

Oceania

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

Final Report

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Japan International Cooperation Agency (JICA)

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

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Abbreviations

Abbreviation	Formal name
ADB	Asian Development Bank
AFC	Automatic Frequency Control
AVR	Automatic Voltage Regulator
C/P	Counterpart
DG	Diesel Generator
EDC	Economic Load Dispatching Control
IPP	Independent Power Producer
IRENA	International Renewable Energy Agency
JCC	Joint Coordination Committee
JICA	Japan International Cooperation Agency
JOCV	Japan Overseas Cooperation Volunteers
MOU	Minutes of Understanding
ODA	Official Development Assistance
OJT	On the Job Training
O&M	Operation & Maintenance
PALM	Pacific Islands Leaders Meeting
PCS	Power Conditioning System
PDM	Project Design Matrix
PO	Plan of Operation
PV	Photovoltaic
RE	Renewable Energy
R/D	Record of Discussions
SDGs	Sustainable Development Goals
UAE	United Arab Emirates
UNDP	United Nations Development Programme
WB	World Bank
Fiji	
MPWTMS	Ministry of Public Works, Transport and Meteorological Services
DOE	Department of Energy
PPA	Pacific Power Association
EFL	Energy Fiji Limited
FEA	Fiji Electricity Authority
FNU	Fiji National University
USP	University of the South Pacific
Tuvalu	
MTET	Ministry of Transport Energy and Tourism

TEC	Tuvalu Electricity Corporation
Kiribati	
MISE	Ministry of Infrastructure and Sustainable Energy
PUB	Public Utilities Board
KIT	Kiribati Institute of Technology
Micronesia	
DRD	Department of Resources and Development
Yap	
YSPSC	Yap State Public Service Corporation
Chuuk	
CPUC	Chuuk Public Utility Corporation
Pohnpei	
PUC	Pohnpei Utilities Corporation
Kosrae	
KUA	Kosrae Utilities Authority
Marshall	
NEO	National Energy Office
MEC	Marshalls Energy Company
KAJUR	Kwajalein Atoll Joint Utilities Resources
Related to Regional Training for Additional countries	
EPC	Electric Power corporation (Samoa)
TPL	Tonga Power Ltd.
SP	Solomon Power
PPL	PNG Power Ltd.
PPUC	Palau Public Utilities Corporation
TAU	Te Aponga Uira O Tumu-Te-Varovaro
NPC	Niue Power Corporation

1. Project background

Many Pacific Island Countries have small and scattered land area, and due to small power demand per power system as well as limited energy resources, they are heavily dependent on imported fuels (mainly diesel fuel) for the main power source. Fuel cost reduction is one of the major challenges, as high transportation cost from major suppliers and oil price volatility significantly impact the procurement of imported fuels.

Given such circumstances, many efforts to accelerate renewable energy (hereinafter RE) introduction to improve energy security and reduce greenhouse gas have been made in the region, with assistance from aid agencies. However, in the integration of variable RE, a certain degree of diesel generator (hereinafter DG) operation for ensuring system stability by responding to the RE's output fluctuations is essential. Therefore, in order to ensure stable power supply and sustainable implementation system while maximizing RE penetration, making efforts to improve DG operation efficiency and reduce fuel cost for improving the finances of power utilities is required.

To this day, Japan International Cooperation Agency (hereinafter JICA) has supported the power sector of the region in various ways, including development of diesel power plant, micro-hydro power plant, photovoltaic power generation (hereinafter PV) power plant and micro-grids, as well as support for drafting development plans and human resource development by providing trainings in Japan. Some of the recent projects include a project in Tonga, in which energy storage technologies (capacitors, etc.) were introduced to stabilize PV output in the Tongatapu island power system, where the PV output accounted for approximately 20% of the total DG output. In addition, in Marshall Islands, support for developing RE integration plan including both legal and technical aspects, along with a survey for proposing methods for economic operation of existing DGs, has been implemented.

Considering the circumstances described above, at the 7th Pacific Islands Leaders Meeting (PALM7), the Government of Japan announced its intention to support for reducing fossil fuel consumption in island nations to contribute for energy security improvement and greenhouse gas reduction.

In response, JICA launched “the Hybrid Island Program” to provide support to countries in the Pacific for hybrid power system development with the aim for stable power supply and reduction in fuel consumption, and in 2015, conducted the “Survey to Gather and Verify Information for Aid Measures to Improve Energy Security in the Pacific Region Power Sector”, and reexamined support programs for these countries and created a road map.

Based on the result of the abovementioned survey, implementation of “the Project for Introduction of Hybrid Power Generation System in the Pacific Island Countries” was requested from the governments of Fiji, Tuvalu, Kiribati, Micronesia, and the Marshall Islands, for which Japan had previously supported by providing DGs and PVs as grant aid and conducting development surveys, and where the integrated, stable, and economic operation of existing DGs and RE has been one of the pressing issues today.

In May through July 2015, JICA conducted a preparatory survey to assess the need and validity of this project and to consider the kind of cooperation to be provided. Based on the survey result, JICA reached a basic agreement on the project framework with the governments of the target countries beginning in October 2016 with the Record of Discussion (R/D), thus determining the implementation of the project.

2. Project overview

2-1. Project name

Project for the Introduction of Hybrid Power Generation System in Pacific Island Countries
(Phase 2)

2-2. Project period

June 19, 2019 – September 29, 2023

2-3. Target countries

The project is implemented for the following five countries.

- 1) Fiji
- 2) Tuvalu
- 3) Kiribati
- 4) Federated States of Micronesia (FSM): Pohnpei, Chuuk, Yap, Kosrae
- 5) Republic of the Marshall Islands (RMI)



Figure 2.3.1 Project target area

2-4. The purpose of the project

The purpose of this project is to provide technical assistance for appropriately and economically operating and maintaining (hereafter O&M) DGs while considering the status of Pacific Island countries' integration of RE sources, as well as integrating and operating RE on an appropriate scale as part of an effort to promote the adoption of hybrid power generation systems employing both DG and renewables. In this project, hybrid power generation system is defined as a system in which DG and RE are operated integrally and appropriately in order to reduce fossil fuel consumption and

greenhouse gas emission.

Among the target countries, Fiji is more advanced in terms of DG O&M than the other four countries, and having the headquarters of Pacific Power Association (PPA), it has played a pivotal role in the region for providing trainings for other countries and is willing to keep the role for solving the common issues in the region. It is therefore decided that the regional training system based in Fiji would be strengthened to encourage the promotion of hybrid generation system operation skills in other countries in the Pacific. The project structure for Fiji is therefore somewhat different from that of the other four countries.

2-5. Counterpart organizations in the target countries (regulatory agencies and implementing organizations)

The counterpart organizations (regulatory agencies and implementing organizations) in the target countries are listed in Table 2.5.1.

Table 2.5.1 The counterpart organizations in the target countries (regulatory agencies and implementing organizations)

Target country	Regulatory agencies and implementing organizations
Fiji	Regulatory agency: Ministry of Public Works, Transport and Meteorological Services (MPWTMS) Implementing organizations: Energy Fiji Limited (EFL) Pacific Power Association (PPA)
Tuvalu	Regulatory agency: Ministry of Transport Energy and Tourism (MTET) Implementing organizations: Tuvalu Electricity Corporation (TEC)
Kiribati	Regulatory agency: Ministry of Infrastructure and Sustainable Energy (MISE) Implementing organizations: Public Utilities Board (PUB)
FSM	Regulatory agency: Department of Resources and Development (DRD) Implementing organizations: Pohnpei Utilities Corporation (PUC) Chuuk Public Utility Corporation (CPUC) Yap State Public Service Corporation (YSPSC) Kosrae Utilities Authority (KUA)
RMI	Regulatory agency: National Energy Office (NEO) Implementing organizations: Marshalls Energy Company (MEC) Kwajalein Atoll Joint Utilities Resources (KAJUR)

2-6. Expert team

Table 2.6.1 lists the members of the expert team organized to implement the project, and each member's responsibility (role).

Table 2.6.1 Members of the Expert team and their responsibilities (role)

Responsibility (role)	Expert team member
Chief/ Hybrid power generation system human resource development	Luis Kakefuku
Deputy chief/ Hybrid power generation system human resource development A/B	Masanori Shimabuku, Masaru Miyagi
DG economic operation A/B/C	Hiroyuki Nakachi, Hisashi Shimabukuro, Hideyasu Hokama
RE integration plan A/B/C	Yusuke Kuniba (Predecessor), Tomohiro Shiohama (Successor), Tasuku Taira, Yuma Uezu
DG maintenance (mechanical) A/B/C	Ken Miyagi, Masaji Miyazato, Tsunemi Henna
DG maintenance (electrical) A/B/C	Riki Oshiro, Tokumitsu Kakazu, Toshio Yogi
RE O&M A/B/C	Hirokazu Nakamura, Kaoru Ikehara, Manatsu Yonashiro (Predecessor), Katsuhiko Tomori (Successor)
Measurement environment survey A/B	Kaoru Ikehara, Katsuhiko Tomori
Work coordination/ monitoring A/B	Takahisa Watanabe, Gaku Hashimoto
System stabilization study A/B	Yusuke Kuniba, Yukihito Miyagi
System simulation analysis A/B	Kiyotake Kinjo, Masamichi Shimabukuro
RE grid stabilization technology A/B	Satoshi Hokama, Gaku Hashimoto
System analysis training	Kiyotake Kinjo
Power system model improvement A/B	Koji Yamashita, Wataru Shima

3. Energy policies in the target countries

(1) Fiji

3-1. Political, social, and economic conditions and status of the electric power sector

3-1-1 Basic information

Viti Levu, the main island of the Republic of Fiji, lies about 3,100km northeast of Australia, and about 2,100km north of New Zealand. The country comprises of more than 330 islands and has the total land area that is approximately the same with Shikoku Island of Japan. Tonga, the closest neighboring island country in the Pacific, lies 770km to the east, and Vanuatu lies 1,100km to the west. Viti Levu Island stretches over 146km across east and west, and 106km across north and south. The country's capital city of Suva is located in the southeastern part of the island, and Nadi, the hub of the country's sightseeing, and Nadi International Airport, the main airport of the country, are located in the western part. Suva and Nadi are connected by Queens Road, a 211km long paved road in the southern part of Viti Levu Island, and by Kings Road, a 265km long partially unpaved road in the eastern part of the island. Table 3-1-1 lists the basic information of Fiji.

Table 3-1-1 Basic information of Fiji

Area	18,270 sq km (roughly the same size as Shikoku Island)
Population	Approx. 920,000 (2021, Source: World Bank)
Capital	Suva population: 9.97 million (2013, Source: Fiji Bureau of Statistics)
Ethnic groups	Fijian (57%), Indian (38%), Others (5%) (2007 national census)
Languages	English (official), Fijian, and Fijian Hindi
Religion	Almost all indigenous Fijians are Christian. Most Indians are Hindu and Muslim. Christians accounts for 52.9% of the total population, Hindu for 38.2%, and Muslim 7.8%.

Source: Ministry of Foreign Affairs of Japan Website, "Countries and regional affairs",
<https://www.mofa.go.jp/mofaj/area/fiji/data.html#section1>
Pacific Islands Center Website, https://pic.or.jp/country_information/4810/

3-1-2 Demographic structure

According to the 2021 census by Fiji Bureau of Statistics, the population of Fiji is 920,000, and about half of the population is under the age of 27.5. As for population distribution, approximately 56% of the population lives in urban areas. 81% of the total population lives on the island of Viti Levu, 15% on the island of Vanua Levu, and the remaining 4% on other islands. Fiji is a multiethnic state and indigenous Fijians, the population excluding Indians and population of European and Chinese descent, accounts for about the half of the total population. In addition, Fijians are very diverse showing various influences of Melanesia, Polynesia, Micronesia, Europe, and Asia in terms of culture and physical features. Such diversity brings not only complexities but also richness in Fijian life and culture.

3-1-3 Economic conditions

During most of the 20th century, sugar industry was the backbone of the Fiji's economy. Today,

sugar industry, tourism industry which welcomes approximately 840,000 visitors annually, and remittances from Fijian nationals living overseas, are the main bases of economy. Major exports include mineral water, sugar, gold, clothes, and fish. According to 2021 statistics, the largest importer of the Fijian exports is the United States, followed by Australia, New Zealand, Tonga, and China. Meanwhile, major imports include metallic minerals, machinery and transportation equipment, industrial products, food and miscellaneous goods, and petroleum. Singapore, Australia, China, New Zealand, and United States are the major sources of imports, according to information by the Ministry of Foreign Affairs / Asia Development Bank (hereinafter MOFA / ADB) in 2021.

3-1-4 Political conditions

The parliamentary system in Fiji is unicameral, and the leader of a political party which becomes a ruling party in general elections held every four years becomes the country's prime minister. The election of members of Parliament is by a multi-member open list system of proportional representation with the entire country voting as a single constituency, and the Parliament that reconvened after the 2018 General Elections had 51 members. The president of Fiji, the head of state who exercises authority with advice from the cabinet, etc., are appointed by voting of parliamentary members from two candidates each nominated by the prime minister and the head of the opposing party. Under the general election held in May 1999, Mahendra Chaudhry became the first prime minister of Indian ancestry. In May 2000, a group of armed men seized the parliament, claiming for the removal of ethnic Indian-led government, revoking 1997 constitution, and resignation of President Ratu Sir Kamisese Mara, and took Prime Minister Chaudhry and thirty cabinet ministers' hostages. Commander Force Josaia Voreqe Bainimarama seized executive power to resolve the incident, declared martial law in the same month, and revoked the 1997 constitution by issuing a decree. In July, the hostages were released, and President Josefa Iloilo and Vice President Jope Seniloli were appointed. A civilian government led by Prime Minister Laisenia Qarase was formed in the same month. In November, the High Court of Fiji declared that the interim government was illegal, and in March 2001, the Court of Appeal of Fiji confirmed the High Court decision. A general election was held in August 2001, and a new administration was formed under a new prime minister Qarase. Since then, confrontation with the opposing Labour Party continued over the post 2000 coup d'état process, and discord between Prime Minister Qarase and Commander Bainimarama became pronounced. In March 2006, Prime Minister Qarase dissolved the parliament to hold a general election and was reelected as a result with the leading United Fiji Party once again winning a majority and formed a coalition government with the Labour Party. However, in December 2006, Commander Bainimarama carried out a coup d'état with a promise of cleaning up rampant corruption under Qarase administration and was appointed as acting prime minister in charge of the interim cabinet. In response to the coup, international community, especially Australia, New Zealand, and the European Union strongly criticized and demanded a prompt holding of a general election to return to democracy. In April 2009, the 1997 constitution was abrogated. Acting prime minister

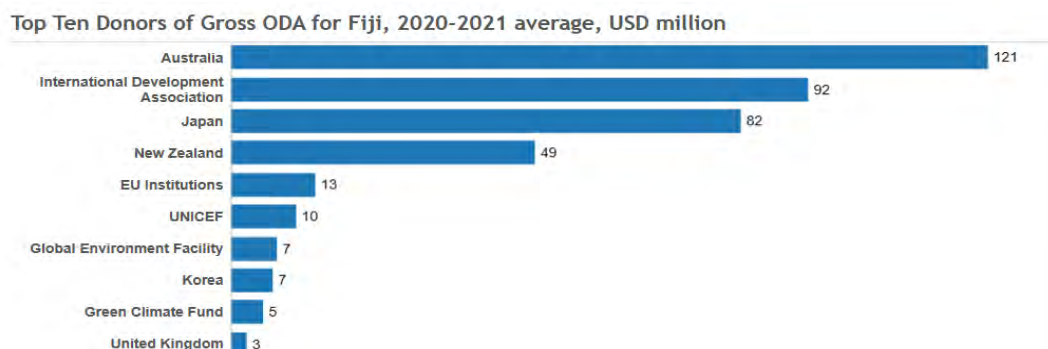
Bainimarama sworn in as prime minister. In July of the same year, Prime Minister Bainimarama announced a road map titled “a Strategic Framework for Change”. In September, the Commonwealth fully suspended Fiji. In 2013, new constitution was introduced. Bainimarama was reelected as president in the September 2014 general election. In 2016, the cabinet was reshuffled, and Prime Minister Bainimarama took a dual position as minister for foreign affairs. In the November 2018 general election, Bainimarama became prime minister for a second term.

3-1-5 Trends in energy and electricity policy

In Fiji, Energy Fiji Limited (EFL) supplies electricity in three major islands of Viti Levu where the country’s capital is located, Vanua Levu, and Ovau. For the other remote islands, electricity is supplied by Department of Energy (DOE). In 2021, the Government of Fiji and Chugoku Electric Power Company entered into a shareholders’ agreement in which the latter obtained 44% ownership of EFL, and RE power sources such as hydropower and PV are actively developed to achieve the country’s target of 100% RE by 2036.

3-1-6 Aid projects in the related field

Major donors of Fiji include Japan (JICA), Australia, New Zealand, EU, and ADB. Records of economic cooperation for Fiji by major donors are shown below.



Source: <https://www.oecd.org/dac/financing-sustainable-development/development-finance-data/aid-at-a-glance.htm>

1) Aid projects by the Government of Japan

Japanese ODA policy to Fiji on climate change and environment are as follows:

In order to mitigate climate change vulnerability while taking into account the Goal 13 of SDGs (climate change mitigation), support measures that are conducive to the mainstreaming of disaster risk reduction, prior investment in disaster risk reduction, and the "Build Back Better" concept will be provided based on the "Sendai Framework for Disaster Risk Reduction 2015-2030". Simultaneously, for the steady implementation of Fiji’s Nationally Determined Contributions under the Paris Agreement, cooperation for initiatives that enable further RE penetration as well as greenhouse gas emission reduction will be provided. In addition, in order to conserve precious natural resources and utilize the

country's limited land area, support measures for the reduction of solid waste including marine debris and improving wastewater treatment will be considered.

● Since 2017, JICA has provided support for developing training programs on RE and diesel power generation, as well as training for the lecturers of these programs for their capacity development through a technical cooperation project “Project for Introduction of Hybrid Power Generation System in the Pacific Island Countries (completed in June 2023)”.

2) Aid projects by other countries and international aid agencies

Aid projects by UAE and other aid agencies except UNDP towards the energy sector of Fiji are as follows:

● Microgrid solar (UAE)

- 150kW Lakeba Island,
- 225kw plant on Kadavu Island
- 150kW plant on Rotuma Island

(2) Tuvalu

3-2. Political, social, and economic conditions and status of the electric power sector

3-2-1 Basic information

Tuvalu is the westernmost country of Polynesia comprised of nine islands. Funafuti atoll, the country's capital, is located approximately 950km south of equator and approximately 1,000km north of Fiji. As there are no domestic flights available, the only means of transportation both for people and commodities is maritime transportation. In addition, all of the islands scattered diagonally across 676km of ocean are low-lying islands with the highest elevation of approximately 5 meters above sea level. The people of Tuvalu therefore consider the sea-level rise arising from climate change a serious threat. Not a few people in Japan know Tuvalu as “sinking islands”. Table 3-2-1 shows the basic information of Tuvalu.

