

#### **Draft Project Design Matrix (PDM)**

Project Title: The Project for Introduction of Hybrid Power Generation System in Pacific Island Countries

Project Term: March 2017 – June 2022 (Five Years) (Phase 1: March 2017 – February 2019, Phase 2: March 2019 – June 2022

**Country: Federated States of Micronesia** 

Target Area: Pohnpei, Chuuk, Yap and Kosrae

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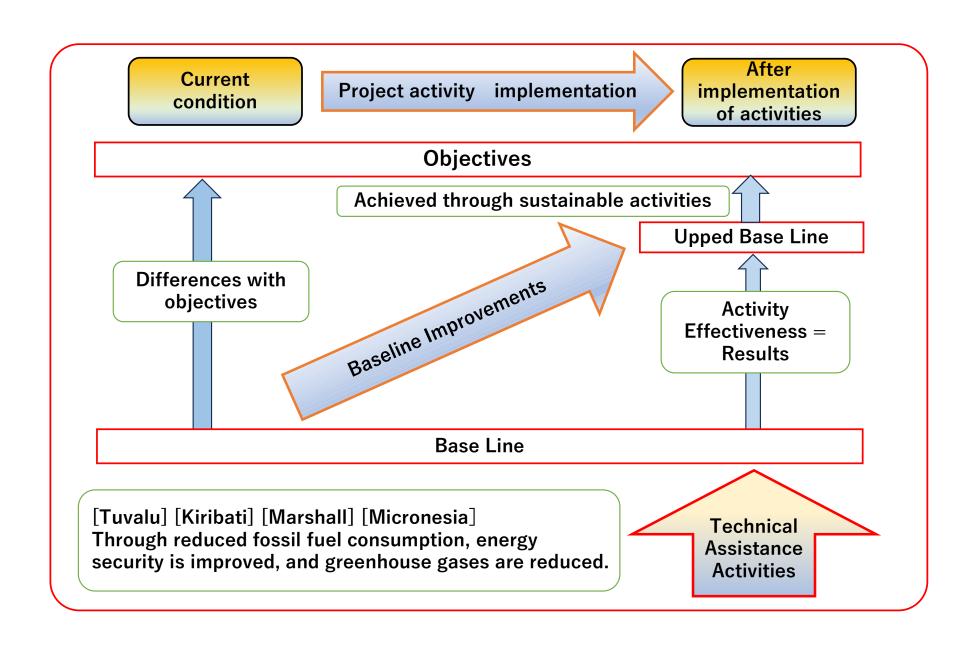
DRD: Department of Resources and Development PUC:Pohnpei Utilities Corporation	KUA: Kosrae Utilities Authority YSPSC: Yap State I	Public Service Corporation CPUC:Chuuk Public U	tility Corporation
Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumptions
Overall Goal  Energy security is improved and greenhouse gases are reduced through the reduction of fossil fuels consumption.	In comparison to the indicators at the time of baseline survey,  1. Reduced amount of CO2 emission of power utilities in the target area  2. Reduced amount of diesel fuel of power utilities in the target area  3. Increased capacity (kW) and actual generated energy (kWh) of renewable energy facilities of power utilities in the target area	1. to 3. Reports of C/P agencies	
Project Purpose			
Hybrid Power Generation System is introduced.	<ol> <li>Improvement of specific fuel consumption of pilot DG units (better than the baseline data set at the beginning of the Project)</li> <li>Improvement of performance ratio for the RE power generation systems (better than the baseline data set at the beginning of the Project in consideration of aging deterioration of PV module)</li> <li>Proper application of planning and O&amp;M method of Hybrid Power Generation System</li> </ol>	<ol> <li>Record on specific fuel consumption of Pilot DG units by C/P, checked by Japanese experts</li> <li>Record on operation of RE power generation systems</li> <li>Evaluation by Japanese experts and C/P on plans of Hybrid Power Generation System</li> </ol>	C/P agencies continue commitment to the Project by continuing budget allocation as well as assignment of personnel for the post- Project activities.
Outputs  1. Appropriate and economical system for O&M of Diesel Generators (DGs) is enhanced.	<output 1=""> 1-1 Adequacy on the use of the work schedule, check sheets and manual for the maintenance work for the pilot DG units 1-2 Number of training participants who are conducting operation and maintenance of DG based on the learnings from the training program (target:2 for each state)</output>	<ul> <li>1-1 Evaluation by Japanese experts and C/P on improvement of maintenance work (daily/partial inspection/overhaul work) for pilot DG units</li> <li>1-2 Capacity assessment of trained O&amp;M staff and managers by Japanese experts</li> </ul>	C/P agencies promote investment on renewable energy facilities based on the current national policy/plan.

2. Methodology for appropriate planning and O&M of renewable energy (RE) is established.	<ul> <li>&lt;0utput 2&gt;</li> <li>2-1 Number of training participants who have been certified under the Project for the planning method of the Hybrid Power Generation System (target: 1 for each state)</li> <li>2-2 Number of training participants who are conducting O&amp;M of RE facilities based on the learnings from the training program (target: 2 for each state)</li> <li>2-3 Preparation of related manuals for Hybrid Power Generation System</li> <li>2-4 Adequacy of the use of the related manuals for Hybrid Power Generation System</li> </ul>	2-1 Capacity assessment of trained staff and managers by Japanese experts  2-2 Capacity assessment of trained O&M staff and managers by Japanese experts  2-3 Evaluation by Japanese Experts on related manuals for Hybrid Power Generation System prepared by C/P  2-4 Evaluation by Japanese experts and C/P on the use of the related manuals for Hybrid Power Generation System	
Activities	Inpu	ts	
<ul> <li>Coutput 1&gt;</li> <li>1-1 Operational conditions of the existing DGs are reviewed, including confirmation of objectively verifiable indicators for overall goal and project purpose.</li> <li>1-2 Specific fuel consumption of pilot DG units is measured.</li> <li>1-3 Improvement plan for the operation of pilot DG units is prepared.</li> <li>1-4 Existing spare parts and maintenance tools of pilot DG units are confirmed.</li> <li>1-5 Improvement plan for the operation of pilot DG units is implemented.</li> <li>1-6 The result of implementation of the improvement plan is evaluated, and improvement plan is updated.</li> <li>1-7 The concept of Economic Dispatch Control (EDC) is shared among operators and applied, if possible.</li> <li>1-8 Necessary spare parts and maintenance tools for the pilot DG units are prepared.</li> <li>1-9 Maintenance work schedule for the pilot DG units is prepared.</li> <li>1-10 Check sheets and maintenance manuals for maintenance works for pilot DG units are conducted in accordance with the maintenance schedule.</li> <li>1-11 Maintenance works (daily/partial inspection/overhaul work) for pilot DG units are conducted in accordance with the maintenance schedule.</li> <li>1-12 The result of maintenance works is evaluated, and future maintenance work schedule together with budget (including sub-contract fee, cost for tools and equipment) is prepared.</li> <li>1-13 Specific fuel consumption of the pilot DG units is measured before and after implementation of the related project activities.</li> <li>1-14 Related training programs for appropriate O&amp;M system for DGs are implemented periodically.</li> <li>1-15 Knowledge on appropriate O&amp;M of DGs is disseminated among stakeholders.</li> <li>Output 2&gt;</li> <li>2-1 Current situation and future development plan of RE is reviewed.</li> <li>2-2 Planning manual for Hybrid Power Generation System is prepared.</li> <li>2-3 Planning manual for Hybrid Power Generation System is reviewed and updated in the target area.</li> <li>2-4 Operating conditions of t</li></ul>	(Japanese side)  1. Dispatch of the Japanese experts	(FSM side)  1. Assignment of C/Ps -Project Director (P/D) -Project Manager (P/M) -Engineers in charge of O&M (Manager level) - Mechanical Staff - Electrical Staff - Planning officer, and others  2. Facilities and equipment -Project office  3. Recurrent costs - C/Ps' wages and allowances - C/Ps' domestic travel expense in part	Preconditions Contents of the current relevant policies on promotion of renewable energy and energy efficiency are not largely changed.

confirmation of objectively verifiable indicators for overall goal and project	
purpose.	
5 O&M manual for RE facilities is prepared.	
6 Maintenance works are conducted according to O&M manual of RE facilities.	
7 The result of maintenance works is evaluated, and future maintenance work	
schedule together with budget is prepared.	
8 Training program for Hybrid Power Generation System including O&M of	
RE facilities is conducted	
9 Knowledge regarding Hybrid Power Generation System is disseminated	
among stakeholders.	

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3 Workflow Chart



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**4 JCC Meeting Records** 

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4.1 1st JCC Meeting

#### MINUTES OF MEETING

#### **BETWEEN**

## THE AUTHORITIES CONCERNED OF THE GOVERNMENT OF FEDERATED STATES OF MICRONESIA

AND

JAPAN INTERNATIONAL COOPERATION AGENCY

**FOR** 

THE FIRST JOINT COORDINATION COMMITTEE (JCC)

ON

### THE PROJECT FOR INTRODUCTION OF HYBRID POWER GENERATION SYSTEM IN PACIFIC ISLAND COUNTRIES

Japan International Cooperation Agency (hereinafter referred to as "JICA") and the authorities concerned of the Federated States of Micronesia (hereinafter referred to as "the FSM side") established a Joint Coordination Committee (hereinafter referred to as "JCC") for the effective and successful implementation of the Project for Introduction of Hybrid Power Generation System in Pacific Island Countries (hereinafter referred to as "the Project").

The first JCC on the Project was held on 25<sup>th</sup> November 2017, at the Training room at Governor's Administration Building, chaired by Hon. Marion Henry, Secretary, Department of Resources and Development.

Kosrae, 25th November, 2017

Tadayuki Ogawa Chief Advisor JICA Expert in Fiji Honorable Marion Henry
Secretary
Department of Resources and
Development
The Federated States of Micronesia

Shinji Shibata Resident Representative JICA Micronesia Office

#### ANNEX

The FSM side and JICA (hereinafter referred to as "both sides") discussed on the issues including the contents of (i)Project Design Matrix (PDM), (ii)Plan of Operation (PO), and (iii)Project Monitoring Sheet, based on the Agenda attached hereto.

The both sides confirmed the main points as described below.

#### 1. Amendment of R/D

The both sides agreed on the amendment of the Record of Discussion dated 18 October, 2016 (hereinafter referred to as "R/D") as follow. All other parts of R/D shall remain unchanged. This amendment will become effective on the date of signing of this Minutes of Meeting.

#### (1) Duration

1) Current Version

Five (5) years (tentatively December, 2016 – November, 2021) from the date of the first arrival of the JICA experts.

2) Amended Version March, 2017 – June, 2022

#### (2) Reason of Amendment

JICA long-term expert stationed in Fiji has started his assignment since March 2017, and the assignment of JICA short-term expert team will last until June 2022.

#### 2. Revision of PDM and PO

The both sides agreed on the revision of PDM and PO as attachment 4 and 5.

#### 3. Project Organization

The both sides confirmed the formation of the Project Counterpart Team and assignment of the officials as described below. The both sides also confirmed that Project Director and Project Manager agreed on the R/D shall be responsible for the coordination among the Project Counterpart Team.

Project Counterparts

#### (1) Yap State; YSPSC

1) Operation and Maintenance of Diesel Engine Generators

Alphonsus Ruwema, Power Plant Manager

Casmiro Yithmeng, Chief Mechanic

Chris Igim, Electrician

Roscoe Tamag, Chief Operator

2) Plan for introduction of hybrid power generation systems

Vincent Bouet, Chief Electrical Engineer

Joe Hafler, Assistant Electrical Engineer

3) Operation and Maintenance of Renewable Energy generation system Joe Hafler, Assistant Electrical Engineer

Charles Laman, Technician, Engineering Division Steven Ken, Technician, Engineering Division Alvin A. Defmew, Technician, Engineering Division Jake Choay, Technician, Engineering Division

#### (2) Chuuk State; CPUC

- 1) Operation and Maintenance of Diesel Engine Generators
- Dennis Triana, Head of power generation and maintenance
- √ Jimmy Reyes, Lead Mechanic
- 2) Plan for introduction of hybrid power generation systems
  Dennis Triana, Head of power generation and maintenance
  Bruno Puas, RE Technician
  - Albert Francis, Head of power distribution
- 3) Operation and Maintenance of Renewable Energy generation system Dennis Triana, Head of power generation and maintenance Jimmy Reyes, Lead Mechanic Bruno Puas, RE Technician

#### (3) Pohnpei State; PUC

- Operation and Maintenance of Diesel Engine Generators Winfred Yamada, Manager, Diesel Plant Qurino Wenio, Mechanic Elbert Elias, Mechanic Erickson Semens, Mechanics
- Plan for introduction of hybrid power generation systems Dackson Solomon, Manager, Power Generation Selestino Santiago, Senior Electrician Pedrus Ehram, Mechanic
- Operation and Maintenance of Renewable Energy generation system Sidney Kilmete, Manager, Renewable Energy Nixon Helgenberger, Electrician Julian Pelep, Solar Technician

#### (4) Kosrae State; KUA

- Operation and Maintenance of Diesel Engine Generators
   Robert Taualupe, Operations Manager
   Ronald Albert, Supervisor of Operator
- 2) Plan for introduction of hybrid power generation systems Gerardo Protacio, Electrical Engineer Tolenoa Joe, Energy Efficiency Officer Hairom Livaie, Customer Service Head, Admin. & Training Officer Robert Taualupe, Operations Manager
- Operation and Maintenance of Renewable Energy generation system Robert Taualupe, Operations Manager Tolenoa Joe, Energy Efficiency Officer Gifford Sigrah, Distribution Foreman

#### 4. Indicators (as the baseline of project evaluation)

(1) Overall Goal

Yap	Chuuk	Pohnpei	Kosrae
10,131	10,471	22,458	4,461
997x10 <sup>3</sup>	1,031x10 <sup>3</sup>	2,210x10 <sup>3</sup>	439x10 <sup>3</sup>
575 kW (PV systems owned by YSPSC) 258 MWh	265 kW 356 MWh	980 kW (PV) 725 kW (Hydro) 1410 MWh (PV) 666 MWh (Hydro)	345 kW 439 MWh
	575 kW (PV systems owned by YSPSC) 258 MWh	10,131 10,471  997x10³ 1,031x10³  575 kW (PV systems owned by YSPSC)	10,131 10,471 22,458  997x10³ 1,031x10³ 2,210x10³  575 kW (PV systems owned by YSPSC) 258 MWh  10,471 22,458  980 kW (PV) 725 kW (Hydro) 1410 MWh (PV) 666 MWh (Hydro)

(2) Project Purpose

State	Yap	Chuuk	Pohnpei	Kosrae
Pilot DG units	Unit 1,2 and 3	Unit 1,2,4 and 5	Unit 4 and 5	2 new units installed under JICA Project
Specific fuel consumption	Deutz - 13.0 kWh/G DEG1&2 CAT 3516- 14.5 kWh/G DEG3 CAT C32 - 14.3 kWh/G	14.91 kWh/G (total average 2017) 13.13kWh/G (unit 3) 14.65kWh/G (unit 5) 14.57kWh/G (unit 4) 15.19kWh/G (Unit 1) 15.21kWh/G (Unit 2)	13.4 kWh/G (total average) 13.7 kWh/G (unit 1) 13.7 kWh/G (unit 2) 13.4 kWh/G (unit 3) 15.7 kWh/G (unit 4) 16.3 kWh/G (unit 5) 10.1 kWh/G (unit 6)	13.6 kWh/G (total average 2016) 12.5 kWh/G (unit 4) 12.62 kWh/G (unit 6) 14.0 kWh/G (unit 8)  T.B.C after completion of installation of new DGs
Performance ratio for RE power generation system	66% (PEC)	72% (Airport) 71% (PEC)	76% (COM) 78% (President's office) 71% (PEC)	66% (PEC) 56% (EU)

#### 5. Counterpart training in Japan

#### (1) Schedule

Counterpart Training in Japan is tentatively planned in February and October, 2018. Further training opportunities will be discussed later.

#### (2) Goal

The goal of the first training in February is to introduce general overview of power supply & demand situation in remote islands in Japan.

The second training in October will be designed to witness and learn the actual maintenance works of Diesel Engine Generators.

#### (3) Participants

The eligible participants for the first training are managers and higher staff responsible for the dissemination of Hybrid Power Generation System. ("Hybrid Power Generation System" is the system in which Diesel Engine Generators and Renewable Energy are operated and maintained properly to reduce consumption of fossil fuel and greenhouse gas emission.)

As a result of discussion, following counterparts are nominated as the participants for the first training.

- 1) Victor Nabeyan, Assistant General Manager (YSPSC)
- 2) T. B. C (CPUC)
- 3) Dackson Solomon, Manager, Power Generation (PUC)
- 4) Hairom Livae, Customer Service Supervisor (KUA)

The participants for the second training would be supervisors/engineers in charge of maintenance of Diesel Engine Generators. The selection of the participants shall be finalized by May, 2018.

#### 6. Identification of DG for overhaul works

Both sides agreed to conduct trainings for DG overhaul works in Kosrae, inviting counterparts from other States. It is because private contractors/supervisors are invited for the supervision of overhaul works in other states.

#### 7. Procurement of fuel flowmeter

JICA Expert team requested FSM side to provide information about specification and quoted price (from three companies) of fuel flowmeter to be procured in Pohnpei and Kosrae state by the middle of December.

8. Technical advice on introducing EMS (Energy Management System)
JICA Expert team will analyze power system composition of Chuuk, Pohnpei
and Kosrae state and advice the possible implementation of EMS system for
more efficient operation of the hybrid power generation system.

#### 9. The next JCC

FSM side and JICA Expert team agreed that the next (2<sup>nd</sup>) JCC meeting will be held around February, 2019 at Pohnpei State.

ATTACHMENT 1 Agenda
ATTACHMENT 2 List of Participants
ATTACHMENT 3 Project Monitoring Sheet
ATTACHMENT 4 Project Design Matrix ver. 2
ATTACHMENT 5 Plan of Operation ver. 2

#### Agenda for JCC Meeting

- 1. Opening Prey and remarks by Hon. Carson Sigrah, Lieutenant Governor, Kosrae State.
- 2. Opening Remarks by Hon. Marion Henry, Secretary, Department of Resources and Development
- 3. Explanation and confirmation on the following documents;
  - (1) Project Design Matrix (PDM)
  - (2) Plan of Operation (PO)
  - (3) Project Monitoring Sheet
- 4. Explanation on the project implementation methodology
- 5. Confirmation on the Minutes of Meeting (M/M)
- 6. Explanation on Capacity Assessment
- 7. Closing Remarks by Mr. Shinji Shibata, Resident Representative of JICA Micronesia Office

#### ATTACHMENT 2 List of Participants

Organization	Position	Name
Department of Resources and Development, FSM	Secretary	Hon. Marion Henry
Department of Resources and Development, FSM	Assistant Secretary	Mr. Hubert Yamada
Yap State Public Service Corporation	Assistant General Manager	Mr. Victor Nabeyan
Chuuk Public Utility Corporation	CEO	Mr. Mark Waite
Pohnpei Utilities Corporation	Act. General Manager	Mr. Nixon T. Anson
Pohnpei Utilities Corporation	Manager, Power Generation	Mr. Dackson Solomon
Kosrae State Government	Lieutenant Governor	Hon. Carson Sigrah
Kosrae Utilities Authority	General Manager	Mr. Fred Skilling
	Electrical Engineer	Mr. Gerardo Protacio
	Customer Service Head	Mr. Hiron Livaie
	Board Chairman	Mr. Lipar George
	Board Secretary	Mr. Isao Mike
JICA Micronesia Office	Resident Representative	Mr. Shinji Shibata
	Program Officer	Ms. Trish-Farrah E. Billen
JICA	Chief Advisor	Mr. Tadayuki Ogawa
JICA/	Team Leader	Mr. Luis Kakefuku
Okinawa Enetech Co., Inc		
JICA/	Team Sub Leader	Mr. Masanori Shimabuku
Okinawa Enetech Co., Inc		
JICA/Okinawa Electronic Power Co., Inc	DG Economical Operation	Mr. Hiroyuki Nakachi
JICA/Okinawa Electronic Power Co., Inc	RE Integration Plan	Mr. Chihiro Tobaru
JICA/KD Tech Co., Itd	Operational Coordination	Mr. Takahisa Watanabe

#### PROJECT MONITORING SHEET

<u>Project Title: The Project for Introduction of Hybrid Power Generation System in Pacific</u>
Island Countries

Version of the Sheet: Ver.1

Name: Tadayuki OGAWA

Title: Chief Advisor

Submission Date: 25th November, 2017

#### I. Summary

- 1 Progress
- 1 1 Progress of Inputs
- (1) Japanese side
  - 1) Long term expert stationed in Fiji has worked in June to confirm the overall operation conditions of existing Diesel Generators (DGs) and Renewable Energy (RE) power generation systems in FSM.
  - 2) Short term expert team arrived at FSM (Yap) on 28<sup>th</sup> October, 2017. The team is looking into the current activities of operation and maintenance of DGs and RE power generation systems in each state of FSM.
- (2) FSM side

Members from FSM side established a following team as the project implementation body.

- (1) Yap State
- 1) Operation and Maintenance of DGs

Alphonsus Ruwema, Power Plant Manager

Casmiro Yithmeng, Chief Mechanic

Chris Igim, Electrician

Roscoe Tamag, Chief Operator

- 2) Plan for introduction of hybrid power generation systems
  - Vincent Bouet, Chief Electrical Engineer

Joe Hafler, Assistant Electrical Engineer

3) Operation and Maintenance of Renewable Energy generation system

Joe Hafler, Assistant Electrical Engineer

Charles Laman, Technician, Engineering Division

Steven Ken, Technician, Engineering Division

Alvin A. Defmew, Technician, Engineering Division

Jake Choay, Technician, Engineering Division

- (2) Chuuk State
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   Dennis Triana, Head of power generation and maintenance
   Jimmy Reyes, Lead Mechanic
- 2) Plan for introduction of hybrid power generation systems Dennis Triana, Head of power generation and maintenance Bruno Puas, RE Technician Albert Francis, Head of power distribution
- 3) Operation and Maintenance of Renewable Energy generation system Dennis Triana, Head of power generation and maintenance Jimmy Reyes, Lead Mechanic Bruno Puas, RE Technician
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   Winfred Yamada, Manager, Diesel Plant
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3) Operation and Maintenance of Renewable Energy generation system Robert Taualupe, Operations Manager Tolenoa Joe, Energy Efficiency Officer Gifford Sigrah, Distribution Foreman

#### 1-2 Progress of Activities

No.	Activity	Progress
Outpu	at 1: 1. Appropriate and economical system for O&M of	Diesel Generators (DGs) is enhanced.
1-1	Operational conditions of the existing DGs are reviewed, including confirmation of objectively verifiable indicators for overall goal and project purpose.	JICA expert to FSM counterparts to collect
1-2	Specific fuel consumption of pilot DG units is measured.	Data for specific fuel consumption was provided by each state utility.  The figure shall be updated after procurement of new flow meter for Pohnpei and Kosrae state.
1-3	Improvement plan for the operation of pilot DG units is prepared.	Detailed operation condition of DGs are under investigation by JICA experts FSM counterparts. Following issues were confirmed by JICA experts;  1) DG operation data shall be recorded and kept in soft data for further power system analysis in Pohnpei.  2) Specific fuel consumption of each unit should be periodically measured and monitored.  3) Periodical patrol checklist for preventive maintenance should be enforced.  4) Seek feasibility of introducing SCADA for remote monitoring and controlling DG and PV systems for Kosrae, Pohnpei, and Chuuk.
1-4	Existing spare parts and maintenance tools of pilot DG units are confirmed.	Existing spare parts and special maintenance tools are under investigation by JICA experts in cooperation with FSM side.
1-7	The concept of Economic Dispatch Control (EDC) is shared among operators and applied, if possible.	EDC manual is under preparation by JICA experts. The basic concept of EDC has been explained by JICA experts.
1-14	Related training programs for appropriate O&M of DGs are implemented periodically.	Technical findings with recommendations are provided for each state.
Output	2: Methodology for appropriate planning and O&M of	renewable energy (RE) is established.
2-1	Current situation and future development plan of RE is reviewed.	Same as activity 1-1

2-4	Operating conditions of the existing RE facilities are reviewed, including confirmation of objectively verifiable indicators for overall goal and project	Same as activity 1-1
2-8	Training program for Hybrid Power Generation System including O&M of RE facilities is conducted.	Technical findings with recommendations are provided for each state.

#### 1.3 Achievement of Output

Initial baseline survey and preparation work is undergoing for both Output 1 & 2.

- 1-4 Achievement of the Project Purpose
- 1.5 Changes of Risks and Actions for Mitigation
- 1.6 Progress of Actions undertaken by JICA
- 1-7 Progress of Actions undertaken by the Parties
- 1.8 Progress of Environmental and Social Considerations (if applicable)
- 1-9 Progress of Considerations on Gender/ Peace Building/ Poverty Reduction (if applicable)
- 1-10 Other remarkable/ considerable issues related/ affect to the Project (such as other JICA's projects, activities of counterparts, other donors, private sectors, NGOs, etc.)
- 2 Delay of Work Schedule and/or Problems (if any)
- 2-1 Detail
- 2-2 Cause
- 2-3 Action to be taken
- 2-4 Roles of Responsible Persons/ Organization (JICA, the Parties, etc.)
- 3 Modification of the Project Implementation Plan
- 3-1 Plan of Operation
  - Project period is updated based on the actual dispatch schedule of JICA Experts (March 2017 – June 2022).
  - > Implementation plan of each activity including trainings are also revised in accordance with the above update.
- 3-2 Other modifications on detailed implementation plan
- II. Project Monitoring Sheet I & II as Attached

(Project Design Matrix and Plan of Operation)

#### **Draft Project Design Matrix (PDM)**

Project Title: The Project for Introduction of Hybrid Power Generation System in Pacific Island Countries

Project Term: March 2017 - June 2022 (Five Years) (Phase 1: March 2017 - February 2019, Phase 2: March 2019 - June 2022

Country: Federated States of Micronesia

Target Area: Pohnpei, Chuuk, Yap and Kosrae

Target Group: Related engineers and other technical staff in the target area (DRD, PUC, KUA, CPUC, YSPSC)

DRD: Department of Resources and Development PUC:Pohnpei Utilities Corporation Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumptions
Overall Goal  Energy security is improved and greenhouse gases are reduced through the reduction of fossil fuels consumption.	In comparison to the indicators at the time of baseline survey,  1. Reduced amount of CO2 emission of power utilities in the target area  2. Reduced amount of diesel fuel of power utilities in the target area  3. Increased capacity (kW) and actual generated energy (kWh) of renewable energy facilities of power utilities in the target area		Amportant Assumptions
Project Purpose			
Hybrid Power Generation System is introduced.	<ol> <li>Improvement of specific fuel consumption of pilot DG units (better than the baseline data set at the beginning of the Project)</li> <li>Improvement of performance ratio for the RE power generation systems (better than the baseline data set at the beginning of the Project)</li> <li>Proper application of planning and O&amp;M method of Hybrid Power Generation System</li> <li>*Based on the review on result of Project activities, specific target numbers are to be determined.</li> </ol>	<ol> <li>Record on specific fuel consumption of Pilot DG units by C/P, checked by Japanese experts</li> <li>Record on operation of RE power generation systems</li> <li>Evaluation by Japanese experts and C/P on plans of Hybrid Power Generation System</li> </ol>	C/P agencies continued commitment to the Project by continuing budget allocation as well as assignment of personner for the post- Project activities.
Outputs			
<ol> <li>Appropriate and economical system for O&amp;M of Diesel Generators (DGs) is enhanced.</li> </ol>	<ul> <li><output 1=""> </output></li> <li>1-1 Adequacy on the use of the work schedule, check sheets and manual for the maintenance work for the pilot DG units</li> <li>1-2 Number of training participants who are conducting operation and maintenance of DG based on the learnings from the training program</li> </ul>	<ul> <li>1-1 Evaluation by Japanese experts and C/P on improvement of maintenance work (daily/partial inspection/overhaul work) for pilot DG units</li> <li>1-2 Capacity assessment of trained O&amp;Mstaff and managers by Japanese experts</li> </ul>	C/P agencies promote investment on renewable energy facilities based on the current national policy/plan.

Methodology for appropriate planning and O&M of renewable energy (RE) is established.	<ul> <li>&lt;0utput 2&gt;</li> <li>2-1 Number of training participants who learned the planning method of the Hybrid Power Generation System</li> <li>2-2 Number of training participants who are conducting O&amp;M of RE facilities based on the learnings from the training program</li> <li>2-3 Preparation of related manuals for Hybrid Power Generation System</li> <li>2-4 Adequacy of the use of the related manuals for Hybrid Power Generation System</li> </ul>	2-1 Capacity assessment of trained staff and managers by Japanese experts 2-2 Capacity assessment of trained O&M staff and managers by Japanese experts 2-3 Evaluation by Japanese Experts on related manuals for Hybrid Power Generation System prepared by C/P 2-4 Evaluation by Japanese experts and C/P on the use of the related manuals for Hybrid Power Generation System	
Activities  Output 1>  1-1 Operational conditions of the existing DGs are reviewed, including confirmation of objectively verifiable indicators for overall goal and project purpose.  1-2 Specific fuel consumption of pilot DG units is measured.  1-3 Improvement plan for the operation of pilot DG units is prepared.  1-4 Existing spare parts and maintenance tools of pilot DG units are confirmed.  1-5 Improvement plan for the operation of pilot DG units is implemented.  1-6 The result of implementation of the improvement plan is evaluated, and improvement plan is updated.  1-7 The concept of Economic Dispatch Control (EDC) is shared among operators and applied, if possible.  1-8 Necessary spare parts and maintenance tools for the pilot DG units are prepared.  1-9 Maintenance work schedule for the pilot DG units is prepared.  1-10 Check sheets and maintenance manuals for maintenance works for pilot DG units are conducted in accordance with the maintenance schedule.  1-12 The result of maintenance works is evaluated, and future maintenance work schedule together with budget (including sub-contract fee, cost for tools and equipment) is prepared.  1-13 Specific fuel consumption of the pilot DG units is measured before and after implementation of the related project activities.  1-14 Related training programs for appropriate O&M system for DGs are implemented periodically.  1-15 Knowledge on appropriate O&M of DGs is disseminated among stakeholders. <output 2="">   2-1 Current situation and future development plan of RE is reviewed.   2-2 Planning manual for Hybrid Power Generation System is prepared.   2-3 Planning manual for Hybrid Power Generation System is reviewed and updated in the target area.   2-4 Operating conditions of the existing RE facilities are reviewed, including confirmation of objectively verifiable indicators for overall goal and project purpose.</output>	(Japanese side)  1. Dispatch of the Japanese experts  SICA long term expert, stationed in Fiji >  - Chief Advisor/Hybrid Power Generation System  SICA Consultant Team> - Team Leader/Operation & Maintenance of DG - Economic operation of DG (EDC) - Maintenance support of DG (Mechanical expert) - Maintenance support of DG (Electrical expert) - O&M of RE power generation system - Integration of RE power generation system - Project Coordinator  2. Training in Japan and Fiji  3. Equipment - In accordance with necessity of activities	(FSM side) 1. Assignment of C/Ps -Project Director (P/D) -Project Manager (P/M) -Engineers in charge of O&M (Manager level) - Mechanical Staff - Electrical Staff - Planning officer, and others  2. Facilities and equipment -Project office  3.Recurrent costs - C/Ps' wages and allowances - C/Ps' domestic travel expense in part	Preconditions Contents of the current relevant policies on promotion of renewable energy and energy efficiency are not largely changed.

2-5 O&M manual for RE facilities is prepared. 2-6 Maintenance works are conducted according to O&M manual of RE facilities. 2-7 The result of maintenance works is evaluated, and future maintenance work schedule together with budget is prepared.	7
2-7 The result of maintenance works is evaluated, and future maintenance work	
2-7 The result of maintenance works is evaluated, and future maintenance work schedule together with budget is prepared.	
schedule together with hudget is prepared	
beneath to be at the frequency.	
2-8 Training program for Hybrid Power Generation System including O&M of	
RE facilities is conducted	
2-9 Knowledge regarding Hybrid Power Generation System is disseminated	
among stakeholders.	
	-

#### Tentative Plan of Operation (PO)

Project Title: The Project for Introduction of Hybrid Power Generation System in Pacific Island Countries
Project Term: March 2017 - June 2022 (Phase 1: March 2017 - February 2019, Phase 2: March 2019 - June 2022
Country: Federated States of Micronesia

Target Area: Pohnpei, Chuuk, Yap and Kosrae

Target Group: Related engineers and other technical staff in the target area (DRD, PUC, KUA, CPUC, YSPSC) 2017 2018 2019 2020 2021 2022 3 4 5 6 7 8 9 10 11 12 1 2 3 4 5 6 7 8 9 10 11 12 1 2 3 4 5 6 7 8 9 10 11 12 1 2 3 4 5 6 7 8 9 10 11 12 1 2 3 4 5 6 7 8 9 10 11 12 1 2 3 4 5 6 7 8 9 10 11 12 1 2 3 4 5 6 7 8 9 10 11 12 1 2 3 4 5 6 7 8 9 10 11 12 1 2 3 4 5 Output1 Activities [Appropriate O&M System for DG] Outcome Org. in charge Operational conditions of the existing DGs are reviewed, including PUC, KUA, CPUC. 1-1. confirmation of objectively verifiable indicators for overall goal and TNA Report YSPSC and JICA project purpose. Experts PUL KUA LPUK Measurement of 1-2. Specific fuel consumption of pilot DG units is measured. YSPSC and JICA Specific fuel consumption PUC, KUATEPUC 1-3. Improvement plan for the operation of pilot DG units is prepared. mprovement plan YSPSC and JICA PUC, EUA, CPUC List of spare parts and Existing spare parts and maintenance tools of pilot DG units are confirm YSPSC and JICA naintenance tools PUC, KUA, EPUC, Improvement Implementation 1-5. Improvement plan for the operation of pilot DG units is implemented. YSPSC and JICA Report PUC, KUATEPUC. The result of implementation of the improvement plan is evaluated, and Improvement Evaluation Report YSPSC and JICA improvement plan is updated. PUC, KUA, CPUC The concept of Economic Dispatch Control (EDC) is shared among EDC software, manual, EDC YSPSC and JICA operators and applied, if possible. sheet PUC, RUAGEPUC, Necessary spare parts and maintenance tools for the pilot DG units are List of spare parts and 1-8. YSPSC and JICA maintenance tools prepared prepared. PUC, KUK, CPUC, 1-9. Maintenance work schedule for the pilot DG units is prepared. Maintenance work shedule YSPSC and JICA ruc, KUATEruc, Check sheets and maintenance manuals for daily maintenance works for Check sheets and maintenance 1-10. YSPSC and JICA pilot DG units are prepared. anulas PUC. KUATEPUC. Maintenance works (daily/partial inspection/overhaul work) for pilot DG Maintenance record YSPSC and JICA units are conducted in accordance with the maintenance schedule. The result of maintenance works is evaluated, and future maintenance work

Evaluation report and future PUC, KUA, CPUC, 1-12. schedule together with budget (including sub-contract fee, cost for tools YSPSC and JICA schedule for maintenance and equipment) is prepared. Experts PUC, KUA, CPUC, 1-13. Specific fuel consumption of the pilot DG units is measured before and Measurement for specific YSPSC and JICA after implementation of the related project activities. consumption of the pilot DG DRD, PUC, KUA, Related training programs for appropriate O&M of DGs are implemented Training record, CPUC, YSPSC and periodically. recommendations, reports, etc. IICA Experts DRD, PUC, KUA, Knowledge on appropriate O&M of DGs is disseminated among 1-15. Seminar, workshop records CPUC, YSPSC and stakeholders. JICA Experts **Output 2 Activities** UC. KUA. CPU 2-1. Current situation and future development plan of RE is reviewed. TNA Report YSPSC and JICA PUC, RUA, CPUC Planning manual for Hybrid 2-2. Planning manual for Hybrid Power Generation System is prepared YSPSC and JICA Power Generation PUC, EVA, CPUC, Planning manual for Hybrid Power Generation System is reviewed and Updated Planning manual for YSPSC and JICA updated in the target area. Hybrid Power Generation PUC, KUA, CPUC. Operating conditions of the existing RE facilities are reviewed, including 2-4. confirmation of objectively verifiable indicators for overall goal and TNA Report YSPSC and JICA project purpose Experts 2-5. O&M manual for RE facilities is prepared O&M manual for RE facilities YSPSC and JICA PUC. KUATEPUC. Maintenance works are conducted according to O&M manual of RE 2-6. Maintenance Record YSPSC and JICA PUC, KUA, CPUC, The result of maintenance works is evaluated, and future maintenance work Evaluation report of 2-7. YSPSC and JICA schedule together with budget is prepared. maintenance work, and schedule Experts DRD, PUC, KUA, Training program for Hybrid Power Generation System including O&M of Training record, CPUC, YSPSC and RE facilities is conducted. ecommendations, reports, etc. JICA Experts Plan Knowledge regarding Hybrid Power Generation System is disseminated DRD, PUC, KUA, eminar, workshop records among stakeholders. CPUC, YSPSC Δ △: JCC Δ ▲: Training in Japan/Fiji JICA long term expert, stationed in Fiji JICA Consultant Team

The Project for Introduction of Hybrid Power Generation in Paci-	fic Island Countries
Project Final Report	Okinawa Enetech Co · Okinawa Electric Power C

4.2 2nd JCC Meeting

#### MINUTES OF MEETING

#### BETWEEN

# THE AUTHORITIES CONCERNED OF THE GOVERNMENT OF FEDERATED STATES OF MICRONESIA AND

JAPAN INTERNATIONAL COOPERATION AGENCY FOR

THE SECOND JOINT COORDINATION COMMITTEE (JCC)
ON

## THE PROJECT FOR INTRODUCTION OF HYBRID POWER GENERATION SYSTEM IN PACIFIC ISLAND COUNTRIES

Japan International Cooperation Agency (hereinafter referred to as "JICA") and the authorities concerned of the Federated States of Micronesia (hereinafter referred to as "the FSM side") established a Joint Coordination Committee (hereinafter referred to as "JCC") for the effective and successful implementation of the Project for Introduction of Hybrid Power Generation System in Pacific Island Countries (hereinafter referred to as "the Project").