Table 3-2-1 Basic information of Tuvalu

Area	26 sq km (roughly the same size as Shinagawa city ward, Tokyo)
Population	11,204 (2021, Source: World Bank)
Capital	Funafuti
Ethnic groups	Polynesian (a small percentage of the population being Micronesian)
Languages	English and Tuvaluan (a Polynesian language closely related to Samoan)
Religion	Mainly Christian (Protestant), and the vast majority of the population belongs to the Church of Tuvalu (Protestant Christian)

Source: Ministry of Foreign Affairs of Japan Website, “Countries and regional affairs”,
<https://www.mofa.go.jp/mofaj/area/tuvalu/data.html#section1>
Pacific Islands Center Website, https://pic.or.jp/country_information/4810/

3-2-2 Demographic structure

According to the World Bank (hereafter WB), the population of Tuvalu in 2021 was 11,204. Approximately 60% of the population lives on Funafuti Atoll.

3-2-3 Economic conditions

Tuvalu has few natural resources. The main income sources of the Tuvaluan economy include the sales of fishing licenses, remittances from seafarers working on overseas vessels, incomes from the management of the Tuvalu Trust Fund (established in 1987 with contributions from the Governments of Tuvalu, the United Kingdom, Australia, and New Zealand), and licensing fee of the domain code “.tv” based on a licensing agreement with a US internet-related company since 1999. With the limited natural resources, how to manage these incomes is a challenge for the future.

3-2-4 Political conditions

Tuvalu is a constitutional monarchy within the Commonwealth, with the British monarch as head of state and the governor-general of Tuvalu performs the duties of the monarch. The governor-general is appointed by the monarch based on advice of the Prime Minister of Tuvalu made after obtaining Parliament’s approval.

The Parliament of Tuvalu is the unicameral national legislature with 15 members, each of whom is elected in eight island-based constituencies of Nanumea, Nanumanga, Niutao, Nui, Vaitupu, Nukufetau, Funafuti, and Nukulaelae (two members are elected from each constituency, except one member from Nukulaelae). The members of parliament serve a four-year term. The Governor General summons Parliament with the advice of Prime Minister. There are no political parties, and the prime minister is chosen by and from the legislature. The prime minister chairs the cabinet.

Tuvalu has a national policy of holding diplomatic relations only with peace-loving states and maintains a close relationship with the member states of the British Commonwealth, donor countries, and Oceanian Countries. Tuvalu’s diplomatic missions abroad include High Commissions in Fiji and New Zealand, embassies in Taiwan, Belgium, and United Arab Emirates, and its office at the United Nations in New York. Tuvalu joined WHO in June 1993, and the United Nations in September 2000. Tuvalu has the Tuvalu Police of approximately 100 members and has no regular military forces.

3-2-5 Trends in energy and electricity policy

In Tuvalu, the Tuvalu Electricity Corporation (TEC) supplies electricity in this project’s target area of Fongafale (Funafuti system) and surrounding remote islands.

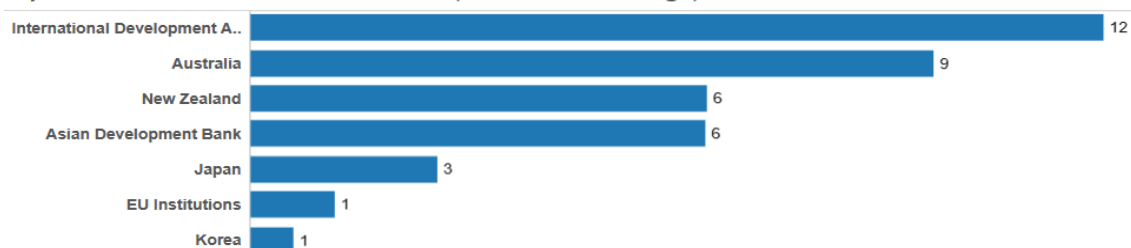
Tuvalu has been working towards the country’s target of 100% RE by 2025, as shown in Table 3-2-2. Implementation of two projects of installing PV(750kW)+BESS(1,000kW/1,000kWh), as well as PV(500kW)+BESS(1,000kW/2,000kWh) are determined with funding from WB and ADB, respectively.

EXISTING							
RE % year 1	RE % 25 year avg.	Cumulative PV Capacity (kWp)	Cumulative BESS (kW/kWh)	Diesel Capacity (kW)	Operating mode	Estimated CAPEX (2019 USD)	Estimated cumulative CAPEX (2019 USD)
15%	12%	735	0	1800	minimum 2 diesel units running	N/A	N/A
WORLD BANK PROJECT							
- addition of 750 kWp solar PV and 1000 kW / 1000 kWh BESS							
- operational in 2021							
RE % year 1	RE % 25 year avg.	Cumulative PV Capacity (kWp)	Cumulative BESS (kW/kWh)	Diesel Capacity (kW)	Operating mode	Estimated CAPEX (2019 USD)	Estimated cumulative CAPEX (2019 USD)
37%	24%	1,485	1000/1000	1800	ZDO	N/A	N/A
STAGE 1 (ADB FUNDED)							
- addition of 500 kWp solar PV and 1000 kW / 2000 kWh BESS							
- operational in 2021							
RE % year 1	RE % 25 year avg.	Cumulative PV Capacity (kWp)	Cumulative BESS (kW/kWh)	Diesel Capacity (kW)	Operating mode	Estimated CAPEX (2019 USD)	Estimated cumulative CAPEX (2019 USD)
49%	33%	1,985	2000/3000	1800	ZDO	\$3.7m	\$3.7m
STAGE 2 (unfunded)							
- addition of 2,400 kWp of solar PV							
- operational in 2023							
RE % year 1	RE % 25 year avg.	Cumulative PV Capacity (kWp)	Cumulative BESS (kW/kWh)	Diesel Capacity (kW)	Operating mode	Estimated CAPEX (2019 USD)	Estimated cumulative CAPEX (2019 USD)
60%	52%	4,385	2000/3000	1800	ZDO	\$6.0m	\$9.7m
STAGE 3 (unfunded)							
- addition of 3,300 kWp of solar PV and 1000 kW / 11,000 kWh BESS							
- operational in 2025							
RE % year 1	RE % 25 year avg.	Cumulative PV Capacity (kWp)	Cumulative BESS (kW/kWh)	Diesel Capacity (kW)	Operating mode	Estimated CAPEX (2019 USD)	Estimated cumulative CAPEX (2019 USD)
~100%	86%	7,635	3000/14000	1800	negligible diesel operation	\$15.1m	\$24.8m

3-2-6 Aid projects in the related field

Tuvalu's major donors include Japan (JICA), Australia, New Zealand, and Korea. Records of economic cooperation for Tuvalu by major donors are shown below.

Top Ten Donors of Gross ODA for Tuvalu, 2020-2021 average, USD million



Source: <https://www.oecd.org/dac/financing-sustainable-development/development-finance-data/aid-at-a-glance.htm>

1) Aid projects by the Government of Japan

Tuvalu formulated National Strategy for Sustainable Development 2016-2020 and has been working towards the improvement of living standards, economic conditions, and government efficiency. Proper maintenance of existing infrastructure, including those developed through Japan's grant aid, is a crucial task for strengthening the foundation of the country's economy. In addition, for the steady implementation of Tuvalu's Nationally Determined Contributions under the Paris Agreement related to climate change mitigation, efforts to facilitate further penetration of RE as well as cooperation for the reduction of greenhouse gas emission are required. Furthermore, proper development and maintenance of foundational infrastructure, including maritime transportation that is the lifeline of economic activities and social life, is important.

- The Power supply facilities developed by the UK and EU are facing performance degradation issues due to aging and salt corrosion. On the other hand, due to increase in power demand in Funafuti, the power supply facilities are overloaded. Considering these situations, Japan decided to provide a grant aid of constructing a diesel power plant (600kW×3 units) in 2005 with a project budget of JPY 925 million.
- Since 2017, JICA has been providing support for training and capacity building of C/Ps on O&M of DGs, methodology and O&M to expand the introduction of RE, through the technical assistance project "Introduction of Hybrid Power Generation Systems in Pacific Island Countries" (completed in September 2023).
- Current diesel power generation facilities in Tuvalu have been malfunctioning due to aging deterioration, and TEC was forced to implement rolling blackouts in May 2018, making the maintenance of generators and other equipment for stable power supply an urgent issue. Considering these situations, Japan decided a grant aid providing generators and other equipment in 2019 with a project budget of JPY 111 million.
- Tuvalu Solar PV project
A 40kW PV system was installed on the roof of the soccer stadium (2008 by Kansai Electric Power Company, implemented by Tokyo Electric Power Company).

2) Aid projects by other countries and international aid agencies

- Roof top solar PV (UAE)
 - 350kWp TEC Compound
 - 75 kWp Hospital/Marine
 - 75 kWp Warehouse
- Grid-connected solar PV (NZ, completed in 2015)
 - 130 kW solar, Main Govt Office Building,
 - 40 kW solar, Media Building,

●PV-Battery hybrid system (NZ, completed in 2015)

- 400kWp. 3,120 kWh Vaitupu
- 195kWp. 1,560 kWh Nanumea
- 205kWp. 1,716kWh Nanumaga
- 230kWp. 1,872kWh Nui

●PV-Battery hybrid system (EU, completed)

- 45kWp. 576 kWh Nukulaelae
- 87kWp. 10008 kWh Nukufetau
- 77kWp. 864kWh Nui

●Energy Sector Development Project(WB)

- Solar PV (750kW), Storage battery (1MW/1MWh)

(3) Kiribati

3-3. Political, social, and economic conditions and status of the electric power sector

3-3-1 Basic information

Kiribati consists of three island groups that spreads eastward from Gilbert Islands, Phoenix Islands, and Line Islands centering the point where the equator and the 180th meridian meet. With the distance of 4,500km from the westernmost Banaba (Ocean) Island, which is located at 169 degrees east longitude almost due north from New Zealand, and the easternmost Millennium (Caroline) island, which is located at 150 degrees west longitude due north from Tahiti, and the distance of 2,050km from the northernmost Teraina (Washington) Island located at 5 degrees north latitude and the southernmost Flint Island located at 11 degrees south latitude, 33 islands (atolls) are scattered over a vast sea area.

Kiribati has a large exclusive economic zone (EEZ) that is the third largest in the world. The total land area of the country is 811 sq km if uninhabited islands are included, and 711 sq km (roughly the same size as Tsushima Island) if only inhabited islands are included, with Kiritimati Island comprising almost the half (364 sq km). The capital is Tarawa and is located in Gilbert Islands. The country's island groups are coral islands and most of them have a coral reef lagoon. Although the highest point of Banaba Island, which is made of raised coral, is 81m, most other islands are flat whose elevation rarely exceeds 3.5m above sea level. Sea level rise due to global warming and climate change are regarded as serious issues. Table 3-3-1 shows basic information of Kiribati.

Table 3-3-1 Basic information of Kiribati

Area	730 sq km (roughly the same size as Tsushima Island)
Population	Approx. 128,874 (2021, Source: World Bank)
Capital	Tarawa
Ethnic groups	Micronesian (98%), Polynesian and European
Languages	Kiribati, English (both are official languages)
Religion	Christian (mainly Catholic and Protestant)

Source: Ministry of Foreign Affairs of Japan Website, "Countries and regional affairs",

<https://www.mofa.go.jp/mofaj/area/tuvalu/data.html#section1>

Pacific Islands Center Website, https://pic.or.jp/country_information/4810/

3-3-2 Demographic structure

According to the WB, the population of Kiribati in 2021 was 128,874. More than approximately 90% of the population lives on Gilbert Islands.

3-3-3 Economic conditions

The economy of Kiribati depended on rock phosphate of Banaba (Ocean) Island for approximately 70 years from around 1900 until 1979. However, as the island's deposit of phosphate rock was already exhausted at the time of the country's independence from the United Kingdom in 1979, development of alternative export goods has been a big challenge for the country. Currently, the country's main export goods include fish (especially Tuna), copra, sea salt, seaweed, and aquarium fish. As Kiribati has a vast EEZ rich in fishery resources such as Bonito and Tuna fish, fishery resources are regarded as the most important resources of the country after the exhaustion of the phosphate deposits. However, as achieving commercial success is difficult with small boats operating mainly in coastal sea area, tourism development has started in recent years, with Kiritimati Island being one of the most promising destinations. The main income sources of the Kiribati economy include import tariffs, fishing license fees, rent paid by Japan Aerospace Exploration Agency (JAXA) for the Tracking station on Christmas (Kiritimati) Island, and incomes from the management of the Revenue Equalization Reserve Fund (RERF), which was established with the earnings from the sales of rock phosphate in the past and aid from donor countries. In addition, remittances from seafarers on Japanese pole-and-line fishing boats and other migrant workers have been one of the major sources of income for the national economy.

3-3-4 Political conditions

While Kiribati is a member of the Commonwealth of Nations, it is a republic without a governor-general. The House of Assembly has 45 members elected from 23 constituencies for a 4-year term. The president of the country is elected by the populace for a 4-year term from among three or four candidates chosen by and from the members of the parliament. The cabinet consists of up to 13 ministers including the president and the vice president. In addition to the central government, local government is through elected island councils.

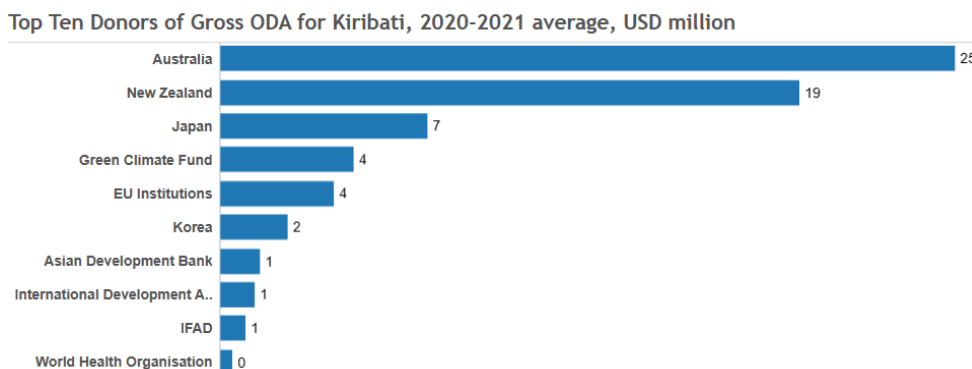
3-3-5 Trends in energy and electricity policy

In Kiribati, Public Utilities Board (PUB) supplies electricity in this project's target area of Tarawa, where the country's capital is located.

PUB owns two power plants, namely Bikenibeu power plant and Betio power plant. A total of three Daihatsu DG generators (1,400kW×3) at Bikenibeu and, 1 unit of Daihatsu DG generator (1,250kW) and 1 unit of Cummins DG generator (625kW) in Betio power plant are installed. There is also a plan to install two Chinese-supported DG generator (1,500 kW×2) and one New Zealand -supported DG generator (2.3 MW) at Betio plant in 2023.

3-3-6 Aid projects in the related field

Kiribati's major donors include Japan (JICA), Australia, New Zealand, and Korea. Records of economic cooperation for Kiribati by major donors are shown below.



Source: <https://www.oecd.org/dac/financing-sustainable-development/development-finance-data/aid-at-a-glance.htm>

1) Aid projects by the Government of Japan

Kiribati has formulated the Kiribati vision for 20 years (KV20), a long-term development blueprint for the country covering the period 2016 to 2036 and has been working towards the improvement of living standards, economic conditions based on fishery and tourism development, and government efficiency. In addition, for the steady implementation of Kiribati's Nationally Determined Contributions under the Paris Agreement related to climate change mitigation, efforts to facilitate further penetration of RE as well as cooperation for the reduction of greenhouse gas emission are required.

Considering the situations described above, Japanese ODA policy to Kiribati on climate change and environment are as follows:

Cooperation will be provided for the development and management of disaster-resilient infrastructure as climate change mitigation, as well as stable power supply based on further integration of RE and achieving the best energy mix with diesel power generation. Simultaneously, support for greenhouse gas emission reduction towards the achievement of carbon neutrality will also be provided. Furthermore, in order to deal with exacerbating meteorological phenomena and natural disasters due to climate change, capacity development on disaster mitigation centered around enhancing capacity on weather forecasting and warning is to be implemented.

● A decision was made in 2001 to provide generators (1,400kW × 2 units), etc. as grant aid with a project budget of JPY 1.23 billion.

● Since 2017, JICA has been providing support for training and capacity building of C/Ps on O&M of DGs, methodology and O&M to expand the introduction of RE, through the technical assistance project "Introduction of Hybrid Power Generation Systems in Pacific Island Countries" (completed in September 2023).

● PEC Fund Project

- Grid Connected PV at Bikenibeu Power Station(400kW)

2) Aid projects by other countries and international aid agencies

●SOLAR WATER PROTECTION PROJECT(UAE)

- Grid Connected PV at Bonriki Water Reserve(500kW)

●Kiribati Grid Connected Solar PV(WB)

- Grid Connected PV at TCH,KVG,KIT,BSC(728kW)

●Kiribati Island Energy Sector(EU/EDF/NZ/MFAT

- HV Network, Two Power Stations and a 150kW Solar PV System on Kiritimati Island(150kW)

(4) The Federated States of Micronesia (FSM)

3-4. Political, social, and economic conditions and status of the electric power sector

3-4-1 Basic information

The Federated States of Micronesia (hereafter FSM) is an island country consisting of four states (Yap, Chuuk, Pohnpei, and Kosrae) that together comprise 607 islands (of which 65 are inhabited) that are spread across approximately 700 sq km of sea area. The country is located in the Western Pacific at the north of the equator, approximately 5,000km west of Hawaii. The capital of FSM is Palikir, located in Pohnpei state.

1) Pohnpei state consists of 137 islands including the largest Pohnpei Island and the surrounding 25 islands, Nukuoro, and Kapingamarangi. Pohnpei Island is roughly round in shape and is approximately 21-24km in diameter. The inland area of the island is mountainous ranging approximately 500-700m in height. The highest point of the country is Mount Nanlaud, at 798m. The island's heavy rainfall results in rich water resources with many waterfalls and fertile soil. The land area of the island is approximately 345 sq km. The capital of FSM was Kolonia before being replaced by Palikir in 1989.

2) Chuuk State consists of seven island groups, including Chuuk Atoll located at the center, Mortlock, and Poluwat. Chuuk atoll is one of the largest atolls in the world, surrounded by the barrier reef of 64 km maximum in diameter and 200km in length. There are 98 islands within the Chuuk lagoon, large and small, including Namoneas group and Faichuk group. The total land area is 127.4 sq km, and the capital of the state is Weno.

3) Kosrae state consists of Kosrae island and other five islands, and the total land area is 109.6 sq km. The main island of Kosrae has a mountain range of approximately 600m in height and rainfall is high. The inland area is covered with forests and the coastal area has beautiful long beaches, which are rare in the country. The state capital is Tofol.

4) Yap State consists of 130 atolls and islands, including the Yap archipelago comprising of four islands of Yap, Maap, Rumung, and Gagil-Tamil, Fais Island, Satawal Island, and Ulithi Atoll. The total land area is 118.4 sq km and the state capital is Colonia on Yap Island. The southern part of Yap Island is flat forest wetland.

Table 3-4-1 shows basic information of FSM.