The second JCC on the Project was held on 29<sup>th</sup> January 2019, at the Pohnpei State Government Conference Room chaired by Hon. Marion Henry, Secretary, Department of Resources and Development.

Pohnpei, 29th January, 2019

Tadayuki Ogawa Chief Advisor

JICA Expert in Fiji

Honorable Marion Henry

Secretary

Department of Resources and

Development

The Federated States of Micronesia

Shinji Shibata

Resident Representative

JICA Micronesia Office

Takahiro Suzuki

Assistant Director

Energy and Mining Group

JICA Headquarters

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Sydneyi 29th January 2018

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#### **ANNEX**

The FSM side and JICA (hereinafter referred to as "both sides") discussed on the issues including the contents of (i)Project Design Matrix (PDM), (ii)Plan of Operation (PO), and (iii)Project Monitoring Sheet, based on the Agenda attached hereto.

The both sides confirmed the main points as described below.

1. Confirmation of PDM, PO and Project Monitoring Sheet

The both sides confirmed the latest version of PDM and PO as attachment 4 and 5. Also, the project monitoring sheet was agreed as attachment 3.

#### 2. Project Organization

The both sides confirmed the update of the Project Counterpart Team and assignment of the officials as described below. Those counterparts are core trainers in each task, and expected to disseminate technical knowledge and skills among other members in the organization periodically during the Project.

The FSM side agreed to make the effort to remain the members as core trainers by 2022.

- Project Counterparts (Core Trainers)
  - "☆" means prioritized counterparts
  - (1) Yap State; YSPSC
  - Operation and Maintenance of Diesel Engine Generators Alphonsus Ruwema, Power Plant Manager Casmiro Yithmeng, Chief Mechanic
     ☆Chris Igim, Electrician (Electrical)
     Roscoe Tamag, Chief Operator
     ☆Rowino Yarofaliut, Power Plant Mechanic (Mechanical)
  - 2) Plan for introduction of hybrid power generation systems Vincent Bouet, Chief Electrical Engineer

#### (2) Chuuk State; CPUC

- Operation and Maintenance of Diesel Engine Generators Dennis Triana, Head of power generation and maintenance Jimmy Reyes, Lead Mechanic Basiente Kintin Jr., Mechanic (T.B.C)
- Plan for introduction of hybrid power generation systems Yolanda Joab Mori, Head of Renewable Energy Dennis Triana, Head of power generation and maintenance

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Bruno Puas, RE Technician
Albert Francis. Head of power distribution

3) Operation and Maintenance of Renewable Energy generation system Yolanda Joab Mori, Head of Renewable Energy Dennis Triana, Head of power generation and maintenance Jimmy Reyes, Lead Mechanic Bruno Puas, RE Technician

#### (3) Pohnpei State; PUC

- Operation and Maintenance of Diesel Engine Generators
   ★Winfred Yamada, Manager, Diesel Plant
   ★Elbert Elias, Mechanic
   Erickson Semens, Mechanics
- 2) Plan for introduction of hybrid power generation systems 
  ☆Dackson Solomon, Manager, Power Generation
  Selestino Santiago, Senior Electrician
  Pedrus Ehram, Mechanic
- 3) Operation and Maintenance of Renewable Energy generation system ☆Sidney Kilmete, Manager, Renewable Energy
  Nixon Helgenberger, Electrician
  Julian Pelep, Solar Technician

#### (4) Kosrae State; KUA

- 1) Operation and Maintenance of Diesel Engine Generators

  ☆Robert Taualupe, Operations Manager (Electrical)

  ☆Ronald Albert, Supervisor of Operator (Mechanical)

  Careston Alokao, Power Plant Operator
- Plan for introduction of hybrid power generation systems
   Gerardo Protacio, Electrical Engineer
   Hairom Livaie, Customer Service Head, Admin. & Training Officer
   Robert Taualupe, Operations Manager
- 3) Operation and Maintenance of Renewable Energy generation system 

  ☆Robert Taualupe, Operations Manager

  ☆Gifford Sigrah, Distribution Foreman

  Ronnie George, Lineman-2



3. Improvement Plan for the Operation of Pilot DG Units

The FSM side agreed to implement following measures to improve the operation conditions of pilot DG units as explained in the letter issued on 28<sup>th</sup> September, 2018. The result of implementation of the improvement plan will be evaluated and updated in 2019 together with JICA Experts.

- (1) DG operation data shall be printed and kept as paper for further power system analysis such as abnormalities in devices of the DG's facilities.
- (2) Specific fuel consumption of each unit should be periodically measured and monitored, and the result shall be reflected in the unit dispatch schedule.
- (3) The actual daily patrol checklist for preventive maintenance should be improved according to the sample format provided by the JICA expert team by the end of March, 2019.
- (4) To efficiently manage overhaul works, overhaul work schedule should be prepared according to the sample format provided by the JICA expert team by the end of March, 2019.
- (5) As for PUC, the JICA expert team confirmed efficient operation on weekday nights running only 2 DGs, but on some nights, 3 units were in operation providing 2000kW of excessive power reserve. To perform efficient operation of the power plant, the appropriate amount of reserve margin should be reminded by plant operators for economic distribution of DGs in accordance with the total demand. FSM side should keep the operation records including the reserve margin and share with JICA expert team.

#### 4. Third Country Training in Fiji

(1) Objective

Counterparts from FSM, RMI, Kiribati and Tuvalu will be invited to Fiji to conduct the 1<sup>st</sup> regional training under the Project in 2019. The participants will have an opportunity to exchange their views and opinions with other participants to improve their skills and knowledge. Trainers in Fiji will be supported by Japanese Experts to deliver classroom lectures and hands-on trainings in accordance with curriculum. The result of the training will be evaluated to improve the training curriculum, textbooks & materials for the next training.

(2) Proposed training courses

As a result of the past trainings for trainers in Fiji, following training courses are proposed for the 1<sup>st</sup> regional training in Fiji.

- 1) Operation & Maintenance for Diesel Engine Generators
- 2) Grid Integration of Renewable Energy Generation Systems
- 3) Operation & Maintenance of Renewable Energy generation Systems (Solar PV)

Initially, the training for the above 2) and 3) will be held simultaneously as the participants are expected same in most countries.



#### (3) Venue

The possible venue of the training are listed as follows;

- 1) EFL (Energy Fiji Limited) Training Center
- 2) EFL Diesel Power plants (Vuda, Kinoya, etc.)
- 3) Solar PV plants (various)

#### (4) Tentative Schedule

About early October, 2019 (1 week for RE and DG respectively)

#### 5. Training Equipment

Following equipment has been handed over to the FSM side under the Project.

No.	Item	Yap	Chuuk	Pohnpei	Kosrae
1	Fuel flow meter			10	6
2	Pyranometer and thermometer	1	1	1	1
3	String tracer (IV curve tracer)	1	1	1	1
4	Cell line checker	1	1	1	1
5	Simulation software (HOMER Pro)	1	1	1	1

In addition, equipment below will be provided by the end of March, 2019.

No.	Item		Yap	Chuuk	Pohnpei	Kosrae
1	FAN UNIT				3	
2	Digital Pressure Calibrator					1
3	Digital multimeter					1
4	Digital thermometer					1
5	Instrumentation si	gnal				1
	measurement / generator					
6	Ohm meter					1
7	Air compressor kit					1
8	Air hose 1 m×2, 1.5 m×1					1
9	Various types of fittings					1

It is required for the FSM side to keep and utilize above equipment in an appropriate manner. In case of missing/malfunction of equipment, the FSM side is requested to inform JICA Experts immediately.

#### 6. Hand Over of Manuals

Following manuals will be handed over to FSM side by March 2019, as a result of discussion and consultation with counterpart members.

Five hard copies of each manual will be provided for each state.

- 1) Planning manual for Hybrid Power Generation System
- 2) Operation & Maintenance Manual for Solar PV System

It is very important that these manuals are fully utilized and revised as necessary after hand over. Therefore, the project counterpart members are requested to share the information and/or conduct training for other staff to apply these manuals in their daily works. The progress of activities will be monitored under the phase-2 period with the assistance by JICA Experts.



7. Venue for the next JCC in FSM FSM side and JICA Expert team agreed that the next ( $3^{rd}$ ) JCC meeting will be held around February, 2020 at Yap State.

ATTACHMENT 1 Agenda for JCC Meeting
ATTACHMENT 2 Lists of Participants
ATTACHMENT 3 Project Monitoring Sheet
ATTACHMENT 4 Project Design Matrix ver. 2
ATTACHMENT 5 Plan of Operation ver. 2
ATTACHMENT 6 Mid-term Review



#### **ATTACHMENT 1**

#### Agenda for JCC Meeting

- 1. Opening Remarks by Hon. Marion Henry, Secretary, Department of Resources and Development, and Mr. Koji Sugiyama, Charge d'Affaires ad interim, Embassy of Japan
- 2. Explanation and confirmation on the following documents;
  - (1) Project Design Matrix (PDM)
  - (2) Plan of Operation (PO)
  - (3) Project Monitoring Sheet
- 3. Confirmation on the Minutes of Meeting (M/M)
- 4. Mid-term Review for the Project
- 5. Closing Remarks by Mr. Shinji Shibata, Resident Representative of JICA Micronesia Office



### ATTACHMENT 2 List of Participants

Organization	Position	Name
Department of Resources	Secretary	Hon. Marion Henry
and Development, FSM		
Department of Resources	Assistant Secretary	Mr. Hubert Yamada
and Development, FSM		
Yap State Public Service	Assistant General Manager	Mr. Victor Nabeyan
Corporation		
Chuuk Public Utility	CFO	Ms. Lei Shirai
Corporation		
Pohnpei Utilities Corporation	General Manager	Mr. Nixon T. Anson
Pohnpei Utilities Corporation	Manager, Power Generation	Mr. Dackson Solomon
Kosrae Utilities Authority	General Manager	Mr. Fred Skilling
Embassy of Japan	Charge d'Affaires ad interim	Mr. Koji Sugiyama
Embassy of Japan	Second Secretary	Mr. Koji Oda
JICA HQs	Deputy Director	Mr. Ken Okumura
Pacific and Southeast Asia		
Division 6		
JICA HQs	Assistant Director	Mr. Takahiro Suzuki
Energy and Mining Group		
JICA Micronesia Office	Resident Representative	Mr. Shinji Shibata
JICA Micronesia Office	Project Formulation Advisor	Ms. Emi Teshima
JICA Micronesia Office	Program Officer	Ms. Trish-Farrah E. Billen
JICA	Chief Advisor	Mr. Tadayuki Ogawa
JICA/	Team Sub Leader	Mr. Masanori Shimabuku
Okinawa Enetech Co., Inc	Icam out Leave	IVII. IVIASAITOIT OTIIITIADURU
JICA/	Short Team Expert	Mr. Hirokazu Nakamura
Okinawa Enetech Co., Inc	Onon realif Expert	IVII. I III ONAZU I TANGITUTA
JICA/	Short Team Expert	Mr. Yuma Uezu
Okinawa Enetech Co., Inc	Onor ream Expert	IVII. Tullia Ocza
JICA/ Okinawa Electric power	Short Team Expert	Mr. Yusuke Kuniba
Co., Inc	·	
JICA/KD Tech Co., Itd	Operational Coordination	Mr. Takahisa Watanabe
JICA/ Centinos, Inc	Evaluation Consultant	Mr. Takeshi Kikukawa



#### **PROJECT MONITORING SHEET**

Project Title: The Project for Introduction of Hybrid Power Generation System in Pacific Island

**Countries** 

Version of the Sheet: Ver.2

Project Term: March 2017 -June 2022

Name: Tadayuki OGAWA

Title: Chief Advisor

Submission Date: 29th January, 2019

#### I. Summary

#### 1 Progress

1-1 Progress of Inputs

#### (1) Japanese side

- Long term expert stationed in Fiji has worked in August to plan & coordinate the trainings for the operation and maintenance of Diesel Engine Generators (DEGs) and Renewable Energy (RE) power generation systems in FSM.
- 2) Short term expert team has worked in July & August to conduct the trainings for the operation and maintenance of Diesel Engine Generators (DEGs) and Renewable Energy (RE) power generation systems in FSM.
- 3) Counterpart training has been conducted in February and September in Okinawa, Japan inviting counterparts from 5 target countries.

#### (2) FSM side

In total 30 number of core trainers are registered under the Project, 9 from YSPSC, 5 from CPUC, 10 from PUC and 6 from KUA staff. Facilities and equipment (e.g. training classrooms) for the trainings in FSM were provided by PUC.

#### 1-2 Progress of Activities

No.	Activity	Progress			
Outpu	Output 1: 1. Appropriate and economical system for O&M of Diesel Generators (DGs) is enhanced.				
Operational conditions of the existing DGs are reviewed, including confirmation of objectively verifiable indicators for overall goal and project purpose.		training needs was compiled as "Training Needs			
1-2	Specific fuel consumption of pilot DG units is measured.	Specific fuel consumption needs to be measured in PUC and KUA after installation of fuel flow meters procured under the project. The baseline			

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#### **ATTACHMENT 3**

1-4 1	Improvement plan for the operation of pilot DG units is prepared.	figure for project evaluation shall be updated after measurment.  Improvement plan was prepared and shared with
1-4 1	• • • • • • • • • • • • • • • • • • • •	Improvement plan was prepared and shared with
1-4 1	• • • • • • • • • • • • • • • • • • • •	
1-4	is prepared.	
		FSM side in the letter issued on 28th September
	7	2018.
4 1	Existing spare parts and maintenance tools of pilot	Existing spare parts and maintenance tools were
	DG units are confirmed.	confirmed in August 2018.
1 2	Improvement plan for the operation of pilot DG units	FSM side is requested to implement the proposed
1	is implemented.	improvement plan under consultation with JICA
1		Expert. After completion of the plan by April
- 1		2019, the result of implementation of the
		improvement plan is evaluated, and improvement
		plan will be updated.
	The concept of Economic Dispatch Control (EDC) is	The basic concept of EDC has been explained by
	shared among operators and applied, if possible.	JICA Expert in August 2018. Necessary software
		has been shared with FSM side.
	Necessary spare parts and maintenance tools for the	KUA is requested to prepare spare parts and
1	pilot DG units are prepared.	maintenance tools in accordance with the advice
		by JICA Expert by February 2020.
. /	Maintenance work schedule for the pilot DG units is	Draft maintenance work schedule is under
1	prepared.	preparation by JICA Expert. KUA is requested to
ł		share the schedule for overhaul works for pilot
		DG units.
	Check sheets and maintenance manuals for daily	Draft check sheets and maintenance manuals are
	maintenance works for pilot DG units are prepared.	under preparation by JICA Expert.
Output 2	2: Methodology for appropriate planning and O&M of r	renewable energy (RE) is established.
2-1	Current situation and future development plan of RE	Same as activity 1-1
i	is reviewed.	
2-2	Planning manual for Hybrid Power Generation	First issue of the planning manual will be
	System is prepared.	delivered to each state by March, 2019.
2-4	Operating conditions of the existing RE facilities are	Same as activity 1-1
	reviewed, including confirmation of objectively	Objectively verifiable indicators for overall goal
	verifiable indicators for overall goal and project	was confirmed at the 1st JCC meeting in 2017.
	purpose.	
2-5	O&M manual for RE facilities is prepared.	First issue of the O&M manual will be delivered
	• •	to each state by March, 2019.

#### 1-3 Achievement of Output

#### (1) Output 1

Technical advice for the improvement of O&M of DGs has been provided by JICA Experts based on the initial survey of current conditions conducted in 2017. Also, classroom lecture & hands-on training have been provided to ensure appropriate and economical O&M of DGs with draft manuals and check sheets. In addition, counterpart training has been conducted with site visits and hands-on trainings to learn the necessary O&M of DGs in Japan. From now on the contribution from FSM side should be enhanced to implement the improved O&M of DGs based on the learnings from the advice and trainings by JICA Experts.



#### **ATTACHMENT 3**

#### (2) Output 2

Technical advice for the appropriate planning and O&M of RE has been provided by JICA Experts based on the initial survey of current conditions conducted in 2017. Also, classroom lecture & hands-on training have been provided to ensure appropriate planning and O&M of RE with draft manuals and check sheets. In addition, counterpart training has been conducted with site visits and hands-on trainings to learn the methodology of planning and O&M of RE in Japan. From now on the contribution from FSM side should be enhanced to implement the improved planning and O&M of RE based on the learnings from the advice and trainings by JICA Experts.