Table 3-4-1 Basic information of FSM

Area	700 sq km (roughly the same size as Amami Oshima Island)
Population	Approx. 113,131 (2021, Source: World Bank)
Capital	Palikir (relocated from Colonia in November 1989)
Ethnic groups	Micronesian
Languages	In addition to English (official), there are eight local languages. Chuukese is spoken in Chuuk State, and Kosraean in Kosrae State. In Pohnpei State, in addition to Pohnpeian, Polynesian languages of Kapingamarangi and Nukuoro are also spoken. In Yap State, in addition to Yapese, Ulithian and Woleaian are used.
Religion	Christian (Protestant and Catholic)

Source: Ministry of Foreign Affairs of Japan Website, “Countries and regional affairs”,
<https://www.mofa.go.jp/mofaj/area/tuvalu/data.html#section1>
 Pacific Islands Center Website, https://pic.or.jp/country_information/4810/

3-4-2 Demographic structure

According to the WB, the population of FSM in 2021 was 113,131. As the population at the time of 2010 census was 102,843 (Male: 52,193 and Female: 50,650), the country’s population increased by approximately 10,000 in ten years.

3-4-3 Economic conditions

FSM’s economy has been largely reliant on financial assistance based on the Compact of Free Association with the US. Since 1996, as part of the country’s efforts towards economic independence, economic reform with supports from ADB and other international aid agencies has begun in areas of national economy stabilization, privatization of state-owned enterprises, investment environment improvement, and private sector development. Both monetary economy and traditional subsistence economy coexist, and with relatively low domestic productivity, most basic commodities are imported, and trade balance has chronically been in the red. While the main income sources of the national economy are export crops, fishing license fees, and tourism, the country has still been largely dependent on foreign aids from the US and other countries and the country’s economic development has mainly been through public investment. Although financial assistance based on the Compact was scheduled to end in 2023, a 20-year extension of Compact-related financial assistance was agreed in May 2023 for 2024-2044.

3-4-4 Political conditions

(1) Political system

FSM has president as Head of State and the government is based on separation of powers under which the executive, legislative, and judicial branches are kept separate. The country's constitution recognizes the role or function of a traditional leader (Chief) as the country's uniqueness.

(2) President • Election

Both the President and the Vice-President are elected by the National Congress by mutual vote from among its four-year members and serve a four-year term. As there are no political parties and the political forces in the Congress are formed based on the state of origin, the President tends to be elected from the most populous (therefore having the largest number of Congress members) state of Chuuk.

3-4-5 Trends in energy and electricity policy

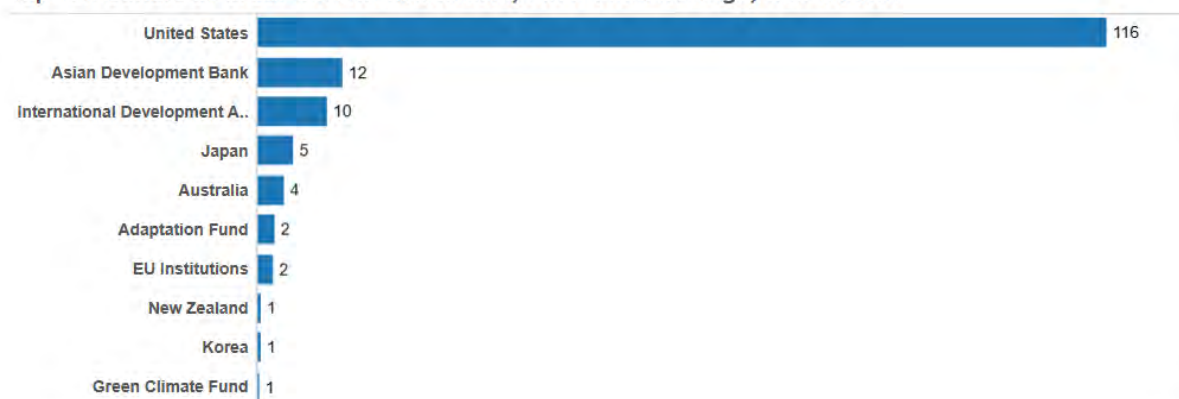
Electrical power supply is provided by Yap State Public Service Corporation (YSPSC) in Yap State, Chuuk Public Utility Corporation (CPUC) in Chuuk State, Pohnpei Utilities Corporation (PUC) in Pohnpei State, and Kosrae Utilities Authority (KUA) in Kosrae State. In specific, the following generating facilities are used in the power system of each state.

- Six DG units are currently operated in Yap, out of which four units ($1,650\text{kW} \times 2 \text{ units} + 830\text{kW} \times 2 \text{ units}$) are manufactured by Caterpillar, and two units by DEUTZ ($3,200\text{kW} \times 2 \text{ units}$).
- Five DG units are currently operated in Chuuk, out of which two units ($1,800\text{kW} \times 2 \text{ units}$) are manufactured by General Electric, and three units by Caterpillar ($1,600\text{kW} + 1,285\text{kW} \times 2 \text{ units}$).
- Six DG units are currently owned and operated by PUC in Pohnpei with the available capacity of 7,340 kW. In addition, four units of DG are operated by Vital Energy, an IPP company, with the available capacity of 1,050 kW.
- Five DG units are currently owned and operated by KUA in Kosrae, out of which two units ($600\text{kW} \times 2 \text{ units}$) were procured under grant aid by JICA, one unit donated by the World Bank (600kW) and the other existing two units ($G8 \times 1,000\text{kW} + G11 \times 600\text{kW}$).

3-4-6 Aid projects in the related field

FSM's major donors include the US, Japan (JICA), Australia, New Zealand, and Korea. Records of economic cooperation for FSM by major donors are shown below.

Top Ten Donors of Gross ODA for Micronesia, 2020-2021 average, USD million



Source: <https://www.oecd.org/dac/financing-sustainable-development/development-finance-data/aid-at-a-glance.htm>

1) Aid projects by the Government of Japan

The government of FSM has formulated Strategic Development Plan 2004-2023. With the goal of achieving economic growth and self-reliance, the government has been working on basic infrastructure development, tax reform, and RE integration.

Although harbor, power system and road infrastructure have been developed in FSM with cooperation by Japan and other donors, minimum basic infrastructure for economic activities and citizens' lives are still insufficient. In addition, noncommunicable diseases (NCD) associated with change in eating habits such as type 2 diabetes has become a major issue and necessitates mitigation measures. In addition, inability to treat solid waste properly due to the continuous increase of solid waste caused by change in lifestyles and large amount of imported goods has negatively impacted on the surrounding environment and public health. Overcoming such vulnerabilities is indispensable for the country's social and economic development.

Considering the situations described above, in order to facilitate the country's self-reliance and sustainable development, the Japanese government has been supporting FSM for overcoming vulnerabilities through economic infrastructure development and improvement of basic social services as well as environmental conservation and climate change mitigation, in line with the FSM's national development plan as well as Japan's policy towards the Pacific Island Countries, exemplified by the Pacific Islands Leaders Meeting (PALM) hosted by Japan once in three years since 1997.

1. All the states

- JICA has provided support for diesel O&M, RE expansion and O&M, human resource development for C/Ps, and capacity development through a technical cooperation project "Project for Introduction of Hybrid Power Generation System in the Pacific Island Countries" since 2017 (completed in June 2023).

2. Yap State

●PEC Fund Project

- Grid Connected PV at YSPSC (200kW)

3. Chuuk State

●PEC Fund Project

- Grid Connected PV at Chuuk High School (200kW)

4. Pohnpei State

●The Project for Introduction of Clean Energy by Solar Electricity Generation System

- PV facility on President Office (20KW with battery storage) and COM Palikir campus (160KW)

●Power Sector Improvement Project for the State of Pohnpei

- 2DGs, Cranes, Back feeder, etc. (This project was approved in 1992, JFY. These DGs were decommissioned)

5. Kosrae State

●Power Sector Improvement Project for the State of Kosrae

1. Two DGs (600KWp×2)
2. Rehabilitation of Power Station
3. Improve U/G Cable at Okat
4. Improve Lelu Island Distribution System

2) Aid projects by other countries and international aid agencies

1. Yap State

●REP-5(EU)

- Stand-alone PV systems to outer islands with total capacity 49.4Kwp

●North REP(EU)

- SHS and SCS for outer islands (204kW)
- Stand-alone PV systems for outer islands (279kW)

●FSM Energy Sector Development Project (WB)

- DG (CAT/1,650KW) to YSPSC
- Support developing "Investment Master Plan"

●Yap Renewable Energy Development Project (ADB)

- Three wind turbines (Vergnet / total capacity: 625KW)
- Two DGs (CAT/1650KW, 830KW)
- Grid-connected PV system in 5 sites

2. Chuuk State

●REP-5(EU)

- Stand-alone PV systems to Chuuk Lagoon island and outer islands with total capacity 27.2Kwp

●North REP(EU)

- SHS and SCS for outer islands (63.27kW)
- Survey wind condition in Ueno Island and Tonoas Island

●PV Project(Italy)

- Grid-connected PV at Chuuk International Airport(65kW)

●Omnibus Infrastructure Development Project(ADB)

- DGs (CAT/1,285KW×2) to CPUC Power Plant
- Distribution system improve

●FSM Energy Sector Development Project(WB)

- Grid-connected PV in Weno Island(400kW)
- Support developing "Investment Master Plan" (on going)

3. Pohnpei State

●REP-5(EU)

- Stand-alone PV systems to 5 outer islands(48.3kW)
- Survey for rehabilitation of Hydro Plant

●North REP(EU)

- Rehabilitation of Hydro Plant(725kW)

●PV Project(UAE)

- 600KW PV at Madolenihmw

●FSM Energy Sector Development Project(on going)(WB)

- Support developing "Investment Master Plan" DGs(200KW)

●DG Project(US)

- Two DGs (545KW×2)

4. Kosrae State

●REP-5(EU)

- PV systems to its airport, legislature, governor's office, hospital, and power plant(45.4kW)

●North REP(EU)

1. Electricity access will be provided to Walung community (not completed).
2. PV facility on Government office(100kW)

●FSM Energy Sector Development Project(on going)(WB)

- One DG (600KW)
- Support developing "Investment Master Plan"

(5) The Republic of the Marshall Islands (RMI)

3-5. Political, social, and economic conditions and status of the electric power sector

3-5-1 Basic information

The Republic of the Marshall Islands (hereafter RMI) is located approximately 4,500km southeast of Japan. RMI consists of five islands and 29 atolls totaling 1,225 coral islands spread over a sea area of 2 million sq km. The total land area is approximately 180 sq km. Table 3-5-1 shows basic information of RMI.

Table 3-5-1 Basic information of RMI

Area	180 sq km (roughly the same size as Lake Kasumigaura)
Population	Approx. 42,050 (2021, Source: World Bank)
Capital	Majuro
Ethnic groups	Micronesian
Languages	Marshallese, English
Religion	Christian (mainly Protestant)

Source: Ministry of Foreign Affairs of Japan Website, "Countries and regional affairs",

<https://www.mofa.go.jp/mofaj/area/tuvalu/data.html#section1>

Pacific Islands Center Website, https://pic.or.jp/country_information/4810/

3-5-2 Demographic structure

According to the WB, the population of RMI in 2021 was 42,050. According to the preliminary result of population census conducted in November 2021 in RMI by the Ocean Policy Research Institute of the Sasakawa Peace Foundation, the population was 39,262, showing decrease from the population in 2011 of 53,158. According to the Economic Policy, Planning and Statistics Office (EPPSO) of RMI which was in charge of the national census, one of the important factors of the decrease was the increase in overseas emigration. Based on the Compact of Free Association (Compact) with the US, RMI citizens can travel to the US without visa.

3-5-3 Economic conditions

Both monetary economy and traditional subsistence economy coexist, and with relatively low domestic productivity, most basic commodities are imported, and trade balance has chronically been in the red. While Compact financial assistance accounts for approximately 60% of the government revenue, as future reduction in the aid is expected, the government has been working on economic structural reform such as private sector development.

3-5-4 Political conditions

The parliament of RMI is unicameral with 33 members who serve a four-year term. The parliament is known as the Nitijela in Marshallese. The president is elected from within the parliament and appoints cabinet members. The term for both the president and the cabinet members are four years. In addition, a council of Iroij, which comprises of tribal chiefs, advises cabinet. RMI's Compact with the US delegates authority for defense and security to the US.

3-5-5 Trends in energy and electricity policy

In RMI, Marshalls Energy Company (MEC) supplies electricity in this project's target area of Majuro, where the country's capital is located. For Ebeye Island, Kwajalein Atoll Joint Utilities Resources (KAJUR) supplies electricity. National Energy Office (NEO) is the regulatory agency for both MEC and KAJUR.

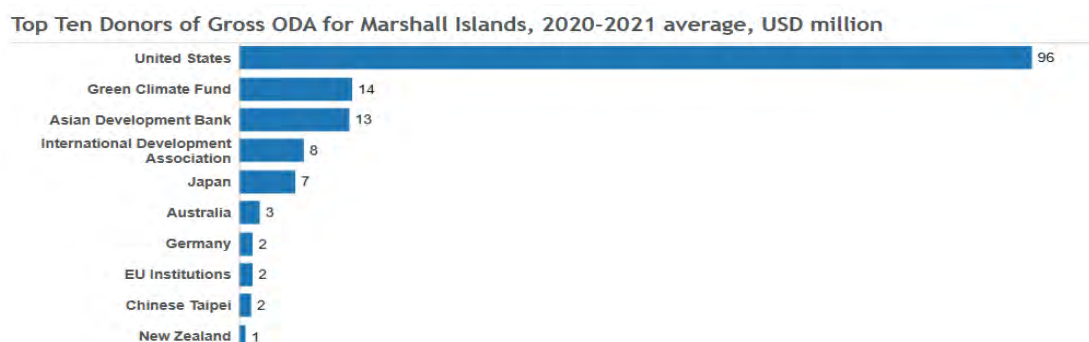
MEC has two power plants located within the same site. The generators installed at the Majuro Power Plant No. 1 are unit 1, 2, and 5, and unit 6 and 7 at the Power Plant No.2. Although the installed capacity is 22.95MW, the current output capability is reduced to 15.3MW due to aging of the DG units and no.2 bearing malfunction of unit 7. The system load of Majuro is approximately 6.5 to 8.0MW.

KAJUR introduced four units of 1,286kW DG (same model, same rated capacity for each) in 2010 and operates with two of the units at ordinary times, and with three units during peak load. The peak load of Ebeye Island is approximately 2.3MW as of 2016.

In relation to further RE integration, RMI has rather ambitious national targets of reducing greenhouse gas emissions by 32 percent below 2010 levels by 2025, 45 percent by 2030, and 100 percent by 2050.

3-5-6 Aid projects in the related field

RMI's major donors include the US, Japan (JICA), Australia, New Zealand, and Germany. Records of economic cooperation for RMI by major donors are shown below.



Source: <https://www.oecd.org/dac/financing-sustainable-development/development-finance-data/aid-at-a-glance.htm>

2) Aid projects by the Government of Japan

In order to achieve national development and improvement of government performance, the RMI government formulated Agenda 2020 which stipulated the most important issues for the government and reform priorities by the end of 2019, and worked towards the improvement of living standards, economic conditions, and government efficiency. Although road, harbor and marine transportation infrastructure have been developed in RMI with cooperation by Japan and other donors, minimum basic infrastructure for economic activities and citizens' lives are still insufficient. In addition, inability to treat solid waste properly due to rapid increase of solid waste caused by modernization of lifestyles has negatively impacted on the surrounding environment and public health. Overcoming such vulnerabilities

is indispensable for the country's social and economic development.

Meanwhile, RMI has close historical relations with Japan, including having been a League of Nations' mandate administered under Japan. The country also holds fisheries agreement and maintains close relations with Japan in fishery, allowing Japanese fishing boats to operate within the RMI's EEZ. Meanwhile, increasing activities by international organizations and other donors in recent years have caused relative decline of Japan's presence. Through Japan's PALM framework, etc., continued support for RMI is important for the country's autonomous and sustainable development and strengthening of Japan-RMI bilateral relations.

Considering the situations described above, Japanese aid policy to RMI on environment and climate change are as follows:

Support for effective RE integration and efficient diesel power generation are priorities. In addition, support will also be provided for disaster prevention and mitigation as adaptive measures, considering drought and damage from rogue waves and storm surge, and continuous improvement on waste management that would contribute for the reduction of marine debris.

- JICA has provided support for diesel O&M, RE expansion and O&M, human resource development for C/Ps, and capacity development through a technical cooperation project "Project for Introduction of Hybrid Power Generation System in the Pacific Island Countries" since 2017 (completed in June 2023).
- Project on the Formulation of a Self-Sufficient Energy Supply System (2013 - 2015)
 - Support for the following four items were provided:
 - ① Developing a Legal System for the RE Introduction
 - ② Evaluation method of the maximum allowable amount of RE power generation connected to power distribution grid.
 - ③ Planning and designing PV-diesel hybrid system on remote island grid
 - ④ Minimizing loss by optimizing power plant operation management
- Preparatory survey on The Project for the Installation of Solar Power Generation System in Ebeye Island (2016 - 2017)
 - Support for the introduction of 600kW PV on Ebeye Island
- The Project for Introduction of Clean Energy by Solar Electricity Generation System
 - 209KW PV on the roof of Majuro Hospital
- Solar Powered Led Street – Lighting Systems for Urban Centers
 - 78 sets of solar powered street lamps were installed in remote area of Majuro.

2) Aid projects by other countries and international aid agencies

- REP-5(EU)
 - 420 solar home systems of 200 Wp each to Ailinglaplap atoll(84kW)

- stand-alone PV systems for powering lights and office equipment to six primary schools on the five atolls(55.6kW)
- North REP(EU)
 - 1500 solar home systems of 300 Wp to 14 atolls(450kW)
- Technical Cooperation Facility II Program Estimate 2(EU)
 - Completion of draft Energy Sector Management Act by Sep. 2017
- PV Project(US)
 - 57KW of PV at Collage of Marshall Island
- PV Project(Taiwan)
 - 54KW of PV at Collage of Marshall Island
- PV Project(UAE)
 - 600KW PV on water reservoir
- Improved Energy Supply for Poor Households(ADB)
 - (i) Improved access and management of electricity for the poor
 - (ii) Extended and improved supply of power to low-income households
 - (iii) Use of local fuels in power generation to provide alternative incomes for the poor.

4. Project Design Matrix

Project Design Matrix (hereinafter PDM) determines the project goals, indicators, etc. for project implementation, and has been agreed upon with the governments of the target countries. No revisions were made throughout the project implementation process. The overall goal, outputs (expected effect), and their corresponding activities set by the PDM are shown below for each of the target countries.

4-1. Fiji

(1) Overall goal and indicators

Overall goal: Necessary know-how and technologies for the Hybrid Power Generation System is continuously utilized by the target group of Fiji as well as other PICs.

Indicator①: Number* of training programs, trainers, participants and their countries, in training program related to Hybrid Power Generation System in Fiji after the project.

Indicator②: Utilization ratio* of training materials (equipment, textbook, reference material, etc.) provided by the Project

Indicator③: Number* of training participants who utilize the learnings from the training programs and seminars in Fiji.

* Specific target values for the above indicators will be set at the end of the programme.

(2) Project purpose and indicators

Project purpose: Regional training system on the introduction of Hybrid Power Generation System is strengthened in Fiji.

Indicator①: Number* of qualified trainers for regional training program

Indicator②: Number* of foreign training participants in the region

Indicator③: More than 80% of training participants assess the training program (trainers, training curriculum, textbook) are good.

Indicator④: More than 80 % of training participants understand the training content.

Indicator⑤: More than 80% of training participants consider the training content is useful.