- 1-4 Achievement of the Project Purpose
- 1-5 Changes of Risks and Actions for Mitigation
- 1-6 Progress of Actions undertaken by JICA
- 1-7 Progress of Actions undertaken by the Parties
- 1-8 Progress of Environmental and Social Considerations (if applicable)
- 1-9 Progress of Considerations on Gender/Peace Building/Poverty Reduction (if applicable)
- 1-10 Other remarkable/ considerable issues related/ affect to the Project (such as other JICA's projects, activities of counterparts, other donors, private sectors, NGOs, etc.)
- 2 Delay of Work Schedule and/or Problems (if any)
- 2-1 Detail
- 2-2 Cause
- 2-3 Action to be taken
- 2-4 Roles of Responsible Persons/ Organization (JICA, the Parties, etc.)
- 3 Modification of the Project Implementation Plan
- 3-1 Plan of Operation
- 3-2 Other modifications on detailed implementation plan

#### II. Project Monitoring Sheet I & II as Attached

(Project Design Matrix and Plan of Operation)



#### Draft Project Design Matrix (PDM)

Project Title: The Project for Introduction of Hybrid Power Generation System in Pacific Island Countries

Project Term: March 2017 - June 2022 (Five Years) (Phase 1: March 2017 - February 2019, Phase 2: March 2019 - June 2022

**Country: Federated States of Micronesia** 

Target Area: Pohnpei, Chuuk, Yap and Kosrae

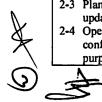
Target Group: Related engineers and other technical staff in the target area (DRD, PUC, KUA, CPUC, YSPSC)

DRD: Department of Resources and Development PUC:Pohnpei Utilities Corporation	KUA: Kosrae Utilities Authority YSPSC: Yap State P		tility Corporation
Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumptions
Overall Goal  Energy security is improved and greenhouse gases are reduced through the reduction of fossil fuels consumption.	<ol> <li>In comparison to the indicators at the time of baseline survey,</li> <li>Reduced amount of CO2 emission of power utilities in the target area</li> <li>Reduced amount of diesel fuel of power utilities in the target area</li> <li>Increased capacity (kW) and actual generated energy (kWh) of renewable energy facilities of power utilities in the target area</li> </ol>	1. to 3. Reports of C/P agencies	
Project Purpose  Hybrid Power Generation System is introduced.	<ol> <li>Improvement of specific fuel consumption of pilot DG units (better than the baseline data set at the beginning of the Project)</li> <li>Improvement of performance ratio for the RE power generation systems (better than the baseline data set at the beginning of the Project)</li> <li>Proper application of planning and O&amp;M method of Hybrid Power Generation System</li> <li>*Based on the review on result of Project activities, specific target numbers are to be determined.</li> </ol>	Record on specific fuel consumption of Pilot DG units by C/P, checked by Japanese experts     Record on operation of RE power generation systems     Evaluation by Japanese experts and C/P on plans of Hybrid Power Generation System	C/P agencies continue commitment to the Project by continuing budget allocation as well as assignment of personnel for the post- Project activities.
Outputs  1. Appropriate and economical system for O&M of Diesel Generators (DGs) is enhanced.	<output i=""> 1-1 Adequacy on the use of the work schedule, check sheets and manual for the maintenance work for the pilot DG units 1-2 Number of training participants who are conducting operation and maintenance of DG based on the learnings from the training program</output>	1-1 Evaluation by Japanese experts and C/P on improvement of maintenance work (daily/partial inspection/overhaul work) for pilot DG units 1-2 Capacity assessment of trained O&M staff and managers by Japanese experts	C/P agencies promote investment on renewable energy facilities based on the current national policy/plan.



Methodology for appropriate planning and O&M of renewable energy (RE) is established.  Activities	<ul> <li>Number of training participants who learned the planning method of the Hybrid Power Generation System</li> <li>Number of training participants who are conducting O&amp;M of RE facilities based on the learnings from the training program</li> <li>Preparation of related manuals for Hybrid Power Generation System</li> <li>Adequacy of the use of the related manuals for Hybrid Power Generation System</li> </ul>	2-1 Capacity assessment of trained staff and managers by Japanese experts 2-2 Capacity assessment of trained O&M staff and managers by Japanese experts 2-3 Evaluation by Japanese Experts on related manuals for Hybrid Power Generation System prepared by C/P 2-4 Evaluation by Japanese experts and C/P on the use of the related manuals for Hybrid Power Generation System	
Activities	Inpu		1
<output 1=""></output>	(Japanese side)	(FSM side)	
	Dispatch of the Japanese experts	1. Assignment of C/Ps	
1-1 Operational conditions of the existing DGs are reviewed, including	<pre></pre> <pre>&lt;</pre>	-Project Director (P/D)	
confirmation of objectively verifiable indicators for overall goal and project	- Chief Advisor/Hybrid Power Generation System	-Project Manager (P/M)	
purpose.		-Engineers in charge of O&M (Manager	
1-2 Specific fuel consumption of pilot DG units is measured.	<pre><jica consultant="" team=""></jica></pre>	level)	
1-3 Improvement plan for the operation of pilot DG units is prepared.	-Team Leader/Operation & Maintenance of DG	- Mechanical Staff	
1-4 Existing spare parts and maintenance tools of pilot DG units are confirmed.	-Economic operation of DG (EDC)	- Electrical Staff	
1-5 Improvement plan for the operation of pilot DG units is implemented.	-Maintenance support of DG (Mechanical expert)	- Planning officer, and others	
1-6 The result of implementation of the improvement plan is evaluated, and	-Maintenance support of DG (Electrical expert)		[
improvement plan is updated.	-O&M of RE power generation system	2. Facilities and equipment	
1-7 The concept of Economic Dispatch Control (EDC) is shared among operators	-Integration of RE power generation system	-Project office	
and applied, if possible.	-Project Coordinator	Troject office	Preconditions
1-8 Necessary spare parts and maintenance tools for the pilot DG units are	1 Toject Coordinator	3.Recurrent costs	Contents of the current
prepared.	2. Training in Japan and Fiji	- C/Ps' wages and allowances	relevant policies on
1-9 Maintenance work schedule for the pilot DG units is prepared.	2. Haming in Japan and Fiji	- C/Ps' domestic travel expense in part	promotion of renewable
1-10 Check sheets and maintenance manuals for maintenance works for pilot DG	2 Equipment	- C/Fs domestic travel expense in part	energy and energy
units are prepared.	Equipment     In accordance with necessity of activities		efficiency are not largely
1-11 Maintenance works (daily/partial inspection/overhaul work) for pilot DG units	-in accordance with necessity of activities		changed.
are conducted in accordance with the maintenance schedule.			
1-12 The result of maintenance works is evaluated, and future maintenance work			
schedule together with budget (including sub-contract fee, cost for tools and			
equipment) is prepared.			
1-13 Specific fuel consumption of the pilot DG units is measured before and after			
implementation of the related project activities.			
1-14 Related training programs for appropriate O&M system for DGs are implemented periodically.			
1-15 Knowledge on appropriate O&M of DGs is disseminated among stakeholders.			
<output 2=""></output>			
2-1 Current situation and future development plan of RE is reviewed.			
2-2 Planning manual for Hybrid Power Generation System is prepared.			
2-3 Planning manual for Hybrid Power Generation System is reviewed and updated in the target area.			
2-4 Operating conditions of the existing RE facilities are reviewed, including			Ì
confirmation of objectively verifiable indicators for overall goal and project			
purpose.			

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2-5 O&M manual for RE facilities is prepared.		
2-6 Maintenance works are conducted according to O&M manual of RE facilities.		
2-7 The result of maintenance works is evaluated, and future maintenance work		
schedule together with budget is prepared.		
2-8 Training program for Hybrid Power Generation System including O&M of		
RE facilities is conducted		
2-9 Knowledge regarding Hybrid Power Generation System is disseminated		
among stakeholders.		
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Project Title: The Project for Introduction of Hybrid Power Generation System in Pacific Island Countries
Project Terral Abrea 5017—June 2023 (Phace I.: March 2017—February 2019, Phace 2: March 2019—June, 2023
Target Area: Pobnoci, Chuule, Yan and Koatas
Target Group: Related engineers and other feelindeal staff in the target area (DRD, PUC, KUA, CPUC, VSPSC)
Target Group: Related engineers and other feelinds at all in the target area (DRD, PUC, KUA, CPUC, VSPSC)

						Tream Tream JCA Consultant Tream
						JICA long term expert, stationed in Fiji
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				DRD, PUC, KUA, CPUC, Pan	Seminar, workshop records	Knowledge regarding Hybrid Power Generation System is disseminated among anknowleds:
				YSPSC and JICA Experts Act	Training record, recommendations, reports, efc.	Training program for Hybrid Power Generation System including O&M OFRE Incitives is conducted.
				YSPSC and JICA Experts Act	Evaluation report of maintenance work, and schedule	
				PUC, KUA, CPUC, Nun YSPSC and JICA Experts An	Maintenance Record	Maintenance works are conducted according to O&M manual of RE facilities
				PUC, KUA, CPUC, Pias YSPSC and JICA Experts Act	O&M numual for RE facilities	
				YSPSC and JICA Experts An	TVA Report	Operating conditions of the existing RE facilities are reviewed, including confirmation of objectively verifiable indicators for overall goal and project purpose
				YSPSC and JICA Experts Act		Planning manual for Hybrid Power Generation System is reviewed and updated in the
				PUC, KUA, CPUC, Plan YSPSC and JICA Experts Act	Planning manual for Hybrid Power Generation	Planning manual for Hybrid Power Generation System is prepared
				YSPSC and JICA Experts Act	TWA Report	Current situation and fulure development plan of RE is reviewed
						put 2 Activities
				PRD, PUC, KUA, CPUC, Plan YSPSC and JICA Experts Act	Seminar, workshop records	Knowledge on appropriate O&M of DGs is disseminated among stakeholders
				YSPSC and JICA Experts Act	Training record, recommendations, reports, ele.	
				PUC, KUA, CPUC, Fine YSPSC and JICA Experts Act	Measurement for specific consumption of the pilot DG	
				ASPSC and JICA Experts Act	Evaluation report and future schedule for maintenance	The result of maintenance works is evaluated, and thinus maintenance work schedule logether with budget (including sub-contract fee, cost for tools and equipment) is prepared
				YSPSC and JICA Experts Act	Manufenance record	Maintenance works (daily/partial inspection/overhaul work) for pilot DG units are conducted in accordance with the maintenance schedule
				YSPSC and JICA Experts Act	Check sheets and maintenance	Obeces sheets and manuferance manuals for daily maintenance works for pilot DO units are prepared.
				YSPSC and JICA Experts Act	Maintenance work shedule	Munitenance work schedule for the pilot DG units is prepared.
				PUC, KUA, CPUC, Pinn PUC, KUA, CPUC, Pinn	List of spare parts and maintenance tools prepared	Necessary space parts and maintenance tools for the pilot IX3 units are prepared
				YSPSC and JICA Experts Act	EDC software, manual, EDC sheet	The concept of Economic Dispatch Control (EDC) is shared among operators and applied, if possible
				YSPSC and JICA Experts Act	Improvement Evaluation Report	blan is updated
				YSPSC and JICA Experts Act	дероп Іприотепені Іпрістепільноп	tradico centera brant tot me oberguoti of bitor two many se ambientener
				VSPSC and JICA Experts Act	List of spare parts and maintenance tools	Existing spare parts and maintenance tools of pilot DG units are confirmed
				PUC, KUA, CPUC, Pink YSPSC and JICA Experts An	Improvement plan	Improvement plan for the operation of pilot DG tunis is prepared
				PUC, KUA, CPUC, Pin YSPSC and JICA Experts An	Specific fuel consumption Measurement of	Specific fuel consumption of pilot DG units is measured
				YSPSC and JICA Experts Act	TVA Report	
9 69 29 19 09 65 85 45 95 55 75 65 25 15 05	5 60 87 45 90 50 00 E0	51 55 54 56 50 51 58 50 30 31 35 34 32 36 3	3 4 2 0 1 8 6 10 11 13 14 15 16 17 18 19 20 14 Cen. 13 Cen. 14 16 17 18 19 20	Org m charge	Product	1100 Activities [Or In De Joseph Parlet Oct Man System for De J
7 2 2 2 3 6 10 11 15 1 5 3 4 2 6	2020		01 6 8 4 9 5 7 6 7 1 7 1 1 0 6 8 4 9 5	11.5		



## Mid-term Review FSM (Pohnpei State)

January 2019

Takeshi Kikukawa

Ver. 1.0

## I. Evaluation by Five Criteria m(1/3)

#	Item	Viewpoints	Assessment
		a) Consistency with government policy	a) Well aligned with government policy and development program such as Infrastructure Development Plan, Strategic Development Plan and
		b) Consistency with Japanese government	Energy Master Plans.
	nce	policy	<ul> <li>b) Consistent with Development Assistance Policy for FSM and Business Development Plan.</li> </ul>
	Relevance	<ul> <li>Meeting the needs of target group and beneficiaries</li> </ul>	c) Project addresses urgent needs of target group.
		d) Communities advantage of	d) DG and RE technologies are well advanced in many
		d) Comparative advantage of technology provided by Japan	regions in Japan.

### I. Evaluation by Five Criteria (2/3)

Five Criteria: (i) Relevance, (ii) Effectiveness, (iii) Efficiency, (iv) Impact and (v) Sustainability

#	Item	Viewpoints	Assessment
ii	Effectiveness	<ul><li>a) Regional Chief Advisor</li><li>b) Collaboration among Other Countries and States</li></ul>	<ul> <li>a) Regional Chief Advisor as a focal point of regional activities.</li> <li>b) Five countries. Four states. Coordination and collaboration with external organizations such as Pacific Power Association (PPA) and South Pacific Community (SPC).</li> </ul>
ii	Efficiency	<ul> <li>a) Dispatch of Japanese Experts</li> <li>b) Provision of Equipment</li> <li>c) Local Operational Cost</li> <li>d) Counterpart Training in Japan</li> <li>e) Assignment of Counterparts</li> </ul>	<ul> <li>a) Japanese experts have been deployed in time for specific project activities.</li> <li>b) Necessary equipment was provided based on the needs of each state.</li> <li>c) Some C/Ps participated the activities out of pocket.</li> <li>d) The trainings in Japan were held twice and well evaluated by participants.</li> <li>e) In general assigned C/Ps took part in the activities.</li> </ul>

## I. Evaluation by Five Criteria (3/3)

Five Criteria: (i) Relevance, (ii) Effectiveness, (iii) Efficiency, (iv) Impact and (v) Sustainability

#	Item	Viewpoints	Assessment
iv	Impact	a) Prospects of Achieving Overall Goal     b) Impact of Project	Overall Goal: Energy security is improved and greenhouse gases are reduced through the reduction of fossil fuels consumption.  a) Project aims at improving performance of power supply through hybrid power generation system.  b) Project is expected to have positive impacts on not just energy but also overall economic development and improvement of living conditions.
V	Sustainability	<ul> <li>a) Policy/Institutional Aspects</li> <li>b) Financial/Organizational Aspects</li> <li>c) Technical Aspects</li> </ul>	<ul> <li>a) Government policy on energy would remain as the current.</li> <li>b) Turnover of staff and financial sustainability will need to be monitored.</li> <li>c) Knowledge obtained in Project would be retained and transferred within the organizations.</li> </ul>

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## II. Suggestions for Management on JICA Project (1/3)

Findings on Issues & Suggestions (1/3)

#	Issues	Possible Challenges	Implication for Business Process Improvement
		Insufficient resources for O/M	Improvement of management of operation and maintenance (O/M) for daily business and large-scale, planned maintenance.
1	Opportunity Loss	a) Knowledge/ communication b) Turnover of staff c) Finance for maintenance d) Facility and accounting management e) Information/data	<ul> <li>a) Streamlining job instruction for O/M &amp; Monitoring</li> <li>b) Salary, Recognition, Certification, Tailor-made compensation Mobilization of females and part-time workforce, Staff exchange program, Temporary leave</li> <li>c) Prioritized budgeting for maintenance, O/M fund, Common inventory control among power utilities, Centralized and planned purchase, Suppliers' financing, Management of reusable spare parts</li> <li>d) Strengthening managerial accounting practice for each small-size work group (not just budget management)</li> <li>e) ITC system, inventory management, accounting practice</li> <li>f) Deployment of staff for operation, maintenance and planning of maintenance</li> </ul>

### II. Suggestions for Management on JICA Project (2/3)

Findings on Issues & Suggestions (2/3)

#	Issues	Possible Challenges	Implication for Business Process Improvement
2	Mid-term Planning	Does the management know exactly what each staff needs to do today for the next few years?	<ul> <li>Existing JICA planning manual will be utilized in 2<sup>nd</sup> Phase.</li> <li>a) Leadership of management (How to do)</li> <li>b) Task for corporate planning division/staff (plus other experts)</li> <li>c) Action plan for planning activities</li> <li>d) Mid-term investment program (update scenario planning. Review of M/P, technical, financial, safeguard, preparation of F/S, etc.)</li> <li>e) Financing plan and funding arrangements</li> <li>f) Tender management &amp; Monitoring/ Rolling development plan</li> </ul>





## II. Suggestions for Management on JICA Project (3/3)6

Findings on Issues & Suggestions (3/3)

#	Issues	Possible Challenges	Implication for Business Process Improvement
			The knowledge and outputs of Project can be institutionalized
		a) Priority of JICA Project     b) Workable manuals and	a) Understanding of management on value of Project
	Linkage of	knowledge in place	b) Customize JICA manuals and knowledge at site
3 JICA Project with Daily Business		<ul> <li>c) Resource allocation by middle/line managers (JICA Project, daily</li> </ul>	c) Management may consider business reengineering
		O/M, administrative work, R&D, team	d) Recognition of performance improvement
		meeting, etc.) d) Turnover	e) Facilitation of JICA experts

Thank you for your attention.

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The Project for Introduction of Hybrid Power (	Generation in Pacific Island Countries
Project Final Report	Okinawa Enetech Co. · Okinawa Electric Power C

4.3 3rd JCC Meeting

#### **MINUTES OF MEETING**

#### BETWEEN

# THE AUTHORITIES CONCERNED OF THE GOVERNMENT OF FEDERATED STATES OF MICRONESIA AND

JAPAN INTERNATIONAL COOPERATION AGENCY

**FOR** 

THE THIRD JOINT COORDINATION COMMITTEE (JCC)

ON

THE PROJECT FOR INTRODUCTION OF HYBRID POWER GENERATION
SYSTEM IN PACIFIC ISLAND COUNTRIES

Japan International Cooperation Agency (hereinafter referred to as "JICA") and the authorities concerned of the Federated States of Micronesia (hereinafter referred to as "the FSM side") established a Joint Coordination Committee (hereinafter referred to as "JCC") for the effective and successful implementation of the Project for Introduction of Hybrid Power Generation System in Pacific Island Countries (hereinafter referred to as "the Project").