*Specific target values for the above indicators are set after verifying the status of the activities.

Indicators③ to ⑤ will be determined taking in consideration the results of questionnaires from participants, the evaluations of Japanese experts and other relevant parties.

(3) Outputs (expected effect)

Output 1): Training programs for appropriate and economical system of O&M for Diesel Generators (DGs) is prepared.

Output 2): Training programs on methodology for appropriate planning and O&M of renewable energy (RE) is prepared.

Indicator①: Number* of new/revised training programs

Indicator②: Number* of prepared/revised training materials

Indicator③: Number* of trainings for trainers

*Specific numbers are determined after reviewing the progress of project activities.

(4) Activities

Activities related to output 1 are listed below.

- 1)-1. Operational conditions of the existing DGs in the target area of Fiji are reviewed to identify training needs.
- 1)-2. Capacity assessment of candidate trainers is conducted.
- 1)-3. Current related training activities and implementation structure are reviewed, including confirmation on objectively verifiable indicators.
- 1)-4. Training for trainers is implemented.
- 1)-5. Training guideline, curriculums, schedule, and textbooks for new/revised training program are prepared.
- 1)-6. Necessary training equipment is identified and prepared (If necessary).
- 1)-7. New/revised training programs are conducted.
- 1)-8. The result of new training programs is evaluated, and lessons learned from evaluation are reflected to revised program.
- 1)-9. Future training programs including necessary budget after project completion are prepared.
- 1)-10. Knowledge on appropriate and economical system for O&M of DGs is disseminated among stakeholders through seminar.

Activities related to output 2 are listed below.

- 2)-1. Current situation and future development plan of RE in the target area of Fiji is reviewed to identify training needs.
- 2)-2. Operational conditions of the existing RE facilities are reviewed to identify training needs.
- 2)-3. Capacity assessment of candidate trainers is conducted.
- 2)-4. Current related training activities and implementation structure are reviewed, including confirmation on objectively verifiable indicators.
- 2)-5. Training for trainers is implemented.
- 2)-6. Training guideline, curriculums, schedule, and textbooks for new/revised training program are prepared.
- 2)-7. Necessary training equipment is identified and prepared (If necessary).
- 2)-8. New/revised training programs are conducted.
- 2)-9. The result of new training programs is evaluated, and lessons learned from evaluation are reflected to next revised program.
- 2)-10. Future training programs including necessary budget after project completion are prepared.

- 2)-11. Knowledge on methodology for appropriate planning and O&M of renewable energy (RE) is disseminated among stakeholders through seminar.

4-2. Tuvalu

(1) Overall goal and indicators

Overall goal: Energy security is improved, and greenhouse gases are reduced through the reduction of fossil fuels consumption.

Indicator①: Reduced amount of CO2 emission* of power utilities in the target area

Indicator②: Reduced amount of diesel fuel* of power utilities in the target area

Indicator③: Increased capacity (kW) and actual generated energy (kWh)* of renewable energy facilities of power utilities in the target area

*Verified during the baseline survey.

(2) Project purpose and indicators

Project purpose: Hybrid Power Generation System is introduced.

Indicator①: Improvement of specific fuel consumption of pilot DG units (better than the baseline data set at the beginning of the Project)

Indicator②: Improvement of performance ratio for RE power generation systems (better than the baseline data set at the beginning of the Project)

Indicator③: Proper application of planning and O&M method of Hybrid Power Generation System

Note: In the Indicator ③ for “proper application” criteria evaluation, a check list including counterpart self-evaluation, Japanese experts evaluation and stakeholder opinions should be prepared.

(3) Outputs (expected effect)

Output 1): Appropriate and economical system for O&M of Diesel Generators (DGs) is enhanced.

Output 2): Methodology for appropriate planning and O&M of Hybrid Power Generation System is established.

Indicator①: Adequacy on the use of the work schedule, check sheets and manual for the maintenance work for the pilot DG units

Indicator②: Number of training participants who are conducting operation and maintenance of DG based on the learnings from the training program

Indicator③: Number of training participants who learned the planning method of the Hybrid Power Generation System

Indicator④: Number of training participants who are conducting O&M of RE facilities based on the learnings from the training program

Indicator⑤: Preparation of related manuals for Hybrid Power Generation System

Indicator⑥: Adequacy of the use of the related manuals for Hybrid Power Generation System

(4) Activities

Activities related to output 1 are listed below.

- 1)-1.Operational conditions of the existing DGs are reviewed, including confirmation of objectively verifiable indicators for overall goal.
- 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 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.

Activities related to output 2 are listed below.

- 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.Implementation result of planning manual for Hybrid Power Generation System is evaluated and the manual content is 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.
- 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.

4-3. Kiribati

(1) Overall goal and indicators

Overall goal: Energy security is improved, and greenhouse gases are reduced through the reduction of fossil fuels consumption.

Indicator①: Reduced amount of CO2 emission* of power utilities in the target area

Indicator②: Reduced amount of diesel fuel* of power utilities in the target area

Indicator③: Increased capacity (kW) and actual generated energy (kWh)* of renewable energy facilities of power utilities in the target area

*Verified during the baseline survey.

(2) Project purpose and indicators

Project purpose: Hybrid Power Generation System is introduced.

Indicator①: Improvement of specific fuel consumption of pilot DG units (better than the baseline data set at the beginning of the Project)

Indicator②: Improvement of performance ratio for RE power generation systems (better than the baseline data set at the beginning of the Project)

Indicator③: Proper application of planning and O&M method of Hybrid Power Generation System

(3) Outputs (expected effect)

Output 1): Appropriate and economical system for O&M of Diesel Generators (DGs) is enhanced.

Output 2): Methodology for appropriate planning and O&M of Hybrid Power Generation System is established.

Indicator①: Adequacy on the use of the work schedule, check sheets and manual for the maintenance work for the pilot DG units

Indicator②: Number of training participants who are conducting operation and maintenance of DG based on the learnings from the training program

Indicator③: Number of training participants who learned the planning method of the Hybrid Power Generation System

Indicator④: Number of training participants who are conducting O&M of RE facilities based on the learnings from the training program

Indicator⑤: Preparation of related manuals for Hybrid Power Generation System

Indicator⑥: Adequacy of the use of the related manuals for Hybrid Power Generation System

(4) Activities

Activities related to output 1 are listed below.

- 1)-1.Operational conditions of the existing DGs are reviewed, including confirmation of objectively verifiable indicators for overall goal.
- 1)-2.Asset management plan of DG is reviewed including financial evaluation on overhaul.
- 1)-3.Specific fuel consumption of pilot DG units is measured.
- 1)-4.Improvement plan for the operation of pilot DG units is prepared.
- 1)-5.Existing spare parts and maintenance tools of pilot DG units are confirmed.
- 1)-6.Improvement plan for the operation of pilot DG units is implemented.
- 1)-7.The result of implementation of the improvement plan is evaluated, and improvement plan is updated.
- 1)-8.The concept of Economic Dispatch Control (EDC) is shared among operators and applied for DG operation, if possible.
- 1)-9.Necessary spare parts and maintenance tools for the pilot DG units are prepared.
- 1)-10.Maintenance work schedule for the pilot DG units is prepared.
- 1)-11.Check sheets and maintenance manuals for maintenance works for pilot DG units are prepared.
- 1)-12.Maintenance works (daily/partial inspection/overhaul work) for pilot DG units are conducted in accordance with the maintenance schedule.
- 1)-13.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)-14.Specific fuel consumption of the pilot DG units is measured before and after implementation of the related project activities.
- 1)-15.Related training programs for appropriate O&M system for DGs are implemented periodically.
- 1)-16.Knowledge on appropriate O&M of DGs is disseminated among stakeholders.

Activities related to output 2 are listed below.

- 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.Implementation result of planning manual for Hybrid Power Generation System is evaluated and the manual content is 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.
- 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.

4-4. Federated States of Micronesia (Pohnpei, Chuuk, Yap and Kosrae)

(1) Overall goal and indicators

Overall goal: Energy security is improved, and greenhouse gases are reduced through the reduction of fossil fuels consumption.

Indicator①: Reduced amount of CO₂ emission* of power utilities in the target area

Indicator②: Reduced amount of diesel fuel* of power utilities in the target area

Indicator③: Increased capacity (kW) and actual generated energy (kWh)* of renewable energy facilities of power utilities in the target area

* Verified during the baseline survey.

(2) Project purpose and indicators

Project purpose: Hybrid Power Generation System is introduced.

Indicator①: Improvement of specific fuel consumption of pilot DG units (better than the baseline data set at the beginning of the Project)

Indicator②: Improvement of performance ratio for the RE power generation systems (better than the baseline data set at the beginning of the Project)

Indicator③: Proper application of planning and O&M method of Hybrid Power Generation System

Note: In the Indicator ③ for “proper application” criteria evaluation, a check list including counterpart self-evaluation, Japanese experts evaluation and stakeholder opinions should be prepared.

(3) Outputs (expected effect)

Output 1): Appropriate and economical system for O&M of Diesel Generators (DGs) is enhanced.

Output 2): Methodology for appropriate planning and O&M of Hybrid Power Generation System is established.

Indicator①: Adequacy on the use of the work schedule, check sheets and manual for the maintenance work for the pilot DG units.

Indicator②: Number of training participants who are conducting operation and maintenance of DG based on the learnings from the training program.

Indicator③: Number of training participants who learned the planning method of the Hybrid Power Generation System

Indicator④: Number of training participants who are conducting O&M of RE facilities based on the learnings from the training program.

Indicator⑤: Preparation of related manuals for Hybrid Power Generation System

Indicator⑥: Adequacy of the use of the related manuals for Hybrid Power Generation System

(4) Activities

Activities related to output 1 are listed below.

- 1)-1. Operational conditions of the existing DGs are reviewed, including confirmation of objectively verifiable indicators for overall goal.
- 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 for DG operation, 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 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.

Activities related to output 2 are listed below.

- 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.Implementation result of planning manual for Hybrid Power Generation System is evaluated and the manual content is 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.
- 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.

4-5. Republic of the Marshall Islands

(1) Overall goal and indicators

Overall goal: Energy security is improved, and greenhouse gases are reduced through the reduction of fossil fuels consumption.

Indicator①: Reduced amount of CO₂ emission* of power utilities in the target area

Indicator②: Reduced amount of diesel fuel* of power utilities in the target area

Indicator③: Increased capacity (kW) and actual generated energy (kWh) of renewable energy facilities* of power utilities in the target area

* Verified during the baseline survey

(2) Project purpose and indicators

Project purpose: Hybrid Power Generation System is introduced.

Indicator①: Improvement of specific fuel consumption of pilot DG units (better than the baseline data set at the beginning of the Project)

Indicator②: Number of the units Economic Dispatch Control (EDC) properly applied (Target number set at the beginning of the Project: 5 units)

Indicator③: Improvement of performance ratio for RE power generation systems (better than the baseline data set at the beginning of the Project)

Indicator④: Proper application of planning and O&M method of Hybrid Power Generation System

Note: Indicators②③ are to be evaluated with counterpart self-evaluation using check sheets that summarize judgment criteria for “proper application”, etc., evaluation by Japanese experts, and

stakeholder opinion.

(3) Outputs (expected effect)

Output 1): Appropriate and economical system for O&M of Diesel Generators (DGs) is enhanced.

Output 2): Methodology for appropriate planning and O&M of Hybrid Power Generation System is established.

Indicator①: Adequacy on the use of the work schedule, check sheets and manual for the maintenance work for the pilot DG units

Indicator②: Number of training participants who are conducting operation and maintenance of DG based on the learnings from the training program

Indicator③: Number of training participants who are operating DG based on the learnings from the training program of EDC

Indicator④: Adequacy of the use of the EDC manual

Indicator⑤: Number of training participants who learned the planning method of the Hybrid Power Generation System

Indicator⑥: Number of training participants who are conducting O&M of RE facilities based on the learnings from the training program

Indicator⑦: Preparation of related manuals for Hybrid Power Generation System

Indicator⑧: Adequacy of the use of the related manuals for Hybrid Power Generation System

(4) Activities

Activities related to output 1 are listed below.

1)-1. Operational conditions of the existing DGs are reviewed, including confirmation of objectively verifiable indicators for overall goal.

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. Necessary spare parts and maintenance tools for the pilot DG units are prepared.

1)-8. Maintenance work schedule for the pilot DG units is prepared.

1)-9. Check sheets and maintenance manuals for maintenance works for pilot DG units are prepared.

1)-10. Maintenance works (daily/partial inspection/overhaul work) for pilot DG units are conducted in accordance with the maintenance schedule.

1)-11. 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)-12. Specific fuel consumption of the pilot DG units is measured before and after implementation of the related project activities.
- 1)-13. Related training programs for appropriate O&M system for DGs are implemented periodically.
- 1)-14. Knowledge on appropriate O&M of DGs is disseminated among stakeholders.
- 1)-15. EDC manual is prepared.
- 1)-16. Training program for Economic Dispatch Control (EDC) is conducted.
- 1)-17. EDC system is introduced at pilot DG power plants on trial basis.
- 1)-18. Knowledge on economical operation of DGs is disseminated among stakeholders.

Activities related to output 2 are listed below.

- 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. Implementation result of planning manual for Hybrid Power Generation System is evaluated and the manual content is 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.
- 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.

5. Project implementation method

5-1. Work plan (general plan)

5-1-1 Basic policy for project implementation

Project work will be implemented based on the following basic policy.

(1) Utilizing expertise from the remote Islands of Okinawa

1) Expertise on RE integration

Supplying energy by integrating RE is important in improving energy security in island regions with high dependence on fossil fuels. However, since RE is an unstable power source, the optimal system configuration for integrating RE varies significantly depending on the penetration rate, type, and power system conditions. Therefore, it is essential to have a variety of expertise and experience in the development of a system which is suitable for the local conditions.

Meanwhile, the joint venture has cultivated the necessary technologies to introduce variable power sources such as PV and wind power in the remote island power system of Okinawa Prefecture, through demonstration tests, etc., in relation to fluctuation control technology and grid stabilization technology (hybrid power generation system technology). This technology necessary for small-scale DG-based grid much like those in this project's target countries in the South Pacific.

The expertise cultivated so far will be utilized in this project as well for technology transfer of stable grid operation technologies including grid stabilization technologies in remote island DG grid and RE.

2) Expertise on O&M of DGs

The Okinawa Electric Power Company, Inc. (hereinafter OEPC), a member of the Joint Venture, is the sole electric power utility in Okinawa prefecture, located at the southernmost part of Japan.

Okinawa prefecture is an island prefecture which consists of approximately 160 islands varying in size, spread in a wide sea area of 1,000km from East to West, and 400km from South to North. OEPC provides power supply service for the main island of Okinawa and 37 other inhabited remote islands.

Power supply for the 37 islands is conducted by DG power plants in 10 locations, and the scale of demand greatly varies from 1MW to 50MW. OEPC supplies power for these remote islands at the same electricity tariff as that of the main island (universal service), as well as ensuring the equivalent power quality (in terms of frequency, voltage, etc.) as in the main island.

On the other hand, as mentioned above, the power supply in the remote islands of Okinawa is carried out with DGs as basic power source, with their fuels, heavy fuel oil, procured through transportation by ship from the main island of Okinawa. As a result, high fuel cost has driven up power supply cost.

Given this background, OEPC has strived for generation cost reduction through the implementation of various technologies for optimal DG plant operation and O&M and is therefore well equipped to transfer such technologies to the target countries of this project.

Power plants on remote islands tend to operate at low load for securing reserve capacity due to large RE output fluctuations. Low-load operation has poor combustion efficiency and increases combustion residues, producing more deposits on combustion chamber and exhaust system.

At periodic maintenance, the impact of low load operation on DGs is confirmed by examining the disassembled parts for the presence of fuel residues before cleaning and comparing with the data from the previous maintenance work. In addition, consultation with the operator in charge is made for post-maintenance DG operation to promote carbon deposit mitigation through high load operation.

For spare parts procurement in power plants of remote islands, long delivery time is taken into consideration and risk management efforts are made to avoid extending arrangement period by placing orders early for the parts whose replacement was recommended at previous inspection, and by making judgment for reusing parts after an overhaul.

(2) Utilizing expertise obtained through past JICA project

In the “Project for Formulation of Master Plan for Development of Micro Grid in Remote Islands” implemented in the fiscal years of 2015-2016, Okinawa Enetech Co., Inc. (hereinafter Okinawa Enetech) formulated a road map for the improvement of energy security through discussions with power sector stakeholders in Republic of Seychelles. During the process, the status of the country was assessed quantitatively by calculating system constants with DG load dump test and by conducting a study of the deployment of EDC operation with fuel efficiency measurement, and feedback for formulating a road map was provided.

With such expertise, quantitative studies of current status based on testing by measurement, etc. will be conducted in this project, and a planning manual for Hybrid Power Generation System that is appropriate for the target area will be prepared in collaboration with the counterparts (hereinafter C/P) in the target countries.

(3) Cooperation with a focus on human resource development

Okinawa Enetech has conducted several JICA trainings programs on RE design and microgrid development planning methods, based on experience in remote island grids. Many participants from Pacific Island Countries participated, and study methods for RE integration based on the current status of each country were instructed in these trainings.

In addition, in the abovementioned project in Republic of Seychelles, guidance on measurement methods was also provided to the C/P during fuel consumption measurements and load dump tests for technology transfer.

Based on past training experience, a flexible training plan will be developed for this project as well, to implement more efficient, self-sustaining, and sustainable technology transfer.

For on-site trainings, target groups will be executives, managers, and engineers of the local C/P to encourage participation of as many people as possible. On the other hand, for trainings in Japan,

effective trainings will be planned for participants including executives. In addition, the results of the trainings will be widely disseminated for neighboring countries of the target countries as well through seminars.

5-1-2 Detailed method of project implementation

(1) Basic workflow of project implementation

In order to improve energy security in Fiji, Kiribati, Tuvalu, FSM, and RMI, which are the target countries of this project (hereinafter target countries), it is desirable to establish an energy self-sufficiency infrastructure based on renewable energy.

In doing so, it is necessary to design appropriate systems according to the scale and classification of the power systems in each target country, which should be studied individually.

Meanwhile, sound operation of DGs, which are the base power source, is essential for increasing RE penetration, and for that purpose, proper O&M is important.

Therefore, the implementation policy of this project is set according to three main themes of “increasing RE integration”, “appropriate O&M of DGs”, and “appropriate O&M of RE”.

■ Increasing RE integration

In close collaboration with C/P, the following technology transfer work will be conducted. For “increasing RE integration,” as shown in Figure 2-1, information on the existing grid and other relevant information (energy policy, etc.) in the target countries will be organized and analyzed to identify the current status and characteristics of each grid.

The next step is to evaluate the feasibility of RE integration. Specifically, operating conditions of the existing DG power plants (output upper and lower limit, etc.) is reviewed, and upward and downward reserve as well as operating reserve are confirmed. Then the allowable RE integration amount is calculated.

Short-term frequency fluctuation is studied by algebraic method, and long-term frequency fluctuation are studied by energy balance analysis using microgrid design support software HOMER.

As the configuration of hybrid power generation system differs for each small-scale power system depending on the use of integrated RE, the purpose of RE introduction will be confirmed before drafting an integration plan. In addition, the impact of increasing RE integration on electricity tariffs will also be examined.

The impact of RE integration on per-unit generation cost will be studied along with technical studies.