The third JCC on the Project was held on 24<sup>th</sup> January 2020, at the Early Childhood Education Center in Yap chaired by Hon. Marion Henry, Secretary, Department of Resources and Development.

Yap, 24th January, 2020

Tadayuki Ogawa

Chief Advisor

JICA Senior Advisor

Honorable Marion Henry

Secretary

Department of Resources and

Development

The Federated States of Micronesia

Shinii Shibata

Resident Representative

JICA Micronesia Office

#### **ANNEX**

The FSM side and JICA (hereinafter referred to as "both sides") discussed on the issues including the contents of (i)Project Design Matrix (PDM), (ii)Plan of Operation (PO), and (iii)Project Monitoring Sheet, based on the Agenda attached hereto.

The both sides confirmed the main points as described below.

- Confirmation of PDM, PO and Project Monitoring Sheet for project evaluation
   Since the Project progressed, the Objectively Verifiable Indicator (OVI) has been
  identified. Both sides confirmed the latest version of PDM and PO as attachment 4
  and 5. Also, the project monitoring sheet was agreed as attachment 3.
- 2. Project Organization

The both sides confirmed the update of the Project Counterpart Team and assignment of the officials as described below. Those counterparts are core trainers in each task, and expected to disseminate technical knowledge and skills among other members in the organization periodically during the Project.

The FSM side agreed to make the effort to remain the members as core trainers by 2022.

- Project Counterparts (Core Trainers)
  - "#" means prioritized counterparts
  - (1) Yap State; YSPSC
  - 1) Operation and Maintenance of Diesel Engine Generators
    Alphonsus Ruwema, Power Plant Manager
    Casmiro Yithmeng, Chief Mechanic

    ☆Chris Igem, Electrician (Electrical)
    Roscoe Tamag, Chief Operator

    ☆Rowino Yarofaliut, Power Plant Mechanic (Mechanical)

  - (2) Chuuk State; CPUC
  - 1) Operation and Maintenance of Diesel Engine Generators
    Dennis Triana, Head of power generation and maintenance
    Jimmy Reyes, Lead Mechanic

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- 2) Plan for introduction of hybrid power generation systems Dennis Triana, Head of power generation and maintenance Albert Francis, Head of power distribution Chris Killion, RE Technician Limus Setik, RE Technician
- Operation and Maintenance of Renewable Energy generation system Dennis Triana, Head of power generation and maintenance Chris Killion, RE Technician Limus Setik, RE Technician

#### (3) Pohnpei State: PUC

- Operation and Maintenance of Diesel Engine Generators ★Winfred Yamada, Manager, Diesel Plant ★Elpert Elias, Mechanic ★Dackson Solomon, Manager, Power Generation Erickson Semens, Mechanics Pedrus Ehram, Mechanic
- 2) Plan for introduction of hybrid power generation systems Selestino Santiago, Senior Electrician Richard Lohn, Electrician

#### (4) Kosrae State; KUA

- 1) Operation and Maintenance of Diesel Engine Generators

  ☆Robert Taualupe, Operations Manager (Electrical)

  ☆Ronald Albert, Supervisor of Operator (Mechanical)

  Careston Alokoa, Power Plant Operator
- 2) Plan for introduction of hybrid power generation systems Gerardo Protacio, Electrical Engineer Robert Taualupe, Operations Manager Casey Freddy, Customer Service Supervisor
- 3) Operation and Maintenance of Renewable Energy generation system 
  ★Robert Taualupe, Operations Manager
  ★Gifford Sigrah, Distribution Foreman
  Ronnie George, Lineman-2

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- 3. Improvement Plan for the Operation of Pilot DG Units

  The FSM side agreed to implement following measures to improve the operation conditions of pilot DG units as explained in the letter issued on December, 2019.
- (1) Monthly summary should be kept in hard copy to enable the analysis of operation condition by the maintenance staff.
- (2) Specific fuel consumption of each unit should be periodically measured and monitored, and the result shall be reflected in the unit dispatch schedule. For Pohnpei state we request strongly the completion of the installation of the fuel flow meters provided under the project by the end of March 2020.

  According to the report of each State the specific fuel consumption of FSM during 2019 is shown in below table.

State	Baseline (2017)	Achievement (2019)
Yap	13.0 kWh/G (Deutz) 14.5 kWh/G (CAT 3516) 14.3 kWh/G (CAT C32)	14.5 kWh/G (0.261 l/kWh)
Chuuk	14.91 kWh/G (total average)	(Unit 1) 15.3 kWh/G (0.247 l/kWh) (Unit 2) 15.2 kWh/G (0.249 l/kWh) (Unit 4) 14.57 kWh/G (0.259 l/kWh) (Unit 5) 14.65 kWh/G (0.258 l/kWh) Avg: 14.93 Wh/G (0.253 l/kWh)
Pohnpei	13.4 kWh/G (total average)	Unit #4 16.3 kWh/G (0.232 l/kWh) Unit #5 14.3 kWh/G (0.264 l/kWh) Avg:15.3kWh/G (0.247 l/kWh)
Kosrae	13.6 kWh/G (total average)	14.5 kWh/G (0.261 l/kWh)

For all States of FSM we recommend set a person in charge in the measurement of monthly specific fuel consumption of all units and report these result with the JICA expert team.

(Pohnpei) Lillyann David (Chuuk) Dennis Triana (Kosrae) Robert Taualupe (Yap) John A. Chieng

(3) The actual daily patrol checklist for preventive maintenance should be improved according to the sample format provided by the JICA expert team by the end of March, 2020.

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- (4) To efficiently manage overhaul works, overhaul work schedule should be prepared according to the sample format provided by the JICA expert team by the end of March, 2020.
- (5) As for PUC, the JICA expert team confirmed efficient operation on weekday nights running only 2 DGs, but on some nights, 3 units were in operation providing excessive power reserve. To perform efficient operation of the power plant, the appropriate amount of reserve margin should be reminded by plant operators for economic distribution of DGs in accordance with the total demand. FSM side should keep the operation records including the reserve margin and share with JICA expert team.

#### 4. Project Seminar

(1) Objective

Project Seminar will be held to share the basic information and latest progress of the Project with relevant stakeholders to seek possible collaboration. Also, the latest progress of introduction of Hybrid Power Generation System will be shared among concerned stakeholders.

- (2) Tentative schedule and Venue Kosrae (end of July, 2020)
- (3) Participants (other than counterpart organization)
  - 1) State government official
  - 2) College, research institute, etc.
  - 3) Development Partner
  - 4) Private company

#### 5. Third Country Training in Fiji

(1) Objective

Counterparts from FSM, RMI, Kiribati and Tuvalu will be invited to Fiji to conduct the 2<sup>nd</sup> regional training under the Project in 2020. The objective of the training is to provide the continuous learning opportunity for the participants who joined the 1<sup>st</sup> regional training. Basic to medium level training incorporating more hands-on training, exercise, group discussion will be introduced in this year. The result of the training will be evaluated to improve the training curriculum, textbooks & materials for the next training.

(2) Proposed training courses

As a result of the past trainings for trainers in Fiji, following training courses are proposed for the 1st regional training in Fiji.

- 1) Operation & Maintenance for Diesel Engine Generators
- 2) Grid Integration of Renewable Energy Generation Systems
- Operation & Maintenance of Renewable Energy generation Systems (Solar PV)

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Initially, the training for the above 2) and 3) will be held simultaneously as the participants are expected same in most countries.

#### (3) Venue

The possible venue of the training are listed as follows;

- 1) EFL (Energy Fiji Limited) Training Center
- 2) EFL Diesel Power plants (Vuda, Nadi, etc.)
- 3) Solar PV plants (various)

#### (4) Tentative Schedule

October, 2020 (1 week for RE and DG respectively)

#### 6. Training Equipment

Following equipment has been handed over to FSM (Items 2~9 KUA only) side

under the Project.

No.	Name of equipment	Model No.	Qty.	Manufacturer
1	Simulation software (HOMER Pro)		4	
2	Digital Pressure Calibrator(With calibration certificate)	DPI800S	1	GE Sensing & Inspection • Technologies
3	Digital multimeter(with calibration certificate)	TY710	1	
4	Digital thermometer(with calibration certificate)	TX1001	1	Yokogawa Test & Measurement
5	Instrumentation signal measurement / generator(with calibration certificate)	CA150	1	Corporation
6	Ohm meter (with calibration certificate)	240633J	1	
7	Air compressor kit PV211	PV 211	1	GE Sensing & Inspection • Technologies
8	Air hose 1m×2, 1.5m×		1	_
9	Various types of fittings (1/8,1/4,3/8,1/2,3/4,1)		1	_

#### 7. Institutionalization of Manuals

Following manuals have been handed over to FSM side by March 2019, as a result of discussion and consultation with counterpart members.

- 1) Operation & Maintenance of Diesel Engine Generator
- 2) Planning manual for Hybrid Power Generation System
- 3) Operation & Maintenance Manual for Solar PV System

It is very important that these manuals are fully utilized and revised as necessary after hand over. Therefore, the project counterpart members are requested to share the information and/or conduct training for other staff to apply these manuals in their daily works. The progress of activities will be monitored under the phase-2 period with the assistance by JICA Experts.

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8. Certificate under the Project

The Project has been coordinating with PacTVET Programme supported by EU to acknowledge those core trainers under their programme after their training. JICA training programme will be shared with COM and related stakeholders for their review and potential accreditation.

#### 9. Venue for the next JCC in FSM

FSM side and JICA Expert team agreed that the next (4<sup>th</sup>) JCC meeting will be held around January, 2021 at Chuuk State.

#### 10. Cost-sharing arrangements for travel

The both sides reconfirmed the cost-sharing arrangements for domestic/overseas travelling as below.

(1) Training in Fiji

JICA will bear all travel cost including air fare, accommodation, and daily allowance.

(2) Training and JCC in FSM

JICA will bear air fare only, FSM side will cover airport tax, accommodation and daily allowance.

#### 10. Flight schedule

JICA prepares above-mentioned tickets for JCC and training with the most effective route, and flight change is fundamentally not allowed. Prior discussion is requested if any flight change is required with unavoidable reasons/ situation.

ATTACHMENT 1 Agenda for JCC Meeting
ATTACHMENT 2 Lists of Participants
ATTACHMENT 3 Project Monitoring Sheet
ATTACHMENT 4 Project Design Matrix ver. 2
ATTACHMENT 5 Plan of Operation ver. 2

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#### **ATTACHMENT 1**

#### **Agenda for JCC Meeting**

- 1. Opening Remarks by Hon. Marion Henry, Secretary, Department of Resources and Development
- 2. Explanation and confirmation on the following documents;
  - (1) Project Design Matrix (PDM)
  - (2) Plan of Operation (PO)
  - (3) Project Monitoring Sheet
- 3. Confirmation on the Minutes of Meeting (M/M)
- 4. Progress Report of the training in Yap by Mr.Luis Kakefuku
- 5. Closing Remarks by Ms. Emi Teshima, on behalf of JICA Micronesia Office

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# ATTACHMENT 2 List of Participants

Organization	Position	Name
Department of Resources and Development, FSM	Secretary	Hon. Marion Henry
Department of Resources and Development, FSM	Assistant Secretary	Mr. Hubert Yamada
Yap State Public Service Corporation	General Manager	Mr. Faustino R. Yangmog
Yap State Public Service Corporation	Engineering Manager	Mr. John Chieng
Chuuk Public Utility Corporation	CFO	Ms. Lei Shirai
Pohnpei Utilities Corporation	General Manager	Mr. Nixon T. Anson
Kosrae State Government	Lieutenant Governor	Mr. Arthy G. Nena
Kosrae Utilities Authority	General Manager	Mr. Fred Skilling
Kosrae Utilities Authority	Legal Counsel	Mr. Casey Freddy
JICA Micronesia Office	Project Formulation Advisor	Ms. Emi Teshima
JICA Micronesia Office	Program Officer	Ms. Trish-Farrah E. Billen
JICA	Chief Advisor	Mr. Tadayuki Ogawa
JICA / Okinawa Enetech Co., Inc	Team Leader	Mr. Luis Kakefuku
JICA / Okinawa Enetech Co., Inc	Short Team Expert	Mr. Hideyasu Hokama
JICA / Okinawa Enetech Co., Inc	Short Team Expert	Mr. Hiroyuki Nakachi

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#### PROJECT MONITORING SHEET

Project Title: The Project for Introduction of Hybrid Power Generation System in Pacific

**Island Countries** 

Version of the Sheet: Ver.3 (Feb. 2019 - Jan. 2020)

Project Term: March 2017 - June 2022

Name: Tadayuki OGAWA

Title: Chief Advisor

Submission Date: 24th January, 2020

- I. Summary
- 1 Progress
- 1.1 Progress of Inputs
- (1) Japanese side
  - JICA Expert Team has worked in July 2019 in Yap to conduct lectures and on-site trainings for RE grid integration and operation and maintenance of solar PV systems.
  - JICA Expert Team has worked in August 2019 in Chuuk to conduct lectures and on-site trainings for the operation and maintenance of Diesel Engine Generators (DEGs).
  - 3) JICA Expert Team has worked in October 2019 in Pohnpei to conduct lectures and on site trainings for RE grid integration and operation and maintenance of solar PV systems.
  - 4) JICA Expert Team has worked in January 2020 in Yap to conduct lectures and on site trainings for RE grid integration and operation and maintenance of solar PV systems.
  - 5) Project Coordinator has visited each state for the preparation of project activities by JICA Expert Team in June and September 2019.

#### (2) FSM side

In total 32 number of core trainers are registered under the Project, 11 from YSPSC, 6 from CPUC, 8 from PUC and 7 from KUA staff. Facilities and equipment (e.g. training classrooms) for the trainings in FSM were provided by FSM side.

1	.2	Progress	of Act	<u>ivities</u>

1		
No.	Activity	Progress
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1.1	Operational conditions of the existing DGs are	kM of Diesel Generators (DGs) is enhanced.  The result of discussions and analysis for
1.1	reviewed, including confirmation of objectively	future training needs was compiled as
	verifiable indicators for overall goal and	"Training Needs Assessment Report" and
	project purpose.	submitted to all members in February
		2018.
1-2	Specific fuel consumption of pilot DG units is	Specific fuel consumption needs to be
	measured.	measured in PUC and KUA after
		installation of fuel flow meters procured
		under the project. The baseline figure for project evaluation shall be updated after
		measurement. Installation of fuel flow
		meters provided to PUC under the project
!		has not been installed completely yet and
		specific fuel consumption for baseline
		figure for the project evaluation has not
		been reported.
1-8	Improvement plan for the operation of pilot	Improvement plan was prepared and
	DG units is prepared.	shared with FSM side in the letter issued
		on 28th September 2018.
1-4	Existing spare parts and maintenance tools of pilot DG units are confirmed.	Existing spare parts and maintenance tools will be confirmed by July 2020.
	Improvement plan for the operation of pilot	Improvement plan has been implemented
1.5	DG units is implemented.	by April 2019 under consultation with
	2 a Limb is impromotion.	JICA Expert.
1.6	The result of implementation of the	The result of implementation of the
- 0	improvement plan is evaluated, and	improvement plan has been evaluated, and
	improvement plan is updated.	improvement plan was updated in Dec
		2019.
1-7	The concept of Economic Dispatch Control	The basic concept of EDC has been
	(EDC) is shared among operators and applied,	explained by JICA Expert in August 2018.
	if possible.	Necessary software has been shared with FSM side.
1-8	Necessary spare parts and maintenance tools	JICA Expert team will finalize the lists
1.0	for the pilot DG units are prepared.	upon visit to Kosrae by July 2020.
1-9	Maintenance work schedule for the pilot DG	JICA Expert team will finalize the lists
	units is prepared.	upon visit to Kosrae by July 2020.
1-10	Check sheets and maintenance manuals for	Pilot DG maintenance manual (OH) was
	daily maintenance works for pilot DG units	delivered to each state by March, 2019.
	are prepared.	Check sheets was provided again in the
		training of August 2019.
1-11	Maintenance works (daily/partial	Yet to be commenced.
	inspection/overhaul work) for pilot DG units are conducted in accordance with the	
	are conducted in accordance with the maintenance schedule.	
1.10	The result of maintenance works is evaluated,	Yet to be commenced.
1.12	and future maintenance work schedule	100 W De WILLIAMS
	together with budget (including sub-contract	
	fee, cost for tools and equipment) is prepared.	
1-13	Specific fuel consumption of the pilot DG units	Yet to be commenced.
	is measured before and after implementation	
	of the related project activities.  Related training programs for appropriate	
		Two counterpart trainings in Japan have



	O&M of DGs are implemented periodically.	completed. Regional training in Fiji is on going.
1-15	Knowledge on appropriate O&M of DGs is disseminated among stakeholders.	Project Seminar was first held in Yap and planned in other States.
Outp	ut 2: Methodology for appropriate planning and O	&M of renewable energy (RE) is established.
2-1	Current situation and future development plan of RE is reviewed.	Same as activity 1·1
2-2	Planning manual for Hybrid Power Generation System is prepared.	First issue of the planning manual was delivered to each state by March, 2019.
2-3	Planning manual for Hybrid Power Generation System is reviewed and updated in the target area.	Each utility is expected to review and update the manual under the support by JICA Expert.
2-4	Operating conditions of the existing RE facilities are reviewed, including confirmation of objectively verifiable indicators for overall goal and project purpose.	Same as activity 1-1 Objectively verifiable indicators for overall goal was confirmed at the 1st JCC meeting in 2017.
2-5	O&M manual for RE facilities is prepared.	First issue of the O&M manual was delivered to each state by March, 2019.
2-6	Maintenance works are conducted according to O&M manual of RE facilities.	Each utility is expected to conduct maintenance works under the support by JICA Expert.
2-7	The result of maintenance works is evaluated, and future maintenance work schedule together with budget is prepared.	Yet to be commenced.
2-8	Training program for Hybrid Power Generation System including O&M of RE facilities is conducted.	Two counterpart trainings in Japan have completed. Regional training in Fiji is on going.
2-9	Knowledge regarding Hybrid Power Generation System is disseminated among stakeholders.	Project Seminar was first held in Yap and planned in other States.

#### 1-3 Achievement of Output

#### (1) Output 1

Technical advice for the improvement of O&M of DGs has been provided by JICA Experts based on the initial survey of current conditions conducted in 2017. Also, classroom lecture & hands on training have been provided to ensure appropriate and economical O&M of DGs with draft manuals and check sheets. In addition, counterpart training has been conducted with site visits and hands on trainings to learn the necessary O&M of DGs in Japan. From now on the contribution from FSM side should be enhanced to implement the improved O&M of DGs based on the learnings from the advice and trainings by JICA Experts. The progress of the updated improvement plan shall be recorded and shared with JICA Experts periodically to further support O&M activities in each state.