The expertise gained in remote islands of Okinawa will be utilized throughout the abovementioned workflow of technical study, and a plan for introducing a hybrid power generation system that is appropriate for each target region will be proposed.

Finally, a case study of hybrid power generation system introduction will be conducted to deepen knowledge on design method for RE facility integration.

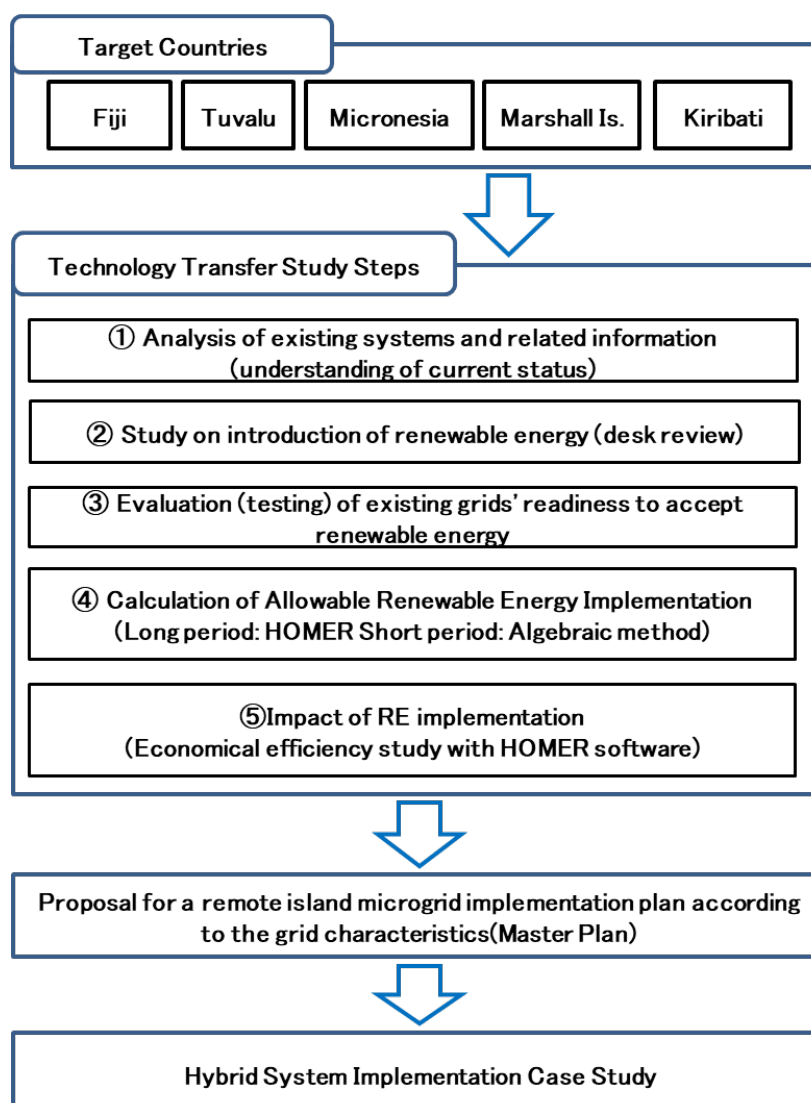


Figure 2-1 Workflow for implementation (increasing RE integration)

■ Appropriate O&M of DGs

For “appropriate O&M of DGs,” as shown in Figure 2-2, current status of O&M practices for the existing DGs in the target countries will be reviewed to identify issues and challenges (conduct analysis for the entire facility).

The next step is to collaborate with the C/Ps of the target countries to organize the differences with remote islands of Okinawa in terms of operations, and manuals on operation and maintenance will be developed. In specific, operating time management at existing DG power plant, maintenance cycle, inspection content (visual inspection to overhaul), and inspection method will be confirmed. Training in Japan will then be conducted to provide knowledge on DG operation and inspection content in Okinawa through lectures and other practical sessions. After the training in Japan, appropriate O&M

methods for the existing DGs in each of the target countries will be instructed through technical support by the Japanese experts.

Throughout the above-mentioned technical study process, expertise from remote islands of Okinawa will be utilized for proposing appropriate O&M management for each of the target regions.

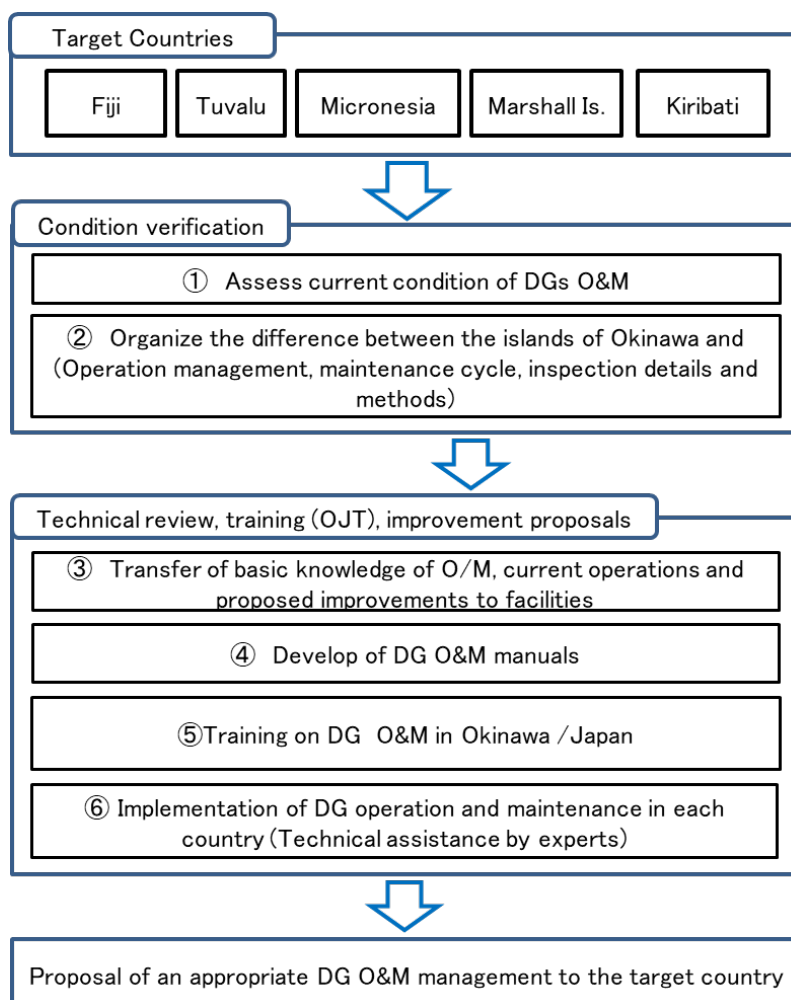


Figure 2-2 Work implementation process (Appropriate O&M of DGs)

■ Appropriate O&M of RE

For “appropriate O&M of RE,” as shown in Figure 2-3, current status of O&M practices for the existing RE facilities in the target countries will be reviewed to identify issues and challenges (conduct analysis for the entire facility).

The next step is to collaborate with the C/Ps of the target countries to organize the differences with remote islands of Okinawa in terms of operations, and manuals on operation and maintenance will be drafted. In specific, operating time management of existing RE facilities, maintenance cycle, inspection content, and inspection method will be confirmed. Training in Japan will then be conducted

to provide knowledge on the content of RE O&M in Okinawa through lectures and other practical sessions. After the training in Japan, appropriate O&M methods for the existing RE facilities in each of the target countries will be instructed through technical support by the Japanese experts.

Throughout the above-mentioned technical study process, expertise from remote islands of Okinawa will be utilized for proposing appropriate O&M for each of the target regions.

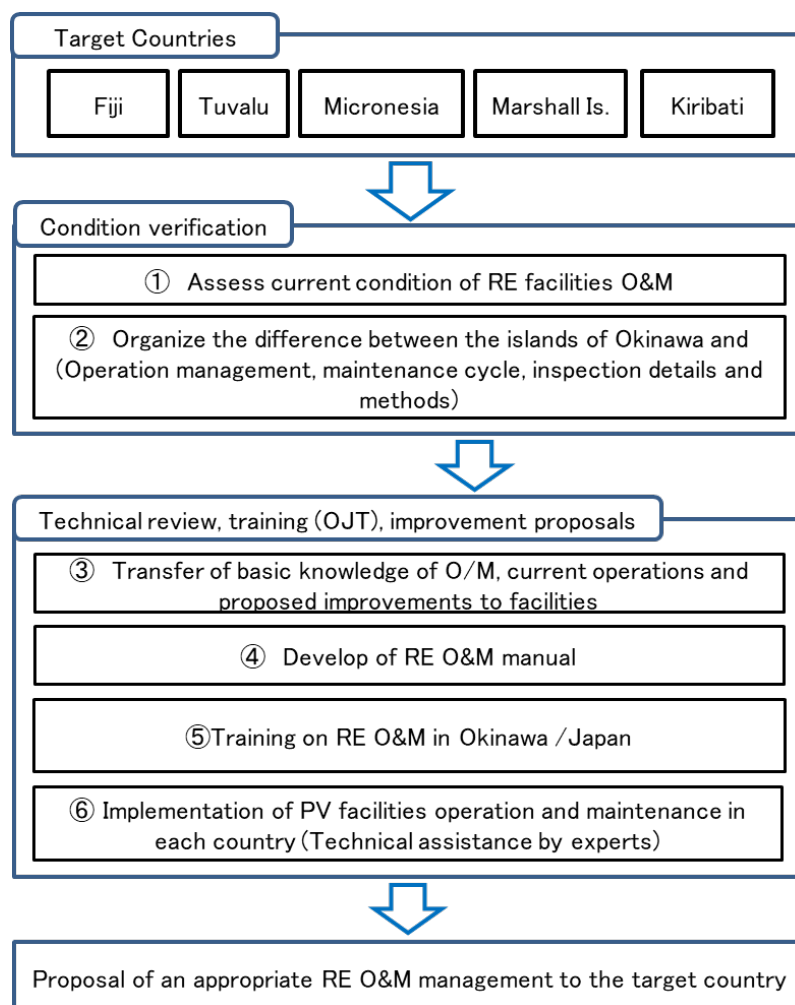


Figure 2-3 Work implementation process (Appropriate O&M of RE)

(2) Basic project implementation method

① Hybrid Power Generation System planning manual

For developing a planning manual, the information collected during field survey, etc. will be organized first, and the Hybrid Power Generation System development plan that contributes for improving energy security in the target countries will be reviewed based on the characteristics of the target countries. A planning manual will then be developed based on the survey results and consultations with stakeholders of the target countries. For reviewing existing plans and developing

a planning manual, previous collaborative experiences of developing a RE development master plan in Marshall Islands, etc., will be utilized.

Study process

- I .Identifying issues and studying a deployment plan
- II .Roadmap development
- III.Discussion and finalization of the roadmap
- IV.Review of the Hybrid Power Generation System development plan (collaborative work)
- V.Developing a planning manual for Hybrid Power Generation System development

I . Identifying issues and support measures

The target countries face various issues including system load increase and decrease, and limit posed on DG operational range. These issues will be assessed during the first field survey to identify support measures.

II . Roadmap development

In response to the identified issues, a roadmap that contributes for the improvement of energy security and support measures for the power sector will be drafted.

III . Finalizing the roadmap

Consultations with the target countries to finalize the draft roadmap will be conducted to ensure its feasibility.

●Roadmap for the formulation of a foundation for energy self-sufficiency

Roadmap will be drafted with the conditions given during consultations with the target countries such that the planning process required for RE integration will be easily understood. For reference, Figure 2-4 shows a roadmap for the formulation of a foundation for energy self-sufficiency in Marshall Islands.

Some examples of potential conditions for RE integration are shown below.

1. Necessity and feasibility of Feed-in Tariff scheme
2. Power demand forecast (including the presence and change in number of HV customers)
3. Permission for reverse power flow and details (grid interconnection regulations, etc.)

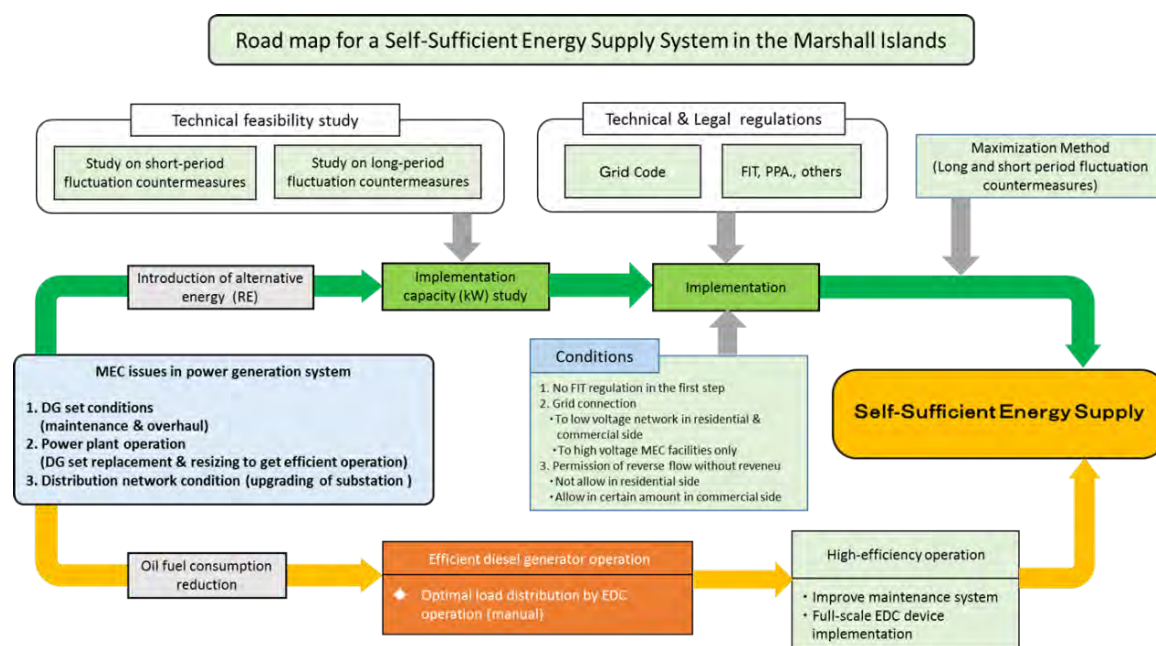


Figure 2-4 Roadmap for the formulation of a foundation for energy self-sufficiency in Marshall Islands (final draft)

IV. Review of the Hybrid Power Generation System development plan (collaborative work)

The existing plans of the target countries on Hybrid Power Generation System and RE will be reviewed by utilizing the information obtained from the field survey and roadmap, etc. as reference.

V. Developing a planning manual for Hybrid Power Generation System development

Based on the review process of the existing plans on Hybrid Power Generation System development, a planning manual will be drafted. The draft manual will be finalized based on the expertise obtained from the experience of Okinawa prefecture in introducing the Hybrid Power Generation System.

For finalizing the planning manual for Hybrid Power Generation System development, the following expertise accumulated through the experience in the remote islands of Okinawa prefecture will be utilized, and technical know-how will be provided through lectures, etc.

1) Calculation of the maximum allowable integration amount of RE

① Short-period constraints

Since RE such as solar and wind power are variable power sources that are dependent on natural forces, they are difficult to control in the way DGs are controlled. Therefore, there are three major challenges to expanding RE integration.

A. Frequency fluctuation (short-period fluctuations)

In order to supply power stably, demand and generation must always be matched by controlling the output of each power plant for the constantly fluctuating demand. This in turn maintains frequency at a constant value. If this balance is not maintained, frequency will fluctuate and may affect the operation of the electrical equipment on the customers' side, and if frequency fluctuations exceed certain values, protection mechanisms of the generators are triggered forcing them to trip (disconnect from the power grid) one after another and may cause a blackout.

B. Excess electricity measures (long-period fluctuations)

The power utility operates power supply by controlling the output of each power plant according to the ever-changing power demand such that demand, and supply are equal at all times. Such operation is required due to the physical characteristics of electricity and is indispensable for stable power supply. However, if the amount of RE with output that is difficult to control increases, a gap between supply and demand may occur during periods of low load due to RE output exceeding the demand excluding the minimum output required from the existing power sources for supply-demand balancing.

C. Voltage rise in distribution system.

If the amount of RE sources interconnected to the distribution system (distribution lines), such as residential PV in particular increases, voltage at the interconnection point may deviate from the target range (101 ± 6 V in Japan) due to reverse power flow in the distribution system. Maintaining voltage within the target range is necessary from the perspective of impact to the life and normal use of electrical equipment on the customer side, and protection of equipment on the grid, so measures such as stopping or curtailing PV generation such that voltage does not exceed the target range are needed. As ① frequency fluctuations (short-period fluctuations) tend to manifest first while striving towards mass integration of RE in island regions, algebraic method, a simple method to calculate allowable RE integration capacity, is used in this project to evaluate system frequency stability (short-period constraint).

② **Overview of the algebraic method**

The algebraic method is a simple method commonly used in Japan, and by using allowable adjustable margin, the generator's frequency response range, demand fluctuation rate, and RE output fluctuations as parameters, the capacity of additional RE that can be integrated into the grid can be calculated. Unlike detailed simulation analysis with simulated generators, this method does not require special tools nor a high level of knowledge and experience, and calculations can be performed with Excel. In addition, since calculation results similar to those of detailed simulations can be obtained, technical trainings on the algebraic method will be

provided in this project. A schematic diagram of the algebraic method is shown in Figure 2-5.

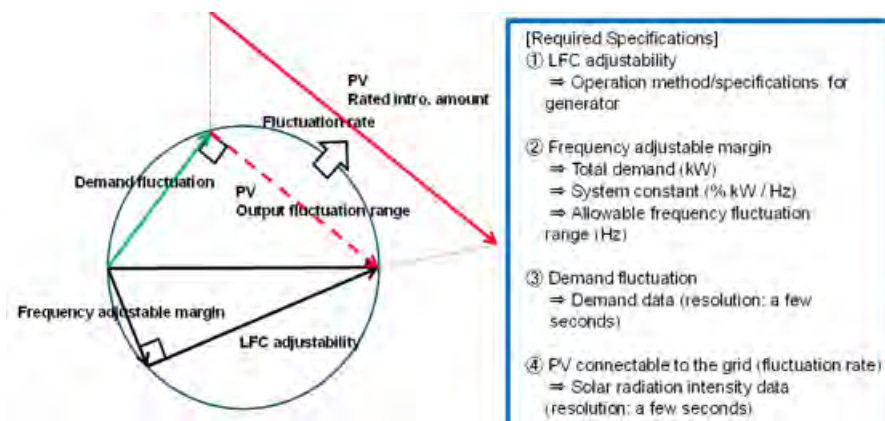


Figure 2-5 A schematic of the algebraic method

With this method, the maximum allowable capacity of PV integration can be calculated using the following formula.

$$\text{PV rated capacity to be integrated} = \frac{(\text{frequency adjustable margin})^2 + (\text{LFC})^2 - (\text{Demand fluctuation})^2}{(\text{Fluctuation rate})}$$

③ Long-period constraints

A supply-demand balance simulation will be conducted to assess how much RE can be deployed to the existing power system. This simulation is a calculation for hourly load fluctuations, solar irradiance, and wind speed, that is, so-called long-period fluctuation analysis. Short period output changes, etc. within one hour, e.g., a few seconds or minutes, are not included. HOMER Pro, a simulation software widely used around the world, is used as an evaluation tool.