#### (2) Output 2

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Technical advice for the appropriate planning and O&M of RE has been provided by JICA Experts based on the initial survey of current conditions conducted in 2017. Also, classroom lecture & hands on training have been provided to ensure appropriate planning and O&M of RE with draft manuals and check sheets. In addition, counterpart training has been conducted with site visits and hands on trainings to learn the methodology of planning and O&M of RE in Japan. From now on the contribution from FSM side should be enhanced to implement the improved planning and O&M of RE based on the learnings from the advice and trainings by JICA Experts.

"Planning manual for Hybrid Power Generation System" and "O&M manual for RE facilities" shall be utilized and updated in accordance with the current O&M practices by each utility. Also, the results of O&M works for all solar PV systems shall be recorded and shared with JICA Expert Team.

#### 1-4 Achievement of the Project Purpose

(Indicator 1) Improvement of specific fuel consumption of pilot DG units

State	Baseline (2017)	Achievement (2019)
Yap	13.0 kWh/G (Deutz)	14.5 kWh/G (0.261 l/kWh)
	14.5 kWh/G (CAT 3516)	
	14.3 kWh/G (CAT C32)	
Chuuk	14.91 kWh/G (total average)	(Unit 1)
		15.3 kWh/G (0.247 l/kWh)
		(Unit 2)
		15.2 kWh/G (0.249 l/kWh)
		(Unit 4)
		14.57 kWh/G (0.259 l/kWh)
		(Unit 5)
		14.65 kWh/G (0.258 l/kWh)
	İ	Avg: 14.93 Wh/G
		(0.253 l/kWh)
Pohnpei	13.4 kWh/G (total average)	Unit#4
		16.3 kWh/G (0.232 l/kWh)
		Unit #5
		14.3 kWh/G (0.264 l/kWh)
		Avg:15.3kWh/G
		(0.247 l/kWh)



Kosrae	13.6 kWh/G (total average)	14 5 LUZ-(C (C CC1 1/LUZ-)
1709146	13.0 KWIDG (total average)	14.5 kWh/G (0.261 l/kWh)

#### (Indicator 2) Improvement of performance ratio for RE power generation systems

State	Baseline (2017)	Achievement (2018)
Yap	66% (PEC)	68% (PEC)
Chuuk	72% (Airport)	72% (Airport)
	71% (PEC)	71% (PEC)
Pohnpei	76% (COM)	76% (COM)
	78% (President's Office)	78% (President's Office)
	71% (PEC)	71% (PEC)
		65% (UAE)
Kosrae	66% (PEC)	68% (PEC/EU)
	56% (EU)	<u> </u>

#### (Indicator 3) Proper application of planning and O&M method of HPGS

State	Planning Manual	O&M Manual
Yap	N/A	Check sheet has been used for outer islands PV systems.
Chuuk	N/A	Check sheet has been used for outer islands PV systems.
Pohnpei	N/A	N/A
Kosrae	N/A	N/A

1.5 Changes of Risks and Actions for Mitigation

N/A

1-6 Progress of Actions undertaken by JICA

1-7 Progress of Actions undertaken by the Parties N/A

- 1-8 Progress of Environmental and Social Considerations (if applicable)
- 1-9 Progress of Considerations on Gender/ Peace Building/ Poverty Reduction (if applicable)
- 1-10 Other remarkable/ considerable issues related/ affect to the Project (such as other JICA's projects, activities of counterparts, other donors, private sectors, NGOs, etc.)

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Installation of new DEGs has been completed in Kosrae in April 2019 under Grant Aid Project by Japanese Government. The overhaul maintenance works will be carried out with those pilot DEGs under the Project.

- 2 Delay of Work Schedule and/or Problems (if any)
- 2-1 Detail
- 2-2 Cause
- 2.3 Action to be taken
- 2-4 Roles of Responsible Persons/ Organization (JICA, the Parties, etc.)
- 3 Modification of the Project Implementation Plan
- 3-1 Plan of Operation
- 3-2 Other modifications on detailed implementation plan
- 4 Preparation of Government of FSM toward after completion of the Project Government of FSM and each state utility will be further requested to utilize and update the related manuals and tools for the planning and O&M of Hybrid Power Generation System. Also, those core trainers who have participated in the training in FSM, Japan and Fiji need to continue on the OJT for other staff inside the organization to share the necessary skills and knowledge for the introduction of Hybrid Power Generation System.
- II. Project Monitoring Sheet I & II as Attached (Project Design Matrix and Plan of Operation)



## Draft Project Design Matrix (PDM)

Project Title: The Project for Introduction of Hybrid Power Generation System in Pacific Island Countries
Project Term: March 2017 - June 2022 (Five Years) (Phase 1: March 2017 - February 2019, Phase 2: March 2019 - June 2022
Country: Federated States of Micronesia
Target Area: Pohnpel, Chuuk, Yap and Kosrae
Target Group: Related engineers and other technical staff in the target area (DRD, PUC, KUA, CPUC, YSPSC)
DRD. Description of Parkers and Other technical Staff in the target area (DRD, PUC, KUA, CPUC, YSPSC)

DRD: Department of Resources and Development PUC:Pohopel Utilities Corporation Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumptions
Overall Goal  Energy security is improved and greenhouse gases are reduced through the reduction of fossil fuels consumption.	In comparison to the indicators at the time of baseline survey,  1. Reduced amount of CO2 emission of power utilities in the target area  2. Reduced amount of diesel fuel of power utilities in the target area  3. Increased capacity (kW) and actual generated energy (kWh) of renewable energy facilities of power utilities in the target area	i. to 3. Reports of C/P agencies	
Project Purpose  Hybrid Power Generation System is introduced.	Improvement of specific fuel consumption of pilot DG units (better than the baseline data set at the beginning of the Project)     Improvement of performance ratio for the RE power generation systems (better than the baseline data set at the beginning of the Project in consideration of aging deterioration of PV module)     Proper application of planning and O&M method of Hybrid Power Generation System	Record on specific fuel consumption of Pilot DG units by C/P, checked by Japanese experts     Record on operation of RE power generation systems     Evaluation by Japanese experts and C/P on plans of Hybrid Power Generation System	C/P sgencies continue commitment to the Project by continuing budget allocation as well as assignment of personnel for the post- Project activities.
Outputs  1. Appropriate and economical system for O&M of Diesel Generators (DGs) is enhanced.	<ul> <li>Output I&gt;</li> <li>1-1 Adequacy on the use of the work schedule, check sheets and manual for the maintenance work for the pilot DG units</li> <li>1-2 Number of training participants who are conducting operation and maintenance of DG based on the learnings from the training program (target:2 for each state)</li> </ul>	1-1 Evaluation by Japanese experts and C/P on improvement of maintenance work (daily/partial inspection/overhaul work) for pilot DG units 1-2 Capacity assessment of trained O&M staff and managers by Japanese experts	C/P agencies promote investment on renewable energy facilities based on the current national policy/plan.



	planning method of the Hybrid Power Generation System (target: I for each state) 2-2 Number of training participants who are conducting O&M of RE facilities based on the learnings from the training program (target: 2 for each state) 2-3 Preparation of related manuals for Hybrid Power Generation System 2-4 Adequacy of the use of the related manuals for Hybrid Power Generation System	staff and managers by Japanese experts 2-3 Evaluation by Japanese Experts on related manuals for Hybrid Power Generation System prepared by C/P 2-4 Evaluation by Japanese experts and C/P on the use of the related manuals for Hybrid Power Generation System	
Activities  Output 1>  1-1 Operational conditions of the existing DGs are reviewed, including confirmation of objectively verifiable indicators for overall goal and project purpose.  1-2 Specific fuel consumption of pilot DG units is measured.  1-3 Improvement plan for the operation of pilot DG units is prepared.  1-4 Existing spare parts and maintenance tools of pilot DG units are confirmed.  1-5 Improvement plan for the operation of pilot DG units is implemented.  1-6 The result of implementation of the improvement plan is evaluated, and improvement plan is updated.  1-7 The concept of Economic Dispatch Control (EDC) is shared among operator and applied, if possible.  1-8 Necessary spare parts and maintenance tools for the pilot DG units are prepared.  1-9 Maintenance works schedule for the pilot DG units is prepared.  1-10 Check sheets and maintenance manuals for maintenance works for pilot DG units are prepared.  1-11 Maintenance works (daily/partial inspection/overhaul work) for pilot DG units are conducted in accordance with the maintenance schedule.  1-12 The result of maintenance works is evaluated, and future maintenance work schedule together with budget (including sub-contract fee, cost for tools and equipment) is prepared.  1-13 Specific fuel consumption of the pilot DG units is measured before and after implementation of the related project activities.  1-14 Related training programs for appropriate O&M system for DGs are implemented periodically.  1-15 Knowledge on appropriate O&M of DGs is disseminated among stakeholders  COutput 2>  2-2 Planning manual for Hybrid Power Generation System is prepared.	-Integration of RE power generation system -Project Coordinator  2. Training in Japan and Fiji  3. Equipment -In accordance with necessity of activities	(FSM side)  1. Assignment of C/Ps  -Project Director (P/D)  -Project Manager (P/M)  -Engineers in charge of O&M (Manager level)  - Mechanical Staff  - Electrical Staff  - Planning officer, and others  2. Facilities and equipment  -Project office  3. Recurrent costs  - C/Ps' wages and allowances  - C/Ps' domestic travel expense in part	Preconditions Contents of the current relevant policies on promotion of renewable energy and energy efficiency are not largely changed.

	confirmation of objectively verifiable indicators for overall goal and project				
	purpose.				
	O&M manual for RE facilities is prepared.		į.		
2-6	Maintenance works are conducted according to O&M manual of RE facilities.		1		
2-7	The result of maintenance works is evaluated, and future maintenance work	*			
	schedule together with budget is prepared.				
2-8	Training program for Hybrid Power Generation System including O&M of				
	RE facilities is conducted			ļ	
2-9	Knowledge regarding Hybrid Power Generation System is disseminated				
	among stakeholders.				
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The Project for Introduction of Hybrid Power Generation in Paci-	fic Island Countries
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4.4 4th JCC Meeting

# MINUTES OF MEETING

BETWEEN

THE AUTHORITIES CONCERNED OF
THE GOVERNMENT OF FEDERATED STATES OF MICRONESIA
AND

JAPAN INTERNATIONAL COOPERATION AGENCY
FOR

THE FOURTH JOINT COORDINATION COMMITTEE (JCC)

ON

THE PROJECT FOR INTRODUCTION OF HYBRID POWER GENERATION SYSTEM IN PACIFIC ISLAND COUNTRIES

Japan International Cooperation Agency (hereinafter referred to as "JICA") and the authorities concerned of the Federated States of Micronesia (hereinafter referred to as "the FSM side") established a Joint Coordination Committee (hereinafter referred to as "JCC") for the effective and successful implementation of the Project for Introduction of Hybrid Power Generation System in Pacific Island Countries (hereinafter referred to as "the Project").

The fourth JCC on the Project was held on 26th October 2021, through the online arrangement connecting stakeholders of FSM and JICA side. The meeting was chaired by Ms. Elina Akinaga, Secretary, Department of Resources and Development.

The both parties acknowledge and agree that the signing of this Minutes of Meeting may be executed by electronic signature, which is considered as an original signature, and therefore has the same force and effect as an original signature. "Electronic signature" includes faxed versions of an original signature or electronically scanned and transmitted versions (e.g., via pdf) of an original signature.

As a result of the discussion on the fourth JCC, JICA and the FSM side agreed on the main points as described in the Annex attached hereto.

Pohnpei, 5th November, 2021

Val.

ED

Ogawa Tadayuki Chief Advisor

JICA Senior Advisor

Elina Akinaga

Secretary
Department of Resources and

Development

The Federated States of Micronesia

Muraoka Keiichi

Resident Representative JICA Micronesia Office

#### ANNEX

The FSM side and JICA (hereinafter referred to as "both sides") discussed on the issues including the contents of (i)Project Design Matrix (PDM), (ii)Plan of Operation (PO), and (iii)Project Monitoring Sheet, based on the Agenda attached hereto.

The both sides confirmed the main points as described below.

Extension of Project Period

It was recommended by JICA Expert to conduct supplementary trainings and meetings at site, in addition to on-line supports, since hands-on trainings at site have been postponed due to COVID-19 pandemic since March 2020. Even though JICA Expert team has been trying to implement on-line support to complete the project activities, some activities related to the training for maintenance of DEG and solar PV system require face-to-face instructions at site in FSM.

The both Parties agreed to process the required procedures for the extension of

the Project period by one year, up to June 2023.

 Confirmation of PDM, PO and Project Monitoring Sheet for project evaluation Since the Project progressed, the Objectively Verifiable Indicator (OVI) has been identified. Both sides confirmed the latest version of PDM and PO as attachment 4 and 5. Also, the project monitoring sheet was agreed as attachment 3.

3. Project Organization

The both sides confirmed the update of the Project Counterpart Team and assignment of the officials as described below. Those counterparts are core trainers in each task, and expected to disseminate technical knowledge and skills among other members in the organization periodically during the Project.

The FSM side agreed to make the effort to remain the members as core trainers

by 2023.

Project Counterparts (Core Trainers)

"\* means prioritized counterparts

(1) Yap State: YSPSC

- Operation and Maintenance of Diesel Engine Generators Alphonsus Ruwema, Power Plant Manager Casmiro Yithmeng, Chief Mechanic ☆Chris Igem, Electrician (Electrical) Roscoe Tarnag, Chief Operator ☆Rowino Yarofaliut, Power Plant Mechanic (Mechanical)
- 3) Operation and Maintenance of Renewable Energy generation system

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Chaem Charles Laman, Technician, Engineering Division Steven Ken, Technician, Engineering Division ★Choay Jacob (Jake), Technician, PV operator

#### (2) Chuuk State; CPUC

 Operation and Maintenance of Diesel Engine Generators Dennis Triana, Head of power generation and maintenance Jimmy Reyes, Lead Mechanic

 Plan for introduction of hybrid power generation systems Dennis Triana, Head of power generation and maintenance Albert Francis, Head of power distribution Chris Killion, RE Technician Limus Setik, RE Technician

 Operation and Maintenance of Renewable Energy generation system Dennis Triana, Head of power generation and maintenance Chris Killion, RE Technician Limus Setik, RE Technician

#### (3) Pohnpei State; PUC

- 1) Operation and Maintenance of Diesel Engine Generators

  ☆Winfred Yamada, Manager, Diesel Plant

  ☆Elpert Elias, Mechanic

  ☆Dackson Solomon, Manager, Power Generation

  Erickson Semens, Mechanics

  Nixon Helgenberger, Electrician
- Plan for introduction of hybrid power generation systems Selestino Santiago, Senior Electrician Richard Lohn, Electrician

#### (4) Kosrae State; KUA

- Operation and Maintenance of Diesel Engine Generators ☆Robert Taualupe, Operations Manager (Electrical) ☆Ronald Albert, Supervisor of Operator (Mechanical) Tedrick Joseph (Mechanic)
- Plan for introduction of hybrid power generation systems Gerardo Protacio, Electrical Engineer Robert Taualupe, Operations Manager Casey Freddy, Customer Service Supervisor
- 3) Operation and Maintenance of Renewable Energy generation system

9 Km

CA

☆Robert Taualupe, Operations Manager ☆Gifford Sigrah, Distribution Foreman Ronnie George, Lineman-2

4. Continued Revision & Update of Manuals

The FSM side has been working to revise and update following manuals by July 2022, under supervision by JICA Expert.

1) Planning manual for Hybrid Power Generation System

2) Operation & Maintenance Manual for Solar PV System

3) Maintenance Manual for DEGs

It is very important that these manuals are continuously utilized and revised as necessary. Therefore, the project counterpart members are requested to share the information and/or conduct training for other staff to apply these manuals in their daily works. The FSM side confirmed the application of manuals in following occasions;

1) Planning hybrid power generation system by development partners

2) Actual O&M works for solar PV system

3) Actual O&M works for DEGs

5. Supervision for DEG overhaul works

The both sides confirmed the supervision of the DEG overhaul work shall be carried out on DEG unit 9 or 10 in Kosrae from June 2022. In order to coordinate with related project activities in other countries, the FSM side is requested to keep updating the latest overhaul schedule with the JICA Expert at least two months before conducting the overhaul works. MOU shall be concluded between KUA and JICA to confirm the scope of works by JICA Expert.

ATTACHMENT 1 Agenda for JCC Meeting

ATTACHMENT 2 Lists of Participants

ATTACHMENT 3 Project Monitoring Sheet ver. 5
ATTACHMENT 4 Project Design Matrix ver. 4

ATTACHMENT 5 Plan of Operation ver. 6.2

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The Project for Introduction of Hybrid Power Generation	n in Pacific Island Countries
Project Final Report	Okinawa Enetech Co. • Okinawa Electric Power Co

4.5 5th JCC Meeting

#### MINUTES OF MEETING

#### BETWEEN

THE AUTHORITIES CONCERNED OF
THE GOVERNMENT OF FEDERATED STATES OF MICRONESIA
AND

JAPAN INTERNATIONAL COOPERATION AGENCY
FOR

THE FIFTH JOINT COORDINATION COMMITTEE (JCC)
ON

# THE PROJECT FOR INTRODUCTION OF HYBRID POWER GENERATION SYSTEM IN PACIFIC ISLAND COUNTRIES

Japan International Cooperation Agency (hereinafter referred to as "JICA") and the authorities concerned of the Federated States of Micronesia (hereinafter referred to as "the FSM side") established a Joint Coordination Committee (hereinafter referred to as "JCC") for the effective and successful implementation of the Project for Introduction of Hybrid Power Generation System in Pacific Island Countries (hereinafter referred to as "the Project").

The fifth JCC on the Project was held on 7<sup>th</sup> April 2023, through the on-line arrangement connecting stakeholders of FSM and JICA side. The meeting was chaired by Mr. Faustino Yarofaisug, Assistant Secretary, Department of Resources and Development.

The both parties acknowledge and agree that the signing of this Minutes of Meeting may be executed by electronic signature, which is considered as an original signature, and therefore has the same force and effect as an original signature. "Electronic signature" includes faxed versions of an original signature or electronically scanned and transmitted versions (e.g., via pdf) of an original signature.