④ Overview of HOMER Pro

HOMER Pro simulates the operation of a system by making energy balance calculations for each of the 8,760 hours in a year. HOMER Pro compares the power demand for each hour with the amount of energy that the system can supply to calculate the energy flow from each component of the system. With a system which has storage batteries or generators, how the generators should be operated or whether the batteries should be charged or discharged is determined for each hour. HOMER Pro determines the feasibility of each system configuration that the user is considering at the same time. It can determine whether or not power demand will be met under the conditions specified by the user as well as estimate the cost of installing and managing the system over the entire duration of the project. Figure 2-6 shows the user screen of HOMER Pro.

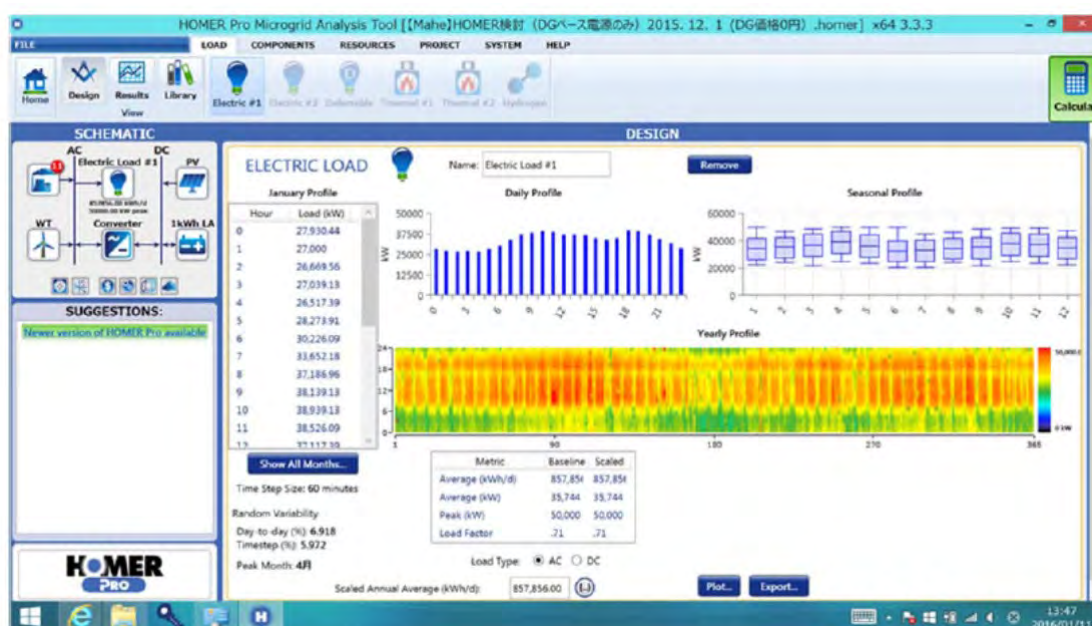
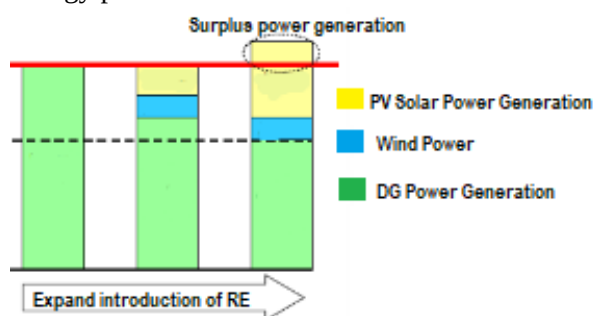


Figure 2-6 User screen of HOMER Pro

2) RE output curtailment

Small remote islands of Okinawa prefecture have made efforts for increasing RE penetration and stabilizing RE output. However, in order to increase RE penetration, it is essential to take into account the limitation posed by the lower operating limit of DGs (i.e., approximately 50% of rated output), which are the base power source. In particular, if RE penetration continues to increase even after the lower operating limit of DGs are exceeded, supply-demand balance will be lost due to the excess energy produced.



This results in the continued increase in frequency that causes issues for stable power supply. While mitigation measures for the issue include installing storage batteries to absorb surplus energy and RE output curtailment, these measures have the downsides of high cost for storage batteries and decreased profitability for

RE output curtailment, respectively. This project therefore evaluates other more effective mitigation measures using the abovementioned HOMER Pro.

In addition, in Miyako Island of Okinawa Prefecture, a mitigation measure for surplus energy production through creating load by operating water transmission pumps during times of maximum PV output is under study. Survey on the existence and potential uses of controllable loads in the target countries will be conducted in this project as well.

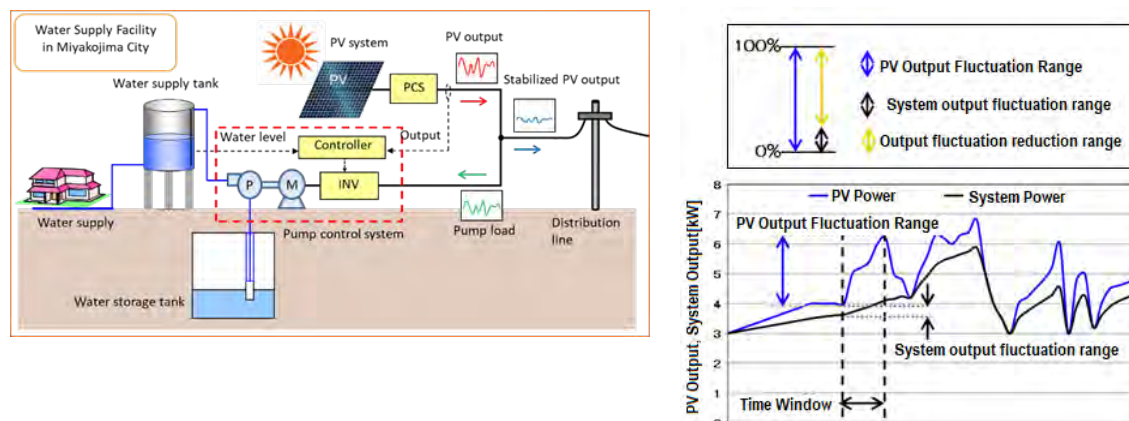
3) Introducing high-speed DGs with superior load following capability

High-speed DGs generally have a superior load following capability than low-speed DGs, and are therefore effective for increasing RE integration. On the other hand, their higher maintenance cost is a disadvantage, as maintenance service intervals for high-speed DGs are shorter than that of low-speed DGs. In addition, in relation to grid stabilization, choosing high-speed DGs for all new installation may cause the grid to be unstable due to insufficient inertia. This project therefore examines the possibility of introducing high-speed DGs while giving due consideration to system stability and economy.

4) Utilizing pumps, etc. for absorbing RE output fluctuations

As a conventional mitigation measure to solve the issue of RE output fluctuations, storage batteries were generally used. However, storage batteries have an issue of cost with their high initial cost and the need for regular replacement due to their degradation from repeated charging and discharging.

In response, Okinawa Enetech conducted demonstration research of controlling controllable loads such as water pumps in a remote island of Okinawa (Miyako Island) to establish a PV output fluctuation suppression method. In specific, controlling the power consumption of controllable loads in response to PV output fluctuations smooths out the PV output and enables stable power supply to the grid. In addition to water pumps, heat pump air conditioners as well as heat pump water heaters were confirmed to have controllability as well. Therefore, potential utilization of controllable loads such as pumps will be studied as one of the RE output fluctuation mitigation methods in this project as well.

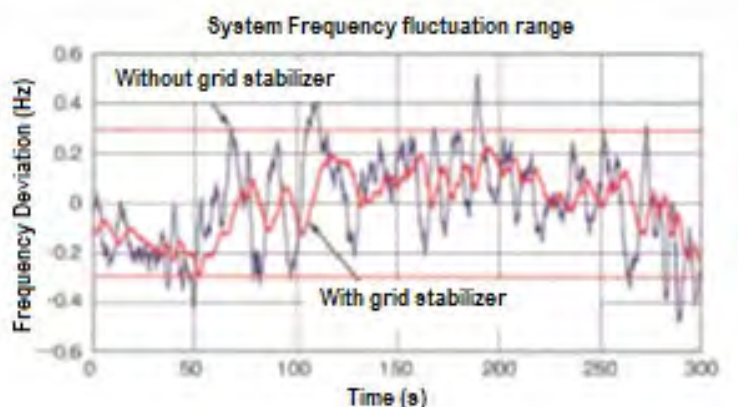


Conceptual diagram of PV output fluctuation mitigation system utilizing water pumps, etc.

5) Introduction of grid stabilizers such as storage batteries

The grid frequency is maintained by constantly balancing generation and load in the grid. For example, when load exceeds generation, the rotational speed of the generators drops and the system frequency decreases. Some RE power sources have large output fluctuations such as PV and wind, and their impact on the system frequency is especially significant for small-scale remote island grids.

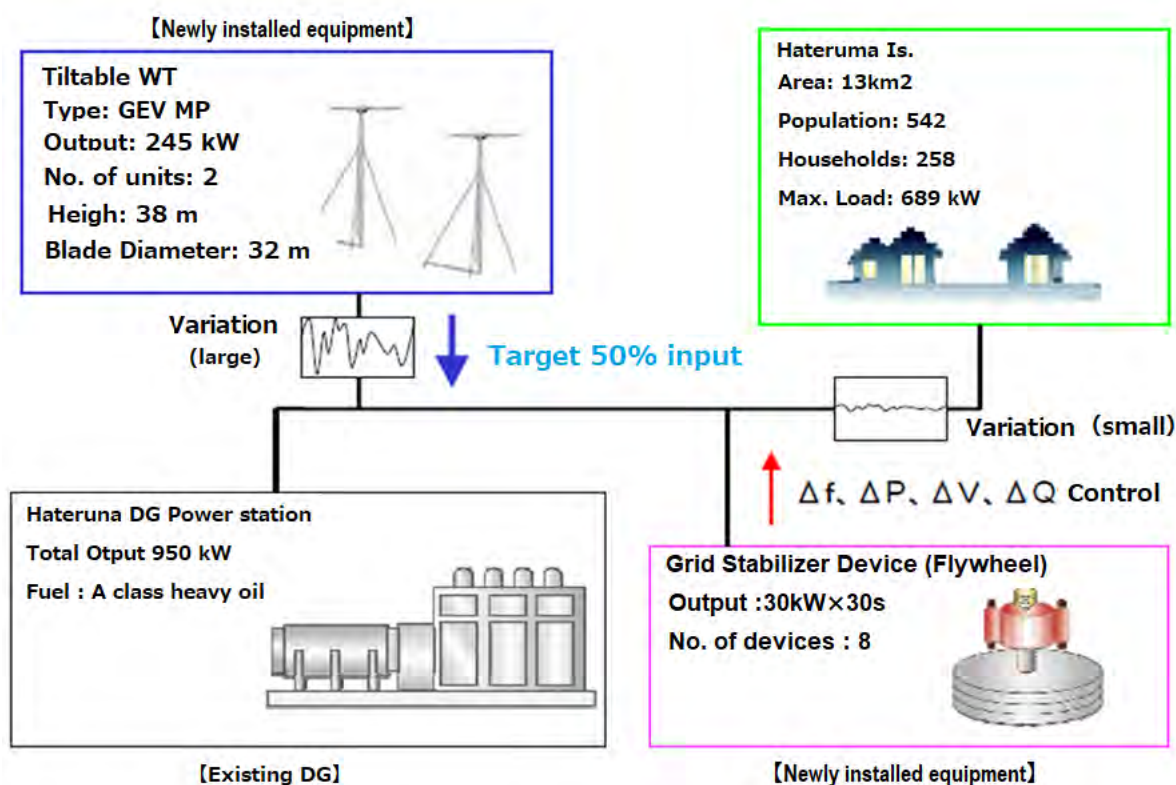
As a mitigation measure to prevent such frequency fluctuations to cause deviations from the system frequency target values, suppression of RE active power fluctuations by grid stabilizers with energy storage function, such as storage batteries, is effective. To date, OEPC has accumulated know-how on grid stabilizer deployment technologies utilizing storage batteries, etc., for increasing RE penetration in remote island grids. These grid stabilization technologies will be utilized in this project for studying the optimal system configuration for the target countries.



Conceptual diagram of grid stabilization

6) Hateruma Island retractable wind turbine system

Okinawa prefecture is a region frequently hit by typhoons and has suffered from typhoon damage numerous times. In 2003, Typhoon No. 14 (Maemi) especially caused serious damage on wind power facilities installed in Miyako Island, and out of the six units of wind turbines owned by OEPC, three units collapsed, two units suffered blade damage, and the remaining one unit suffered damage on the nacelle. In order to protect wind power facilities from typhoon damage, OEPC therefore introduced two units of retractable turbines in Hateruma Island, and developed a Hybrid Power Generation System coordinated with existing DGs. When a typhoon approaches, the wind turbines in this system are tilted to the ground in advance (tilting operation completes in approximately 40 minutes) in preparation for the typhoon (the turbines can withstand typhoons with wind gust speed of 85m/s when tilted to the ground). In addition, as the turbines are tiltable, large cranes are unnecessary for construction and maintenance, which offers a significant advantage in terms of cost. Flywheels were also installed in the system as grid stabilizers.



Overview of Hateruma Island retractable wind turbine demonstration system

7) Low-risk fluctuation mitigation system by using multiple PCS units for PV

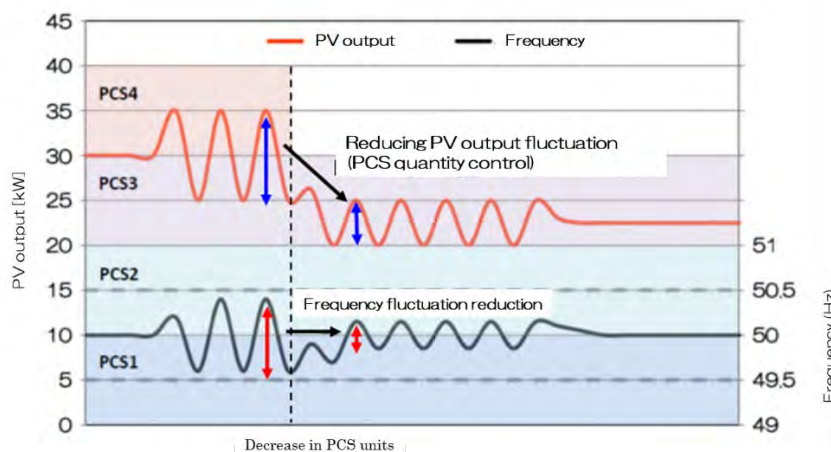
As mass integration of PV systems may cause various issues including decrease in power quality and supply reliability in the grid, low-load generator operation, etc., countermeasures against these issues are necessary. Introducing a Hybrid Power Generation System in which the number of operating PCS units is controlled according to the conditions of the grid and PV system output can be considered as an effective measure.

In Okinawa, for mitigating frequency fluctuations and low load DG operation, a PV system which does not have storage batteries but have multiple units of low-capacity PCS that can be controlled individually is used. More specifically, when grid frequency fluctuations become large due to fluctuations in the PV system output, the number of PCS units in operation is reduced (quantity control) to reduce the PV system output fluctuation range, thereby mitigating the grid frequency fluctuation. In addition, as countermeasure against low load DG operation, DG units are monitored, and when output drops below the output lower limit, quantity control is performed on the PV system by reducing the number of PCS units in operation in order to minimize low load DG operation.

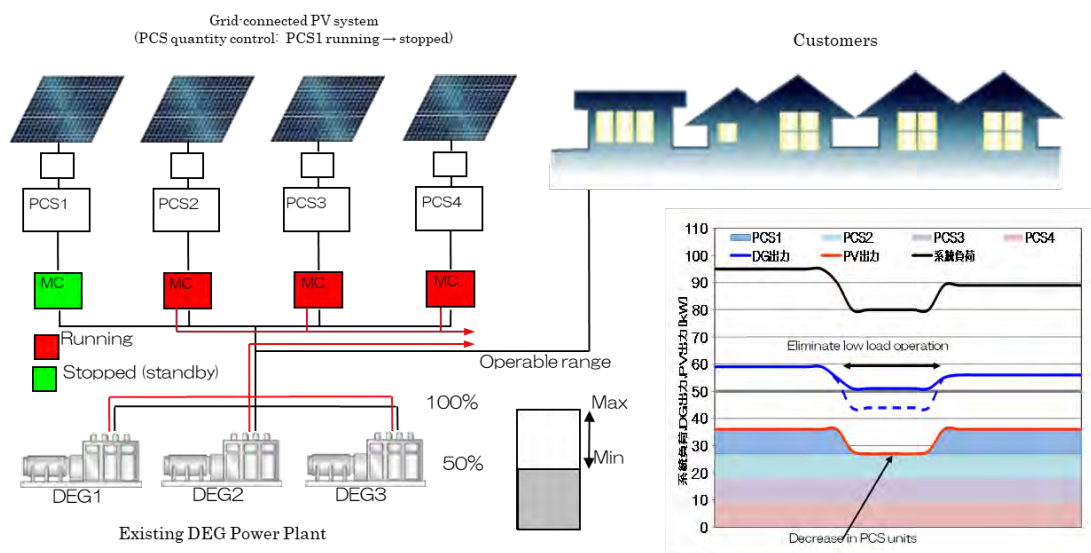
After the DG output goes back above the output lower limit, the number of PCS units in operation is increased to enable maximum utilization of the power generated by the PV system.

Furthermore, combining multiple commercial small capacity PCSs makes it possible for the owners to handle failures on their own, enabling rapid recovery, and improved capacity factor can be expected.

Therefore, compared to a system that uses made to order PCSs, troubleshooting costs can be reduced. It also has an advantage in terms of workability as the owner can sustainably operate and maintain it without relying on the manufacturer.



Conceptual diagram of system frequency stabilization with PCS quantity control



Conceptual diagram of DG low load operation mitigation with PCS quantity control



Technical support will be provided on the abovementioned items 1 through 7, and the technical know-how will be summarized as a Hybrid Power Generation System Planning Manual.

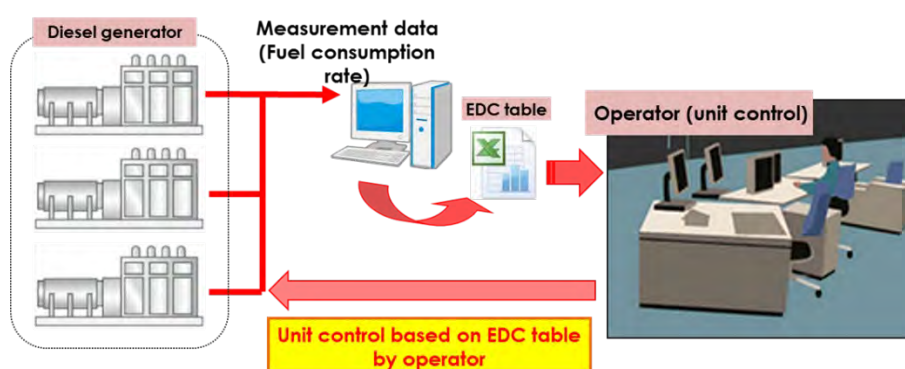
⑤ Effective technology transfer method for appropriate O&M of DG

1) Efficient operation of existing power sources for improving energy self-sufficiency

In order to improve energy self-sufficiency, in addition to substituting fossil fuels with RE, reducing fuel consumption by efficient operation of existing DGs is necessary. To do so, the following two methods can be used.

- Proper maintenance to prevent worsening of fuel consumption characteristics (individual management of generators): Properly maintain each generator to ensure proper fuel consumption characteristics. In addition, operate at highly efficient output by keeping output within the operational range.
- Application of economic load dispatch (EDC) operation to optimize fuel consumption (management of power plant operation): Reduce fuel consumption by optimizing fuel consumption of a power plant as a whole for each load profile, taking into account the fuel consumption characteristics of each generator.

In small-scale power plants in remote island regions of Okinawa Prefecture, EDC operation has not been conducted because cost-effectiveness cannot be expected with improved fuel efficiency due to high cost of deploying a full-fledged EDC system with automatic control functions. However, even without implementing automatic EDC operation, economic operation is conducted based on a rule of thumb, by determining the fuel consumption characteristics of each generator and getting more output from fuel-efficient generators. In this project, as an appropriate EDC operation for small-scale power plants without deploying system equipment, technology transfer of EDC operation, in which commercially available PC software (Microsoft Excel) is used to calculate for economic load dispatch, and optimal output is manually dispatched according to the calculation results, will be implemented.



Conceptual diagram of EDC operation

2) On-site work

Each of the target countries has a long-established O&M method. Therefore, in providing technical support on O&M, existing good practices will be kept while improving bad practices by ensuring agreement from the target countries based on sufficient understanding on the method in Okinawa. In addition, collaborative work with the target countries is set as a basic policy for implementation.

For technology transfer, reference materials that have been used in Okinawa, such as work instruction manual, will be utilized for improving the effectiveness of the support. A sample of reference material to be used is shown below.

Work safety instruction manual

3) Project implementation structure for the Japanese side

Technical support related to O&M in this project will be provided with an equivalent structure with the O&M work implemented for remote island DG power plants operated by OEPC. The actual structure is shown in the figure below.

Having a long track record of providing power supply services in the remote island regions of Okinawa prefecture, OEPC has expertise in economic operation. Okidenkigyo Co., Ltd has implemented maintenance operations in the remote island regions where OEPC provides power supply services, and has expertise in efficient and effective maintenance operations. Minami Kikai Service, Ryukyu Nainenki, Toyo Denki Seigyo, Kiden Kogyo are partner companies of OEPC. The assignment of maintenance work services is determined among the four companies by the rated output of the DGs to be serviced. For example, Ryukyu Nainenki is assigned if rated output is more than 1MW, and Minami Kikai Service is assigned if rated output is below 1MW. As the existing DGs to be overhauled were unknown at the time of project planning, the project implementation structure was designed to be able to deal with any of the existing DGs.

DG Economical Operation A Okinawa Electric Power Co.	DG Economical Operation B Okinawa Electric Power Co.	DG Economical Operation C Okinawa Enetech Co.
DG Mechanical Maintenance A Okiden Kigyo Co	DG Mechanical Maintenance B Minami Kikai Service	DG Mechanical Maintenance C Ryukyu Nainenki
DG Electrical Maintenance A Okiden Kigyo Co	DG Electrical Maintenance B Toyo Denki	DG Electrical Maintenance C Kiden Kogyo

4) Implementation of trainings in Japan

In this project, trainings in Japan are to be held for three times. The first training is to be held around February 2018 by inviting approximately ten high-level officers from the target countries for facilitating their understanding on the Hybrid Power Generation System effectively through lectures and site visits of the systems introduced in remote island regions. The second training is to be held around September 2018 by inviting approximately twenty workers involved in O&M of DG (two people for mechanical and two people for electrical for each of the target countries) and implement actual maintenance work together with experts (implement as OJT) to learn the maintenance method of OEPC by experience. The third training is to be held around February 2023 by inviting approximately three top-ranking officials from Fiji.

③ O&M manual of RE

PV is generally said to be maintenance-free due to their rarity of breakdown and malfunctions. However, cases of breakdowns and malfunctions have been reported in reality, and what is problematic is that such issues are hard to detect, and a continued decrease in generated energy over a long period would eventually lead to loss of economic efficiency. Therefore, this project attempts to provide effective technical supports on O&M of PV including actual case studies in Okinawa. In addition, the support plans include handling of tools and instruments used for inspection, and maintenance workers from the target countries who will participate in the training in Japan will be provided with an opportunity to be instructed at an actual inspection setting of existing facilities in a manner equivalent to OJT, so they acquire sufficient learning for providing instructions for other maintenance workers back home. The inspection tools and instruments include insulation resistance tester, tester, voltmeter, ammeter, voltage detector, earth resistance tester, I-V checker, etc. For RE O&M-related activities in this project, Okinawa Kobori Denki Ltd., which has a track record of implementing work in remote islands of Okinawa and overseas including Marshall Islands and Laos, etc., will provide support. In drafting a O&M manual of RE, expertise accumulated through operations in remote island regions of Okinawa and various technical know-how will be shared through lectures, etc.



Typical instruments used for inspection

④ Enhancement of Fiji's capacity for providing regional trainings

The regulatory agency of Fiji is MPWTMS, and implementing organizations are EFL and PPA. EFL supplies power from the major power system in the country, in specific, it is responsible for power generation, transmission, and distribution for the islands of Viti Levu and Ovalau. In addition, EFL has as its slogan "Center for Excellence" and has strived to make its training center located in the country's second major city of Lautoka be the regional hub for the promotion of technology and skills in the Pacific region. Based on the above, the following activities will be implemented in this project in collaboration with the C/P for the enhancement of the trainings in Fiji.

- Have discussions on the training programs provided at the center with the stakeholders of the training center
- Determine the training content using RE manual and O&M manual, etc. upon discussion with EFL
- Provide training on the effective use of "HOMER Pro", a support software for developing an economical system
- Provide training on the calculation method of the "algebraic method," a method to estimate allowable RE integration capacity
- Provide training on the economic load dispatch control (EDC) of DG
- Provide training on effective and efficient DG maintenance methods
- In providing trainings, utilize the training materials from the past JICA Okinawa trainings that the joint venture for this project has implemented
- Provide effective trainings including not only lectures but also OJT in the field (for example, how to use I-V checker, etc.)

The activities listed above will be conducted in order to strengthen the training programs in Fiji.

⑤ Organizing process for JCC, keeping abreast of the aid activities by other donors, content of public relations material

1) Organizing process for Joint Coordinating Committee (JCC)

JCC is to be conducted once a year (generally planned in February) for each of the target countries as a principle for having discussions and gaining approval on the project plan, confirmation of project implementation status and result, consideration on issues and important matters, and gaining

consensus with the C/P of the target countries. In addition, revision of PDM (including setting indicators) and Plan of Operation is conducted as necessary on the occasion of JCC. For holding a JCC meeting, meeting material on project implementation status and discussion agendas will be prepared in advance upon consultation with the department in charge at JICA and the project expert, and the meeting will be jointly held with the C/Ps.

2) Keeping abreast of the aid activities by other donors

In the five target countries, World Bank, ADB, International Renewable Energy Agency (IRENA), New Zealand, etc. have ongoing relevant aid projects. There are also regular donor meetings for sharing information on the projects with each other. In this project, regular collection of the information on relevant projects in each of the target countries will therefore be conducted and the collected information will be shared with the department in charge at JICA and the project expert as necessary. In addition, depending on the situation, reporting on the implementation status of this project at the donor meetings will be made upon consultation with the JICA department and the project expert.

3) Content of public relations material

Various opportunities for public relations activities, including the 8th Pacific Islands Leaders Meeting (PALM8) to be held in May 2018, will be used to facilitate the understanding of the C/P, Japanese side, and other donors through easy to understand, active, and effective dissemination of information. In addition, regular documentation of technology transfer with photos and videos will be made and promotional video materials for effective promotional effect will also be made. Using these promotional materials, public relations activities will be conducted at PPA annual conferences, donor meetings, and JCC, in addition to PALM8. Furthermore, for PR activities in Japan, activity reports will be published on the websites of OEPC and Okinawa Enetech whenever possible, as well as publishing articles on OEPC's annual Environmental Action Report.

PR activities will be conducted in collaboration with the Okinawa-Hawaii cooperation promotion project of the Okinawa Prefectural government (Okinawa Enetech is the implementing organization) as well as at the project committee meetings and symposiums for the residents of Okinawa.

5—1—3 Specific implementation method of the project

(1) First part of work in Japan

1) Collect, organize, and analyze the existing information

Basic information pertaining to the items below will be collected and organized. During the collection process, due attention will be paid for ensuring the organization of information for easy reference.

- Existing laws and various systems related to the energy and electricity sector
- Management structure of the power sector
- Procurement of primary energy

- O&M practices of the existing DG
- Availability of spare parts and maintenance tools of the existing DG
- Operational record of power plants (including the status of primary energy use)
- RE (operating status, integration target, integration plan, etc.)
- Batteries and control system (history of introduction, integration plan, etc.)
- Existing water pump and ice factory
- Hybrid Power Generation System technologies in remote island regions of Japan (except those in Okinawa prefecture)
- Hybrid Power Generation System technologies in other island countries

2) Drafting a work plan

The information listed above will be compiled and a work plan will be drafted.

3) Preparing a list of collected information and a questionnaire

A list of the information collected in Japan will be prepared to confirm the availability of the necessary information. A survey questionnaire to collect additional information needed for the project will be prepared and used during the first field survey.

(2) First field survey

1) Interviewing with the electricity and other relevant sectors

The work plan prepared in the first part of the work in Japan will be shared with the electricity and other relevant sectors to collect additional information needed and to update the collected information. In addition, information on other donor activities will also be collected to harmonize with them as much as possible.

2) Survey on the current conditions of power facilities

The power plants as well as the transmission and distribution facilities of the target regions will be surveyed to understand their current conditions. In addition, existing measuring instruments related to load dump tests to be conducted in the fourth field survey will be confirmed and coordination with the C/P will be made.

3) Collection of information on RE and DG in the field

- Confirm that the flow meter in the fuel system of each DG is functioning correctly, and if malfunctions are found, collect data necessary for replacement.
- Select the unit to be overhauled in the target country, and prepare a list of necessary spare parts. In addition, conduct inquiries on the procurement route used in the target countries for spare parts, their price, etc.

- Conduct a survey on the operating conditions of RE facilities (including the possibility of control), and maintenance work. In addition, identify potential site for installing RE facilities in the future, and collect necessary data for conducting case studies.
- Conduct a survey on the per-unit price of RE equipment that can be procured in the target countries, per-kW installation cost, etc.

4) Survey on the operation and maintenance of diesel power plants

Review current operational conditions and maintenance works of the diesel power plants, including the policy on the operational output range, periodic inspection, and the number of must-run units (in Okinawa, more than 2 units).

5) Confirm project implementation structure and lecture venues of C/P

Confirm project implementation structure, lecture venues, etc.

(3) Second part of work in Japan

1) Preparation for the training in Japan

Coordinate with stakeholders in the target countries on the members to participate in the training in Japan, and make travel arrangement (plane tickets, accommodation, visa, etc.)

2) Organizing issues and challenges of power plant O&M

Organize the information on diesel power plant O&M obtained in the first field survey, and identify the issues and challenges.

(4) Training in Japan

Training in Japan is held in order to introduce the Hybrid Power Generation System technologies and know-how accumulated in the remote islands of Okinawa prefecture with field visits to the actual project site for more effective technology transfer. The training will be implemented with the following two considerations.

- 1) Policies on the introduction and operation of Hybrid Power Generation System in the remote island region of Okinawa, and introduction of related technologies
- 2) Site visits related to high-efficiency operation of DG and optimal power plant operation in the remote island region of Okinawa

A draft schedule for the training in Japan is shown below. The training is intended to facilitate understanding of the issues and challenges in the power systems of OEPC, and mitigation measures to resolve them.

Schedule of training in Japan (draft)

Date	Day	Training Contents	Site
11/25	Sat		
11/26	Sun	Arrive	
11/27	Mon	Program orientation	Enetech / OEPC
		Lecture of Japan / Okinawa power system	
		Stabilization technology of electric power system	
		Country report	
11/28	Tue	Issues in Okinawa power system	Enetech / OEPC
		Introduction of renewal energy technology in Okinawa remote Islands	
		EDC system expalantion, implementation example	
11/29	Wed	Basic of Microgrid systems	Enetech / OEPC
11/30	Thu	Tarama Wind Turbine Hybrid System/Stabilizer/Photovoltaic System	Tarama Is./ Miyako Is
12/1	Fri	Miyako mega solar & EMS (Energy Management System) Experimental System	Miyako Is.
12/2	Sat		
12/3	Sun		
12/4	Mon	Abu Mega Solar	Okinawa mainland
12/5	Tue	Visit to JICA Headquarter	Tokyo
12/6	Wed	Visit to RE facility	Tokyo
12/7	Thu	Visit to DG power station facility	Tokyo
12/8	Fri	Closing ceremony at JICA Headquarter	Tokyo
12/9	Sat	returning to one's country	
12/10	Sun		

(5) Second part of work in Japan (target countries in the southern hemisphere, target countries in the northern hemisphere)

1) Organization of survey items

Sort survey items in preparation for the second field survey.

2) Organization of issues and challenges of DG power plant operation and maintenance works

Based on the findings of the field survey, existing DG units to be piloted for maintenance works will be considered.

3) Training program development

Efficient and effective training program (draft) will be developed for providing technical support.

4) Maintenance manual (draft) development

Develop a draft maintenance manual based on the information obtained in the first field survey.

5) Development of equipment procurement plan

Equipment procurement plan will be developed based on the information on the availability of the spare parts of the existing DG units and maintenance tools, parts that can be procured on site, and procurement route.

6) Preparation of lecture material on EDC

Based on the information on DG obtained in the first field survey, lecture material for the lecture on EDC will be prepared.

(6) Second field survey (target countries in the southern hemisphere, target countries in the northern hemisphere)

1) Basic knowledge of DG (lecture)

Basic knowledge of DG is provided through lectures.

2) Consultation on the draft maintenance manual

Organize the draft maintenance manual in collaboration with C/P.

3) Basic knowledge of RE technology (lecture)

Basic knowledge of RE is provided through lectures.

4) Consultation on the equipment to be provided by the project

Consult with C/P to finalize the list of equipment to be provided by the project, which is made based on the information obtained from the first field survey.

5) Lecture on EDC

Lecture on EDC, including its principle, measuring method of specific fuel consumption, and hands-on practice using a simple software will be conducted for facilitating understanding.

(7) The 8th Pacific Islands Leaders Meeting (PALM8)

Implementation status of this project will be reported with photos and videos at the 8th Pacific Islands Leaders Meeting (PALM8) to be held from May 18 and 19, 2018 in Fukushima prefecture.

(8) Third part of work in Japan

1) Preparation for training in Japan

Coordinate with stakeholders in the target countries on the members to participate in the training in Japan, and make travel arrangement (plane tickets, accommodation, visa, etc.)

(9) Training in Japan

Training in Japan is held in order to introduce DG maintenance-related technologies and know-how accumulated in the remote islands of Okinawa prefecture with hands-on experience (OJT) through collaboration in actual maintenance works for more effective technology transfer. The training will be implemented with the following consideration.

■ Introduction of DG inspection and maintenance-related technologies unique to the remote island region of Okinawa

A draft schedule for the training in Japan, with consideration on the point above, is shown below.

Training schedule in Japan

Item	1 st Week				2 nd Week				3 rd Week				4 th Week			
1.Disassembly																
2.Inspection, cleaning																
3.Assembly																
4.Commissioning																
5.Reporting																

(10) Third part of work in Japan (target countries in the southern hemisphere, target countries in the northern hemisphere)

1) Development of DG O&M work plan (draft)

Check sheets and maintenance manuals for inspection and maintenance works of pilot DG units are prepared.

2) Development of plans for specific fuel consumption test and load dump test

Prepare a manual for specific fuel consumption measurement to be conducted during the third field survey in order to compare the specific fuel consumption values measured before and after overhaul.

In addition, the responsiveness of DGs need to be confirmed to estimate the maximum RE penetration. A load dump test is therefore planned for the fourth field survey, and the testing measures will be determined in this part of work.

3) Development of RE O&M manual (draft)

Based on the information obtained during the previous field surveys, O&M manuals for RE facilities are prepared.

4) Development of planning manual for Hybrid Power Generation System

A draft planning manual for Hybrid Power Generation System, in consideration with the information obtained during the previous field surveys on the status of RE facility installation and operation, as well as future development plans, will be prepared.

(11) Third field survey (target countries in the southern hemisphere, target countries in the northern hemisphere)

1) Specific fuel consumption test at power plants

After the specific fuel consumption measurement manual is shared with the stakeholders, conduct specific fuel consumption test. The test will be implemented in the presence of the C/P to provide it as OJT.

2) Consultation on the draft DG O&M work plan

Consult with C/P to jointly finalize the draft DG O&M work plan prepared during the work in Japan.

3) Consultation on the draft RE facility O&M manual

Consult with C/P to jointly finalize the draft RE facility O&M manual prepared during the work in Japan.

4) Consultation on the draft planning manual for Hybrid Power Generation System

Consult with C/P to jointly finalize the draft planning manual for Hybrid Power Generation System prepared during the work in Japan.

5) Lectures on the algebraic method (maximum allowable RE penetration)

Lectures on the principle and calculation method of the algebraic method, which is a simplified method to calculate the allowable RE penetration in consideration with short-term RE fluctuations, will be provided.

(12) Fourth part of work in Japan (Tuvalu, and other target countries in the southern hemisphere)

1) Preparation for overhaul (Tuvalu)

Based on the DG O&M work plan, prepare for overhaul of pilot DG units selected based on the result of field survey in Tuvalu.

2) Preparation for measuring instruments (load dump test)

For calculating the allowable RE penetration in consideration of short-term RE fluctuations, load dump test needs to be conducted on site to confirm the response of the DG units. As the same number of measuring instruments as the DG units will be necessary, the instruments will be prepared in advance.

3) Preparation for holding a seminar in Fiji

A seminar is scheduled to be held in Fiji at the end of June 2019. The C/P from other four target countries will be invited to participate as well. Participant selection and other preparations will be conducted with coordination with the C/P of the target countries, JICA, and other stakeholders.

<Supplementary note>

For drafting a Hybrid Power Generation System development plan, the following considerations will be made.

- Conditions of the existing grid will be surveyed to assess the extent of readiness for RE integration.
- The extent of allowable RE integration in the existing grid is assessed to use as an indicator.
- Operational structure for maintenance works and its content is reviewed to identify necessary actions (DG replacement, improvement of maintenance works) to incorporate in the integration plan. A thorough consideration will be especially necessary for target countries whose readiness for integrating RE is considered insufficient, including operating DGs with a limited operating range due to insufficient maintenance work, etc.
- Status of RE integration is assessed to consider what needs to be incorporated in the development plan to fill the gap with the target value for future RE integration.

In specific, the following items will be considered to include in the development plan.