As a result of the discussion on the fifth JCC, JICA and the FSM side agreed on the main points as described in the Annex attached hereto.

Pohnpei, 7th April, 2023





Ogawa Tadayuki Chief Advisor JICA Senior Advisor

Acting Secretary Department of Resources and

Development

The Federated States of Micronesia

Muraoka Keiichi

Resident Representative JICA Micronesia Office

#### ANNEX

The FSM side and JICA (hereinafter referred to as "both sides") discussed on the issues including the contents of (i)Project Design Matrix (PDM), (ii)Plan of Operation (PO), and (iii)Project Monitoring Sheet, based on the Agenda attached hereto.

The both sides confirmed the main points as described below.

- Confirmation of PDM, PO and Project Monitoring Sheet for project evaluation Since the Project progressed, the Objectively Verifiable Indicator (OVI) has been identified. Both sides confirmed the latest version of PDM and PO as attachment 4 and 5. Also, the project monitoring sheet was agreed as attachment 3.
- 2. Project Organization

The both sides confirmed the update of the Project Counterpart Team and assignment of the officials as described below. Those counterparts are core trainers in each task, and expected to disseminate technical knowledge and skills among other members in the organization periodically during the Project.

The FSM side agreed to make the effort to remain the members as core trainers by 2023.

- Project Counterparts (Core Trainers)
  - "A" means prioritized counterparts
  - (1) Yap State: YSPSC
  - Operation and Maintenance of Diesel Engine Generators Casmiro Yithmeng, Chief Mechanic
     ☆Chris Igem, Power Plant Manager (Electrical)
     Roscoe Tamag, Chief Operator
     ☆Rowino Yarofaliut, Power Plant Mechanic (Mechanical)
  - 2) Plan for introduction of hybrid power generation systems

     ☆ John A. Chieng, Engineering Manager

  - (2) Chuuk State; CPUC
  - Operation and Maintenance of Diesel Engine Generators Dennis Triana, Head of power generation and maintenance Jimmy Reyes, Lead Mechanic
  - Plan for introduction of hybrid power generation systems
     Dennis Triana, Head of power generation and maintenance
     Albert Francis, Head of power distribution
     Chris Killion, RE Technician

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Limus Setik, RE Technician

 Operation and Maintenance of Renewable Energy generation system Dennis Triana, Head of power generation and maintenance Chris Killion, RE Technician Limus Setik, RE Technician

#### (3) Pohnpei State; PUC

- Operation and Maintenance of Diesel Engine Generators ☆Elpert Elias, Mechanic
   ☆Dackson Solomon, Manager, Power Generation Erickson Semens, Mechanics Nixon Helgenberger, Electrician
- Plan for introduction of hybrid power generation systems Selestino Santiago, Senior Electrician Richard Lohn, Electrician

#### (4) Kosrae State; KUA

- Operation and Maintenance of Diesel Engine Generators ☆Robert Taualupe, Operations Manager (Electrical) ☆Ronald Albert, Supervisor of Operator (Mechanical) Tedrick Joseph (Mechanic)
- Plan for introduction of hybrid power generation systems
   Gerardo Protacio, Electrical Engineer
   Robert Taualupe, Operations Manager
   Casey Freddy, Assistant General Manager
- 3) Operation and Maintenance of Renewable Energy generation system 
  ☆Robert Taualupe, Operations Manager
  ☆Gifford Sigrah, Distribution Foreman
  Ronnie George, Lineman-2

# 3. Continued Revision & Update of Manuals

The FSM side has been working to revise and update following manuals by April 2023, under supervision by JICA Expert.

- 1) Planning manual for Hybrid Power Generation System
- 2) Operation & Maintenance Manual for Solar PV System
- 3) Maintenance Manual for DGs

It is very important that these manuals are continuously utilized and revised as necessary. Therefore, the project counterpart members are requested to share

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the information and/or conduct training for other staff to apply these manuals in their daily works. The FSM side confirmed the application of manuals in following occasions;

- 1) Verify the plan for hybrid power generation system by development partners Homer software has been applied for the ADB Phase-1 Project.
- Actual O&M works for solar PV system
   O&M Manuals and check sheets have been used for several PV systems in capital and remote islands.
- Actual O&M works for DGs
   O&M Manuals and check sheets have been used for daily and periodical
   maintenance works for DGs.

# 4. Improvement Plan for the Operation of Pilot DG Units

The FSM side agreed to implement following measures to improve the operation conditions of pilot DG units. The result of implementation of the improvement plan will be confirmed with JICA Expert teams by the end of the Project.

(PUC)

- (1) Reparing fault fuel meters and monthly measurement of SFC.
- (2) Periodical patrol checklist for preventive maintenance should be enforced. It is recommended to utilize the check sheet to perform the preventive maintenance works systematically without asking the detailed instructions from the generation manager. Also, it is advised to prepare reports of the work done and keep it to use as reference in case of sudden trouble.

(CPUC)

- (1) Keep record of troubles and fixing equipment in accordance with the records in the power plant.
- (2) Introduce spare parts account record book.

(KUA)

- (1) Periodical generator cleaning to prevent insulation faults.
- (2) Cable pit opening curing in the old PS.

(YSPSC)

- (1) Inspection of overhead crane.
- (2) Record monthly measurement of SFC.

#### 5. Training Equipment

Following equipment has been handed over to FSM side under the Project. JICA has provided below equipment to improve the operation & maintenance works in DEG and RE.

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List of equipment provided to FSM

No	Equipment Name	Model No.	PUC	CPUC	KUA	YSPSC
1	Fuel flow meter	BRC20-2-P4	10	=	4	=
2	Pyranometer & thermometer	SPST-A-F2	1	1	1	1
3	StringTracer(I -V curve tracer)	SPST-A2A-Y1	1	1	1	1
4	Cell Line Checker (Fault module detector)	SPLC-A-Y1	1	1	1	1
5	Fan Unit (For Power Conditioner)	P83B FANUNIT FM4	3	=	2	-
<u>6</u>	HOMER PRO (Permanent license with Hydro module)	_	1	1	1	1
7	Insulation Tester	IR4053-11	1	1	1	1
8	Battery HiTester	BT3554	1	1	1	1
9	Clamp on AC/DC HiTester	3285	1	1	1	1
10	Radiation thermometer	FT3701	1	1	1	1
11	Battery hydrometer	Ξ	1	1	1	1
12	Vibration measuring instrument	TA415EB	1	1	1	1
13	Thermographic Camera	TiS55	1	1	1	1
14	<u>Digital Multimeter</u>	DT4254	1	1	1	1
<u>15</u>	Mower	MEM428	1	1	:	1
16	High pressure washer	JCE-1408UDX	1	1	1	1
17	Digital Pressure Calibrator	DPI800S	=	=	1	=
18	Digital thermometer	TX1001	ė.	=	1	-
<u>19</u>	Instrumentation signal measurement / generator	CA150	=	=	1	ż
20	Ohm meter	MY600	=	3	1	=
21	Air compressor kit	PV 211	2	2	1	=
22	Air hose	1m×2 / 1.5m×1	=	=	1	=
23	Various types of fittings		=	2	1	- 2

It is required for the FSM side to keep and utilize above equipment in an appropriate manner. In case of missing / malfunction of equipment, the FSM side is requested to inform JICA Expert teams immediately.

 2<sup>nd</sup> phase regional technical cooperation project
 JICA is going to launch the 2<sup>nd</sup> phase regional technical cooperation project covering Palau, FSM, Tuvalu, Samoa and Fiji in 2023. The project will focus Yap in FSM and support other states through on-line arrangements for continued activities.



ATTACHMENT 1 Agenda for JCC Meeting
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# Agenda for JCC Meeting

- Opening Remarks by Mr. Faustino Yarofaisug, Assistant Secretary, Department of Resources and Development
- 2. Explanation and confirmation on the following documents;
  - (1) Project Design Matrix (PDM)
  - (2) Plan of Operation (PO)
  - (3) Project Monitoring Sheet
- 3. Confirmation on the Minutes of Meeting (M/M)
- 4. Progress of Activities
- Closing Remarks by Mr. Muraoka Keiichi, Resident Representative, JICA Micronesia Office

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# ATTACHMENT 2 List of Participants

Organization	Position	Name	
Department of Resources and Development	Assistant Secretary	Mr. Faustino Yarofaisug	
Yap State Public Service Corporation	General Manager	Mr. Faustino R. Yangmog	
Chuuk Public Utility Corporation	Chief Financial Officer	Ms. Lei Shirai	
Pohnpei Utilities Corporation	Chief of Planning and Engineering Services	Mr. Alex Nanpei	
Kosrae Utilities Authority	General Manager	Mr. Fred Skilling	
Kosrae Utilities Authority	Assistant General Manager	Mr. Casey Freddy	
Kosrae Utilities Authority	Customer Service Supervisor	Mr. Hairom Livaie	
JICA Micronesia Office	Resident Representative	Mr. Muraoka Keiichi	
JICA	Chief Advisor	Mr. Ogawa Tadayuki	
JICA	JICA Expert	Mr. Luis Kakefuku	
JICA	JICA Expert	Mr. Shimabuku Masanori	
JICA	JICA Expert	Mr. Hokama Hideyasu	
JICA	JICA Expert	Mr. Nakamura Hirokazu	
JICA	JICA Expert	Mr. Watanabe Takahisa	

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#### To RR of JICA Micronesia Office

#### PROJECT MONITORING SHEET

Project Title: The Project for Introduction of Hybrid Power Generation System in

Pacific Island Countries

Version of the Sheet: Ver.6 (Nov. 2021 - Feb. 2023)

Project Term: March 2017 -June 2023

Name: Ms. Elina Akinaga

Title: Project Director

Name: Tadayuki OGAWA

Title: Chief Advisor

Submission Date: 7th April, 2023

## I. Summary

- 1 Progress
- 1-1 Progress of Inputs
- (1) Japanese side
- Since March 2019, Chief Advisor has been based in Japan and assists JICA expert team & FSM counterparts to continuously upgrade skills and knowledge mainly through on-line support.
- Due to the spread of COVID-19, JICA expert team has been working for on-line remote trainings since June 2020. Since November 2021, a total of eleven (11) remote sessions were held for O&M of Diesel Engine Generator (DG) and another fourteen (14) sessions were conducted for grid integration of RE, O&M of PV facilities, in these sessions follow-up of revising RE manuals also were held. (Pohnpei: DG/3, RE/4 Chuuk: DG/2, RE/3, Kosrae: DG/3, RE/4, Yap: DG/3, RE/3) In January 2023 JICA Experts Team has started the DG and RE hands-on training on site and it is planned hold in March the last DG training in Chuuk and RE training in Kosrae.

#### (2) FSM side

In total 31 number of core trainers are registered under the Project, 10 from YSPSC, 5 from CPUC, 9 from PUC and 7 from KUA staff. Facilities and equipment (e.g., training classrooms) for the trainings in FSM were provided by FSM state side. For the on-line

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support sessions 306 trainers (cumulative total) joined by the end of December of 2022. (131 numbers for DG and 175 for RE)

# 1-2 Progress of Activities

No.	Activity	Progress
Outp	ut 1: 1. Appropriate and economical system for O	&M of Diesel Generators (DGs) is enhanced.
1-1	Operational conditions of the existing DGs are reviewed, including confirmation of objectively verifiable indicators for overall goal and project purpose.	The result of discussions and analysis for future training needs was compiled as "Training Needs Assessment Report" and submitted to all members in February 2018.
1.2	Specific fuel consumption of pilot DG units is measured.	KUA (January2023) Fuel flow meters provided under the project has been installed and recent measurement result of SFC in February was: Unit #9: 0.278 l/kWh Unit #10: 0.294 l/kWh PUC (January2023) PUC installed fuel flow meters provided under the project, but some of them needs reparation due to wearing of internal parts. Last measurement in January was as follow: Unit #1: 0.288 l/kWh Unit #2: 0.244 l/kWh Unit #5: 0.266 l/kWh PUC should repair the meters as soon as possible to update the baseline for evaluation. CPUC (June 2022) Unit #1: 0.243 l/kWh YSPSC (August 2022) Unit #1: 0.269 l/kWh Unit #2: 0.281 l/kWh
1-3	Improvement plan for the operation of pilot DG units is prepared.	Unit #3: 0.299 l/kWh Improvement plan was prepared and shared with FSM side in the letter issued on 28th September 2018.
1-4	Existing spare parts and maintenance tools of pilot DG units are confirmed.	Existing spare parts and maintenance tools were confirmed in July 2020.
1-5	Improvement plan for the operation of pilot DG units is implemented.	Improvement plan has been implemented by April 2019 under consultation with JICA Expert.
1-6	The result of implementation of the improvement plan is evaluated, and improvement plan is updated.	PUC: JICA expert advice 16 tasks, and in January the result shows 4 completed, 3 on going, 4 became unnecessary, 1not possible to do due to shortage in budget, and 4 PUC will share information.

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		CPUC:
		JICA expert advice 13 tasks, the report of last June was, 11 completed, 2 on going.  KUA:
		JICA expert advice 20 tasks, the report of last June was, 12 completed, 2 not implemented yet, 2 on going, 2 became not necessary and 2 KUA will share information.  YSPSC:
		JICA expert advice 21 tasks, the report of last June was, 17 completed, 3 not implemented yet and 1 to check.
1-7	The concept of Economic Dispatch Control (EDC) is shared among operators and applied, if possible.	The basic concept of EDC has been explained by JICA Expert in August 2018. Necessary software has been shared with FSM side.
1-8	Necessary spare parts and maintenance tools for the pilot DG units are prepared.	Necessary spare parts and maintenance tools was re-confirmed by August 2021.
1-9	Maintenance work schedule for the pilot DG units is prepared.	Maintenance work schedule for the pilot DG units was prepared by September 2021.
1-10	Check sheets and maintenance manuals for daily maintenance works for pilot DG units are prepared.	Pilot DG maintenance manual (OH) was delivered to each state by March 2019. Check sheets was provided again in the training of August 2019. The manual revision has started in June 2020, updating the contents according to FSM standards. Update completion was set by April. KUA update completed.
1-11	Maintenance works (daily/partial inspection/overhaul work) for pilot DG units are conducted in accordance with the maintenance schedule.	Maintenance works for pilot DG units are conducted in accordance with the maintenance schedule. OH work in units No. 9 and No. 10 at KUA is planned for April.
1-12	The result of maintenance works is evaluated, and future maintenance work schedule together with budgets prepared.	Yet to be commenced.  Gathering of sub-contract fee, cost for tools and equipment information.
1-13	Specific fuel consumption of the pilot DG units is measured before and after implementation of the related project activities.	Kosrae OH work is planned for April. Indication for measurement of SFC before and after OH was done.
1-14	Related training programs for appropriate O&M of DGs are implemented periodically.	From November 2021 to February 2023, eleven (11) on line training was carried out with 131 cumulative total participants.
1-15	Knowledge on appropriate O&M of DGs is disseminated among stakeholders.	Project Seminar was first held in Yap in 2019.  Last online seminar schedule for FSM is in study.
Outpu	ut 2: Methodology for appropriate planning and O	
2-1	Current situation and future development plan of RE is reviewed.	Same as activity 1-1
2-2	Planning manual for Hybrid Power	First issue of the planning manual was





	Generation System is prepared.	delivered to each state by March, 2019.
2-3	Planning manual for Hybrid Power Generation System is reviewed and updated in the target area.	Each utility is expected to review and update the manual under the support by JICA Expert. Updating is going or according to FSM standards and it was planned to finish in December 2022.
2-4	Operating conditions of the existing RE facilities are reviewed, including confirmation of objectively verifiable indicators for overall goal and project purpose.	Same as activity 1-1 Objectively verifiable indicators for overall goal were confirmed at the 1st JCC meeting in 2017.  Last Performance ratio of each state is as follow: PUC President Office: PCS fault PEC fund: 31.7% (April 2022) COM: 33.2% (July 2022) CPUC PEC fund:52.5% (Dec2022) Airport: 44.9% (Dec2022) World Bank:75.6% (Dec2022) KUA EU fund: 58.2% (Oct 2022) PEC fund: 50% (Dec 2022) YSPSC
2-5	O&M manual for RE facilities is prepared.	PEC fund:38.8% (Aug 2022)  First issue of the O&M manual was delivered to each state by March 2019.  Update completion was set by April. Only Pohnpei has finished the update, other 3 states will be checked in March trip.
2-6	Maintenance works are conducted according to O&M manual of RE facilities.	Each utility is expected to conduct maintenance works under the support by JICA Expert.  The O&M manual update was scheduled to be completed in December 2022. Only Pohnpei has completed, the other 3 states' manuals will be reviewed during the March visit.
2-7	The result of maintenance works is evaluated, and future maintenance work schedule together with budget is prepared.	Future maintenance plan with budget is in preparation in all states.
2-8	Training program for Hybrid Power Generation System including O&M of RE facilities is conducted.	From November 2021 to February 2023, fourteen (14) on line training including manuals follow up was carried out with 175 cumulative total participants.
2-9	Knowledge regarding Hybrid Power Generation System is disseminated among stakeholders.	Same as activity 1·15

(Remarks) Yellow-highlighted activities have already been completed.

# 1.3 Achievement of Output

(1) Output 1

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Technical advice for the improvement of O&M of DGs has been provided by JICA Experts based on the initial survey of current conditions conducted in 2017. Also, classroom lecture, hands on training and online trainings have been provided to ensure appropriate and economical O&M of DGs with draft manuals and check sheets. In addition, counterpart training has been conducted with site visits and hands on trainings to learn the necessary O&M of DGs in Japan. Since June 2020, on-line support by JICA Experts has been carried out to monitor the progress of related activities.

From now on further commitment to the Project is expected by FSM counterparts to implement the improved O&M of DGs based on the learnings from the advice and trainings by JICA Experts. The progress of the updated improvement plan shall be recorded and shared with JICA experts periodically to further support O&M activities in each state.

#### (2) Output 2

Technical advice for the appropriate planning and O&M of RE has been provided by JICA Experts based on the initial survey of current conditions conducted in 2017. Also, classroom lecture, hands on trainings and online trainings have been provided to ensure appropriate planning and O&M of RE with draft manuals and check sheets. In addition, counterpart training has been conducted with site visits and hands on trainings to learn the methodology of planning and O&M of RE in Japan. Since June 2020, on-line support by JICA Experts has been carried out to monitor the progress of related activities.

From now on further commitment to the Project is expected by FSM counterparts to implement the improved O&M of RE facilities based on the learnings from the advice and trainings by JICA Experts.

"Planning manual for Hybrid Power Generation System" and "O&M manual for RE facilities" shall be utilized and updated in accordance with the current O&M practices by each utility. Also, the results of O&M work for all solar PV systems shall be recorded and shared with JICA Expert Team. Therefore, further contribution from FSM side should be expected to implement the improved planning and O&M of RE based on the learnings from the advice and trainings by JICA Expert Team.

# 1.4 Achievement of the Project Purpose

(Indicator 1) Improvement of specific fuel consumption of pilot DG units

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State	Baseline (2017)	Achievement (2020)
Yap	14.5 kWh/G (CAT 3516)	13.39 kWh/G (0.283 l/kWh)
	14.3 kWh/G (CAT C32)	Unit #1: 14.07 kWh/G (0.269 l/kWh)
		Unit #2: 13.47 kWh/G (0.281 l/kWh)
		Unit #3: 12.65 kWh/G (0.299 l/kWh)
Chuuk	14.91 kWh/G (total average)	15.57 kWh/G (0.243 l/kWh)
		Unit #1: 15.57 kWh/G (0.243 l/kWh)
		Unit #2: 15.57 kWh/G (0.243 l/kWh)
Pohnpei	13.4 kWh/G (total average)	14.29 kWh/G (0.266 l/kWh)
2020N/A		Unit #1: 13.14 kWh/G (0.288 l/kWh)
		Unit #2: 15.51 kWh/G (0.244 l/kWh)
		Unit #5: 14.23 kWh/G (0.266 l/kWh)
Kosrae	13.6 kWh/G (total average)	13.24 kWh/G (0.286 l/kWh)
		Unit #9: 13.61 kWh/G (0.278 l/kWh)
		Unit #10: 12.87 kWh/G (0.294 l/kWh)

(Observation of Results)

YSPSC: The SFC of the units #2 and #3 are below than the baseline. The cause of this could be the influence of the operation condition under RE fluctuation or the necessity of the OH due to the operation hours.

CPUC: Good performance of DGs due to recent OH.

PUC: Need reparation of flow meters of the unit #3 and #5. The SFC average is good. PUC should continue the measurement every month and share results.

KUA: SFC measurement should be done before and after the top OH works planned in next April.

(Indicator 2) Improvement of performance ratio for RE power generation systems

State	Baseline (2017)	Achievement (2021~2022)	
Yap	66% (PEC)	38.8% (PEC) (August)	
Chuuk	72% (Airport) 71% (PEC)	44.9% (Airport) 52.5% (PEC) (December values)	
Pohnpei	76% (COM) 78% (President's Office) 71% (PEC)	33.2% (COM) Fault (President's Office) 31.7% (PEC) (July values)	
Kosrae	66% (PEC) 56% (EU)	66.92% (PEC) 56.67% (EU) (2020 December value)	





Deterioration of performance indicators are observed in Yap, Chuuk and Pohnpei. Possible causes for the decline in the PR values are as follow.

Yap: Last June, rainwater has leaked into the power cable pit, and the 95mm<sup>2</sup> cable needs to be replaced. The main reason for this fault would be improper installation works. YSPSC is waiting for the cables to arrive.

Chuuk: Airport PV requires replacement of the faults power conditioner. CPUC is studying which PCS manufacturer is the best to install. For PEC fund PV needs to monitor this year's values to know if there are any problems. (Before month value was 60.9%)

Pohnpei: COM PV has many problems after rain. According to the survey by JICA Experts in January, the power cable is damaged, 2 combiner boxes have been burned probably due to moisture inside combiner boxes, and 2 strings are not working. PEC fund PV system stopped since last April and repaired last January. PUC will share PR values of February. President's office PV is now in repair process with the assistance of JICA.

All utilities are encouraged to record and monitor this indicator on a monthly basis and to investigate the cause of any reduction in PV system output.

(Indicator 3) Proper application of planning and O&M method of HPGS

State	Planning Manual	O&M Manual	
Yap	Homer software has been applied for the ADB Phase 1 Project.	Check sheet has been used for both capital & outer islands PV systems.	
Chuuk	Planning Manuals has created, but we still have some additional manuals to submit to JICA expert team for the checking/review and to finalize the manual.	re some additional mit to JICA The Off-Grid/ Stand-alone sol	
Pohnpei Check sheets, reporting form has been applied. Integration manual update already completed.			
Kosrae	RE integration manual update already almost completed.	O&M manual update for RE already completed.	

- 1-5 Changes of Risks and Actions for Mitigation N/A
- 1-6 Progress of Actions undertaken by JICA N/A

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- 1-7 Progress of Actions undertaken by the Parties N/A
- 1-8 Progress of Environmental and Social Considerations (if applicable)
- 1-9 Progress of Considerations on Gender/ Peace Building/ Poverty Reduction (if applicable)
- 1·10 Other remarkable/ considerable issues related/ affect to the Project (such as other JICA's projects, activities of counterparts, other donors, private sectors, NGOs, etc.)
- 2 Delay of Work Schedule and/or Problems (if any)
- 2-1 Detail

Although online support activities have been undertaken and no obvious delay was expected, certain activities such as the revision of manuals for diesel operation and maintenance are at a standstill. Despite having a busy work in the power station, the JICA experts recommend a more active participation in the project activities to obtain better efficiency in the operation of the hybrid power generation.

#### 2-2 Cause

The issue was caused by the global COVID-19 pandemic and related international border restrictions.

2-3 Action to be taken.

Both parties should focus on the tasks to be accomplished during the rest of the project period.

- 2-4 Roles of Responsible Persons/ Organization (JICA, the Parties, etc.)
  Record of Discussions (R/D) has been amended to officially agree on the extension of the project period. The R/D has been signed by Department of Resources and Development, Department of Foreign Affairs, and JICA Micronesia Office.
- 3 Modification of the Project Implementation Plan
- 3.1 Plan of Operation

Plan of Operation (PO) has also been amended to indicate the extension of project period by one year.

3-2 Other modifications on detailed implementation plan

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# 4 Preparation of Government of FSM toward after completion of the Project

Government of FSM and each state utility will be further requested to utilize and update the related manuals and tools for the planning and O&M of Hybrid Power Generation System. Also, those core trainers who have participated in the training in FSM, Japan and Fiji need to continue on the OJT for other staff inside the organization to share the necessary skills and knowledge for the introduction of Hybrid Power Generation System.

# II. Project Monitoring Sheet I & II as Attached

(Project Design Matrix and Plan of Operation)



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Ver. 4, October. 2021

## Draft Project Design Matrix (PDM)

Project Title: The Project for Introduction of Hybrid Power Generation System in Pacific Island Countries

Project Term: March 2017 - June 2023 (Six Years) (Phase 1: March 2017 - February 2019, Phase 2: March 2019 - June 2023

Country: Federated States of Micronesia

Target Area: Pohnpei, Chuuk, Yap and Kosrae

Target Group: Related engineers and other technical staff in the target area (DRD, PUC, KUA, CPUC, YSPSC)

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumptions
Overall Goal  Energy security is improved and greenhouse gases are reduced through the reduction of fossil fuels consumption.	In comparison to the indicators at the time of baseline survey,  1. Reduced amount of CO2 emission of power utilities in the target area  2. Reduced amount of diesel fuel of power utilities in the target area  3. Increased capacity (kW) and actual generated energy (kWh) of renewable energy facilities of power utilities in the target area	1. to 3. Reports of C/P agencies	
Project Purpose			
Hybrid Power Generation System is introduced.	Improvement of specific fuel consumption of pilot DG units (better than the baseline data set at the beginning of the Project)     Improvement of performance ratio for the RE power generation systems (better than the baseline data set at the beginning of the Project in consideration of aging deterioration of PV module)     Proper application of planning and O&M method of Hybrid Power Generation System	Record on specific fuel consumption of Pilot DG units by C/P, checked by Japanese experts     Record on operation of RE power generation systems     Evaluation by Japanese experts and C/P on plans of Hybrid Power Generation System	C/P agencies continue commitment to the Project by continuing budget allocation as well as assignment of personnel for the post- Project activities.
Outputs			
<ol> <li>Appropriate and economical system for O&amp;M of Diesel Generators (DGs) is enhanced.</li> </ol>	<ul> <li><output 1=""></output></li> <li>1-1 Adequacy on the use of the work schedule, check sheets and manual for the maintenance work for the pilot DG units</li> <li>1-2 Number of training participants who are conducting operation and maintenance of DG based on the learnings from the training program (target:2 for each state)</li> </ul>	1-1 Evaluation by Japanese experts and C/P on improvement of maintenance work (daily/partial inspection/overhaul work) for pilot DG units 1-2 Capacity assessment of trained O&M staff and managers by Japanese experts	C/P agencies promote investment on renewable energy facilities based on the current national policy/plan.



Methodology for appropriate planning and O&M of renewable energy (RE) is established.  Activities	<ul> <li>&lt;0utput 2&gt;</li> <li>2-1 Number of training participants who have been certified under the Project for the planning method of the Hybrid Power Generation System (target: 1 for each state)</li> <li>2-2 Number of training participants who are conducting O&amp;M of RE facilities based on the learnings from the training program (target: 2 for each state)</li> <li>2-3 Preparation of related manuals for Hybrid Power Generation System</li> <li>2-4 Adequacy of the use of the related manuals for Hybrid Power Generation System</li> </ul>	2-1 Capacity assessment of trained staff and managers by Japanese experts  2-2 Capacity assessment of trained O&M staff and managers by Japanese experts  2-3 Evaluation by Japanese Experts on related manuals for Hybrid Power Generation System prepared by C/P  2-4 Evaluation by Japanese experts and C/P on the use of the related manuals for Hybrid Power Generation System	
<output 1=""></output>	(Japanese side)	(FSM side)	
<ul> <li>1-1 Operational conditions of the existing DGs are reviewed, including confirmation of objectively verifiable indicators for overall goal and project purpose.</li> <li>1-2 Specific fuel consumption of pilot DG units is measured.</li> <li>1-3 Improvement plan for the operation of pilot DG units is prepared.</li> <li>1-4 Existing spare parts and maintenance tools of pilot DG units are confirmed.</li> <li>1-5 Improvement plan for the operation of pilot DG units is implemented.</li> <li>1-6 The result of implementation of the improvement plan is evaluated, and improvement plan is updated.</li> <li>1-7 The concept of Economic Dispatch Control (EDC) is shared among operators and applied, if possible.</li> <li>1-8 Necessary spare parts and maintenance tools for the pilot DG units are prepared.</li> <li>1-9 Maintenance work schedule for the pilot DG units is prepared.</li> <li>1-10 Check sheets and maintenance manuals for maintenance works for pilot DG units are onducted in accordance with the maintenance schedule.</li> <li>1-11 Maintenance works (daily/partial inspection/overhaul work) for pilot DG units are conducted in accordance with the maintenance schedule.</li> <li>1-12 The result of maintenance works is evaluated, and future maintenance work schedule together with budget (including sub-contract fee, cost for tools and equipment) is prepared.</li> <li>1-13 Specific fuel consumption of the pilot DG units is measured before and after implementation of the related project activities.</li> <li>1-14 Related training programs for appropriate O&amp;M system for DGs are implemented periodically.</li> <li>1-15 Knowledge on appropriate O&amp;M of DGs is disseminated among stakeholders.</li> <li>Output 2&gt;</li> <li>2-1 Current situation and future development plan of RE is reviewed.</li> <li>2-2 Planning manual for Hybrid Power Generation System is prepared.</li> <li>2-3 Planning manual for Hybrid Power Generation System is reviewed, including updated in the target area.</li> <li>2-4 Operating conditions of the existing RE</li></ul>	1. Dispatch of the Japanese experts  SICA long term expert, stationed in Fiji > - Chief Advisor/Hybrid Power Generation System (Completed by March 2019)  SICA Consultant Team> - Team Leader/Operation & Maintenance of DG - Economic operation of DG (EDC) - Maintenance support of DG (Mechanical expert) - Maintenance support of DG (Electrical expert) - O&M of RE power generation system - Integration of RE power generation system - Project Coordinator  2. Training in Japan and Fiji  3. Equipment - In accordance with necessity of activities	1. Assignment of C/Ps -Project Director (P/D) -Project Manager (P/M) -Engineers in charge of O&M (Manager level) - Mechanical Staff - Electrical Staff - Planning officer, and others  2. Facilities and equipment -Project office  3.Recurrent costs - C/Ps' wages and allowances - C/Ps' domestic travel expense in part	Preconditions Contents of the current relevant policies on promotion of renewable energy and energy efficiency are not largely changed.



	confirmation of objectively verifiable indicators for overall goal and project		
	purpose.	4 6	
2.5	O&M manual for RE facilities is prepared.		
2.0	Militariual for RE facilities is prepared.		
	Maintenance works are conducted according to O&M manual of RE facilities.		
2-7	The result of maintenance works is evaluated, and future maintenance work		
	schedule together with budget is prepared.		
2-8	Training program for Hybrid Power Generation System including O&M of		
	RE facilities is conducted		
2-9	Knowledge regarding Hybrid Power Generation System is disseminated		
	among stakeholders.		
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Plan of Operation (PO)

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Intget Group, Related engineers, and offer technical staff in the target area (DRIA, PLC, ALIA, CPTC, AND SC

	itemp. Belated engineers, and other technical staff in the seget area (IVBIs, PEC, Sallis, CPLC, Si			
		Product	Organization in Charge	
Ouip	ut I Activities [Appropriate O&M System for DG]			1 2 3 4 5 4 5 7 7 7 9 9 11 11 11 11 11 11 15 16 17 18 19 20 11 12 12 12 12 12 12 12 12 12 12 12 12
1.1	Operate and conditions of the central COs are reversely, including confirmation of objects sky ventilable indicators for overall goal and project purpose	TNA Report OVI	PEIC, CPEIC, KUA, VEPEC, IICA Experis	
14	Operation field communications of paint DG sectle on communicati	Measurament of Specific fael-consumption	PUC, CPUC, KUA, YSPSC, RCA Esperts 56	
1.2	Improvement plan for the operation of pilot DXI state in prepared	Improvement plan	PUC, CPUC, KUA, YSPSC, JICA Experts	
14	Horting space and paintenance took of pilot IX units we conferred.	Liet of aguere parts and mointenance took	PUC, CPUC, KUA, YSPSC, RCA Expens	
1.5	begrove network place for the operations of pilot LRG units to sequences all	Empuse control language trashuse Happert	PUC, CPUC, KUA, YSPSC, RCA Experts 54	
146	The new off of employmentation of the emprovement plan is availabled, and improviment plan is updated.	Improvement Evaluation Report	PUC, CPUC, KUA. Plac YSPSC, JICA Experts Ass	Cast Induces
1-2	The convent of Economic Disputch Control (EEX") is closed intend openators and applied, if good life	EIN' software, manual EIN' sheet	PUC CPUC, KUA. Place YSPSC, JICA Experts	
10	Necessary space parts and manifestance tools for the july DV units are proposed.	List of opose parts and baseques took prepared	PUC, CPUC, KUA, Pine VSPSC, RCA Experts Ass	
10	Africatemanue work actuabile for the pilot CKI units is prepared.	Maintenance work shedule	PUC, CPUC, KUA, Plac YSPSC, RCA Esperts Are	
1-10	Check shows and maintenance manuals for doubt maintenance winds for pilot DG usets are propored.	Check sheets and engintenance manufac	PUC, CPUC, KUA, VNPSC, RCA Experts An	Taking Mainte autoritig is 750 registed.
-11	Mannetance works study pured inspection or what works for pain DG uturs are continued as accordance with the quantities or when the	Ataintenance record	PUC, CPUC, KUA, Pac VSPSC, JICA Experts	Child Sedama
62	The result of maintennants works in evaluated, and flature maintenance work schedule together will budget (middleng sub-contract for, cost for tools and apopters) is proposed.	Evaluation report and future schedule for maintenance	PUC, CPUC, KUA: PS- VSPBC, RCA Saports As	Catalogue
12	Specific that consumpting of the plan EG omits is measured before and after any homeopatical of the related propert activities	Mesoconomist for specific consequents of of the pilot (N)	PUC, CPUC, KUA, YSPSC, RCA Experts As	
.14	belond training programs for appropriate (MAH+FCKs are supersected perculsionly	Truning record, recommendations, reports, etc.	DROUGHE, OPER, KNIA, Philipsens Air	Think-th is the or Ch. Bast critical S-Ch-Ste Storage 7 Town Married America
-15	Coverledge on appropriate CAM of DOs is disconnected among stakeholders	Semmar, workshop records	DHID, PEST, CPLE, KUA, VSPSC, DCA Experts As	
stes	2 Activities [Appenpriate planning and O&M of renewable energy (RF)]			
54 (	urcut eduction and future development plan of RE is reviewed.	TNA Report, OVI	PUC, CPUC, KUA, YSPEC, JICA Equeta	
13. 1	Planning manual for Hybrid Power Generation System is prepared	Planning manual for Hybrid Private Generation	PUC, CPUC, KUA, YSPSC, JICA Experts	
1	Taxong manual for Hybrid Power Generation System is reviewed and opdated in the arget area.	Updated Planning raccoal for Hybrol Proces Generation	PUC, CPUC, KUA, YSPSC, RCA Experts Ass	Lister street
4	syrrating combinions of the existing RE tackines are reviewed, excluding condequation of depotently verticable includers for overall good and project purpose.	TNA Report, OVI	PUC, CPUC, KUA, YSPSC, RCA Experts As	
	MAN manual for RE Dedices is prepared.	O&M manual for IEE facilities	FUC, CPUC, KUA. 798 YSPSC, RCA Esperts As	The second secon
n 3	distribution works are conducted according to O&M manual of RE facilities.	Maintenance Record	PUC, CPUC, KUA. Pw YSPSC, RCA Experts As	Control Medicalism
. 1	he result of mandonance works a evaluated, and future mantenance work schedule option with budget is prepared.	Enablement report of quanteriance work, and authorisis	PUC, CPUC, KUA. Plan YSPSC, BCA Experts Ass	Charles Van Barren
a I	raining program for Hybrid Power Generation System anduling OASM of RE facilities in onducted.	Emming record, recommendations, reports, etc.	DRD, PUC, CPUC, KUA, Pte 1995 C. RCA Experts Ave	Tool a mile of the beauting
e. K.	awskelge regarding Hybrid Power Generation System is discriminated aroung alcheiden	Sceninar, workshop records	PRED, PRIC, CITEC, KUA, Pile 17875C, RCA Diports An	
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