- Implementing appropriate O&M for the existing DGs
- Applying EDC for existing DGs
- Rehabilitation and replacement of existing DGs
- Integration of grid-connected PV
- Introduction of grid stabilization technologies and RE integration maximizing technologies (storage batteries, utilization of RE-derived energy for water pump operation, etc.)
- Integration of other RE (hydro, biomass, etc.)
- Efficient energy use and energy saving on the demand side (including LED lighting, etc.)
- Implementing appropriate O&M for the existing DGs

In island regions such as Oceania, many countries have a set of inspection items for the engine as well as auxiliary equipment, and periodic inspections are conducted by operators. However, in some cases, the list of inspection items exists only on paper and is not used at actual maintenance works. As a result, many of them resort to breakdown maintenance due to inability for early detection of malfunctions, causing operation to be hampered with a limited operating range, etc. This project therefore aims to solve the abovementioned issue by dispatching O&M experts for supporting the implementation of appropriate daily inspection and maintenance works. Additionally, OJT will be provided as well.

- Applying EDC for existing DGs

In island regions such as Oceania, many countries select DG units to be online according to the output capacity of each unit, often disregarding their operational efficiency such as specific fuel efficiency curves. In response, support measures will be provided for implementing economic load dispatching, in which the generator unit and the output appropriate for the system demand are selected based on the efficiency characteristics of each generator unit, for reducing fuel consumption. However, appropriate O&M of DG needs to be implemented as well, as it is a prerequisite for introducing EDC operation. In addition, the applicability of EDC operation needs to be confirmed with a survey, as EDC operation may not be appropriate for power plants where DG startups and shutdowns are automatically controlled, or automatic control of the DG output is implemented with isochronous control, load sharing, etc.

- Rehabilitation and replacement of existing DGs

A limit on the DG operational range is often set in many cases where maintenance works on the DGs are not properly implemented. As this is expected to cause problems in responding to load fluctuations and securing sufficient downward reserve for compensating RE output, appropriate rehabilitation of DG engines and auxiliary equipment will be implemented for readjusting the operational range to an appropriate level, and improve system operation. Additionally, the readjustment of the operational range will enable optimal operation, in which reduction of fuel

consumption is expected. This project will therefore provide technical support for the improvement of DG operation.

Meanwhile, in cases where DG output capacity is not sufficient for responding to the decrease and increase in system load, the reserve capacity of the system may not be sufficient for the planned RE integration. Therefore, depending on the system load and corresponding DG output capacity of the target countries, further integration RE will be facilitated through optimization of DG output capacity by DG replacement.

Other possible countermeasures for RE output fluctuations include improvement of system constant through readjusting the droop value of existing DGs, and increase in the number of units under LFC control by retrofitting existing DGs to add AFC function.

- Integration of grid-connected PV

As the solar resource conditions in target countries are relatively favorable for PV, mass integration of grid-connected PV may be incorporated in the RE integration plan. For planning a large-scale grid-connected PV integration, a thorough study on the impact of output fluctuations on the grid, as well as possible mitigation measures including storage battery installation and using multiple small-capacity PCS, need to be considered. In addition, it is critical to develop a system with as much versatility as possible to ensure sustainability of the system with sufficient operability for the target countries.

- Introduction of grid stabilization technologies and RE integration maximizing technologies (storage batteries, utilization of RE-derived energy for water pump operation, etc.)

The development plan which incorporates energy transition by introducing large-scale storage batteries as well as securing downward reserve by optimizing DG capacity will be implemented for system stabilization and maximization of RE integration. In addition, one component of the plan can be the use of controllable loads such as water pumps as RE output mitigation devices by introducing inverter control on them. Energy balance simulations to identify the optimal combination of components will be performed based on the information obtained with surveys to prioritize among them.

- Integration of other RE (hydro, biomass, etc.)

In view of the diversity of RE potential in Oceania, introduction of RE other than PV will be studied. In specific, substitution of diesel fuel with coconut oil, and development of micro hydropower system in the cooling water system of diesel power plants can be considered.

- Efficient energy use and energy saving on the demand side (including LED lighting, etc.)

Introduction of energy saving measures including improvement of energy-efficiency of large-scale load equipment such as hot water heaters and air conditioners, as well as converting streets lights to LED can be considered.

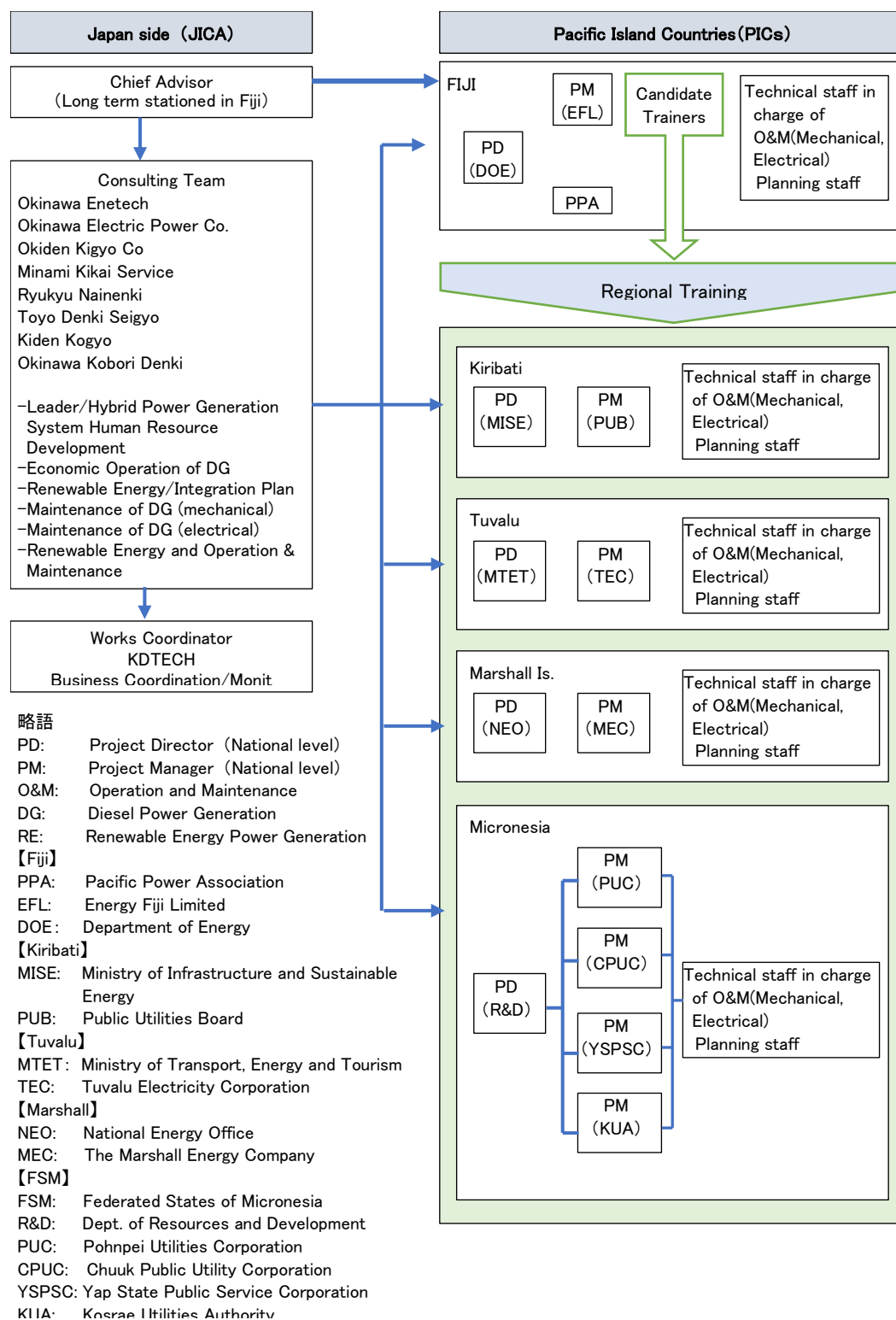
Studies on any of the items above will be conducted with the following considerations:

- RE integration needs to be implemented while ensuring grid stability.
- For the effectiveness and sustainability of the development plan, in addition to the technical aspect, due consideration will be given to the economic aspect for each stakeholder, including the donor as well as the government, implementing organizations, and the customers of the target countries. The bearer of initial investment and maintenance cost will be determined in due consideration with particular circumstances of the target region.

If some information necessary for conducting the study is lacking, collection measures for the information by field survey need to be identified beforehand.

5-1-4 Project implementation structure (including JCC structure)

The figure below shows the implementation structure of this project.



Project implementation structure

Draft Project Design Matrix (PDM)

Fiji

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: Republic of Fiji

Target Area: Vitilevu Island of Fiji

Target Group: Related engineers and other technical staff in the target area in Fiji (MOIT-DOE, PPA, FEA)

MOIT: Ministry of Infrastructure and Transport DOE: Department of Energy PPA: Pacific Power Association EFL: Fiji Electricity Authority

Final Beneficiaries: All training participants in regional training system in Fiji, including all target groups of Kiribati, Tuvalu, FSM and Marshall under the Project

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumptions
Overall Goal Necessary know-how and technologies for the Hybrid Power Generation System is continuously utilized by the target group of Fiji as well as other PICs.	1. Number* of training programs, trainers, participants and their countries, in training program related to Hybrid Power Generation System in Fiji after the project. 2. Utilization ratio of training materials provided by the Project 3. Number* of training participants who utilize the learnings from the training programs and seminars in Fiji. <i>*At the time of Project completion, specific target numbers are to be determined.</i>	1.and 2. Reports and interviews with C/P agencies 3. Follow-up questionnaire to training participants after the training	
Project Purpose Regional training system on the introduction of Hybrid Power Generation System is strengthened in Fiji.	1. Number* of qualified trainers for regional training program 2. Number* of foreign training participants in the region 3. More than 80% of training participants assess the training program (trainers, training curriculum, textbook) are good. 4. More than 80 % of training participants understand the training content. 5. More than 80% of training participants consider the training content is useful. <i>*Based on the review on progress of Project activities, specific target numbers are to be determined.</i>	1. Project related documents and evaluation by C/P agencies and Japanese experts on trainers, certification system in Fiji, if applied 2. Project related documents 3to 4 • Questionnaire to training participants at the end of training program • Evaluation by C/P agencies and Japanese experts on training participants	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.Training programs for appropriate and economical system of O&M for Diesel Generators (DGs) is prepared.	<Output 1> 1-1Number*of new/revised training programs 1-2Prepared/revised training materials 1-3Number*of trainings for trainers <i>*Based on the review on result of Project activities, specific target numbers are to be determined.</i>	1-11Project related documents, evaluation by Japanese experts and C/P agencies 1-2Documents of materials 1-3Project related documents, evaluation by Japanese experts and C/P agencies	Most of the trained trainers continue to work for EFL.
2.Training programs for methodology for appropriate planning and O&M of renewable energy (RE) is prepared.	<Output 2> 2-1Number* of new/revised training programs 2-2Prepared/revised training materials 2-3Number* of trainings for trainers <i>*Based on the review on result of Project activities, specific target numbers are to be determined.</i>	2-1Project related documents, evaluation by Japanese experts and C/P agencies 2-2Documents of materials 2-3Project related documents, evaluation by Japanese experts and C/P agencies	

Activities <Output 1>	Inputs		
1-1Operational conditions of the existing DGs in the target area of Fiji are reviewed to identify training needs. 1-2Capacity assessment of candidate trainers is conducted. 1-3Current related training activities and implementation structure are reviewed, including confirmation on objectively verifiable indicators. 1-4Training for trainers is implemented. 1-5Training guideline, curriculums, schedule and textbooks for new/revised training program are prepared. 1-6Necessary training equipment is identified and prepared (If necessary). 1-7New/revised training programs are conducted. 1-8The result of new training programs is evaluated, and lessons learned from evaluation are reflected to revised program. 1-9Future training programs including necessary budget after project completion are prepared. 1-10Knowledge on appropriate and economical system for O&M of DGs is disseminated among stakeholders through seminar.	(Japanese side) 1. Dispatch of the Japanese experts <u><JICA long term expert, stationed in Fiji ></u> - Hybrid Power Generation System <u><JICA short team expert team></u> -Team Leader / Operation & Maintenance of DG -Economic operation of DG -Maintenance support of DG (Mechanical expert) -Maintenance support of DG (Electrical expert) -O&M of RE energy -Integration of Renewable Energy -Project Coordinator 2. Training in Japan and Fiji 3. Equipment -In accordance with necessity of activities	(Fiji side) 1. Assignment of C/Ps -Project Director (P/D) -Project Manager (P/M) -Related Trainers of Trainings at XXX -Mechanical Staff -Electrical Staff -Planning officer, and others 2. Facilities and equipment -Project office 3.Recurrent costs - C/Ps’ wages and allowances - C/Ps’ travel expense	
<Output 2> 2-1Current situation and future development plan of RE in the target area of Fiji is reviewed to identify training needs. 2-2Operational conditions of the existing RE facilities are reviewed to identify training needs. 2-3Capacity assessment of candidate trainers is conducted. 2-4Current related training activities and implementation structure are reviewed, including confirmation on objectively verifiable indicators. 2-5Training for trainers is implemented. 2-6Training guideline, curriculums, schedule and textbooks for new/revised training program are prepared. 2-7Necessary training equipment is identified and prepared (If necessary). 2-8New/revised training programs are conducted. 2-9The result of new training programs is evaluated, and lessons learned from evaluation are reflected to next revised program. 2-10Future training programs including necessary budget after project completion are prepared. 2-11Knowledge on methodology for appropriate planning and O&M of renewable energy (RE) is disseminated among stakeholders.			<u>Preconditions</u> Contents of the current relevant policies on promotion of renewable energy and energy efficiency are not largely changed.

Draft Project Design Matrix (PDM)

Tuvalu

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: Tuvalu

Target Area: Funafuti

Target Group: Related engineers and other technical staff in the target area (MPU(Department of Energy) and TEC)

MPU: Ministry of Public Utilities (Department of Energy) TEC : Tuvalu Electricity Corporation

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumptions
<u>Overall Goal</u>	In comparison to the indicators at the time of baseline survey,		

Energy security is improved and greenhouse gases are reduced through the reduction of fossil fuels consumption.	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. 1to 3. Reports of C/P agencies	
<u>Project Purpose</u> Hybrid Power Generation System is introduced.	1. Improvement of specific fuel consumption of pilot DG units (better than the baseline data set at the beginning of the Project) 2. Improvement of performance ratio for RE power generation systems (better than the baseline data set at the beginning of the Project) 3. Proper application of planning and O&M method of Hybrid Power Generation System	1. Record on specific fuel consumption of Pilot DG units by C/P, checked by Japanese experts 2. Record on operation of RE power generation systems 3. Evaluation by Japanese experts and C/P on plans and O&M 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.
<u>Outputs</u> 1.Appropriate and economical system for O&M of Diesel Generators (DGs) is enhanced.	<Output 1> 1-1Adequacy on the use of the work schedule, check sheets and manual for the maintenance work for the pilot DG units 1-2Number of training participants who are conducting operation and maintenance of DG based on the learnings from the training program	1-1Evaluation by Japanese experts and C/P on improvement of maintenance work (daily/partial inspection/overhaul work) for pilot DG units 1-2Capacity assessment of trained maintenance staff and managers by Japanese experts	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.	<Output 2> 2-1Number of training participants who learned the planning method of the Hybrid Power Generation System 2-1Number of training participants who are conducting O&M of RE facilities based on the learnings from the training program 2-3Preparation of related manuals for Hybrid Power Generation System 2-4Adequacy of the use of the related manuals for Hybrid Power Generation System	2-1Capacity assessment of trained staff and managers by Japanese experts 2-2Capacity assessment of trained O&M staff and managers by Japanese experts 2-3Evaluation by Japanese Experts on related manuals for Hybrid Power Generation System prepared by C/P 2-4Evaluation by Japanese experts and C/P on the use of the related manuals for Hybrid Power Generation System	
	<u>Inputs</u>		
<u>Activities</u> <Output 1> 1-1Operational conditions of the existing DGs are reviewed, including confirmation of objectively verifiable indicators for overall goal and project purpose. 1-2Specific fuel consumption of pilot DG units is measured. 1-3Improvement plan for the operation of pilot DG units is prepared. 1-4Existing spare parts and maintenance tools of pilot DG units are confirmed. 1-5Improvement plan for the operation of pilG units is implemented. 1-6The result of implementation of the improvement plan is evaluated, and improvement plan is updated. 1-7The concept of Economic Dispatch Control (EDC) is shared among operators and applied, If possible. 1-8Necessary spare parts and maintenance tools for the pilot DG units are prepared. 1-9Maintenance work schedule for the pilot DG units is prepared. 1-10Check sheets and maintenance manuals for maintenance works for pilot DG units are prepared.	(Japanese side) 1. Dispatch of the Japanese experts <u><JICA long term expert, stationed in Fiji ></u> - Hybrid Power Generation System <u><JICA Consultant Team></u> -Team Leader / Operation & Maintenance of DG -Economic operation of DG -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	(Tuvalu 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	

1-11Maintenance works (daily/partial inspection/overhaul work) for pilot DG units are conducted in accordance with the maintenance schedule. 1-12The 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. 1-13Specific fuel consumption of the pilot DG units is measured before and after implementation of the related project activities. 1-14Related training programs for appropriate O&M system for DGs are implemented periodically. 1-15Knowledge on appropriate O&M of DGs is disseminated among stakeholders. <Output 2> 2-1Current situation and future development plan of RE is reviewed. 2-1Planning manual for Hybrid Power Generation System is prepared. 2-3Planning manual for Hybrid Power Generation System is reviewed and updated in the target area. 2-4Operating conditions of the existing RE facilities are reviewed, including confirmation of objectively verifiable indicators for overall goal and project purpose. 2-5O&M manual for RE facilities is prepared. 2-6Maintenance works are conducted according to O&M manual of RE facilities. 2-7The result of maintenance works is evaluated, and future maintenance work schedule together with budget is prepared. 2-8Training program for Hybrid Power Generation System including O&M of RE facilities is conducted 2-9Knowledge regarding Hybrid Power Generation System is disseminated among stakeholders.			Preconditions Contents of the current relevant policies on promotion of renewable energy and energy efficiency are not largely changed.

Draft Project Design Matrix (PDM)

Marshall

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: Republic of the Marshall Islands
Target Area: Majuro
Target Group: Related engineers and other technical staff in the target area (MRD and MEC)
MRD: Ministry of Resources and Development MEC: The Marshalls Energy Company

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumptions
<u>Overall Goal</u> 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. 1to 3. Reports of C/P agencies	
<u>Project Purpose</u> Hybrid Power Generation System is introduced.	1. Improvement of specific fuel consumption of pilot DG units (better than the baseline data set at the beginning of the Project)	1. Record on specific fuel consumption of Pilot DG units by C/P, checked by Japanese experts	C/P agencies continue commitment to the Project by continuing budget allocation as

	2. Number of the units Economic Dispatch Control (EDC) properly applied (Target number set at the beginning of the Project) 3. Improvement of performance ratio for RE power generation systems (better than the baseline data set at the beginning of the Project) 4. Proper application of planning and O&M method of Hybrid Power Generation System	2. Evaluation by Japanese experts on C/P agencies' application of EDC 3. Record on operation of RE power generation systems 4. Evaluation by Japanese experts and C/P on plans and O&M of Hybrid Power Generation System	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> 1-1Adequacy on the use of the work schedule, check sheets and manual for the maintenance work for the pilot DG units 1-2Number of training participants who are conducting operation and maintenance of DG based on the learnings from the training program 1-3Number of training participants who are operating DG based on the learnings from the training program of EDC 1-4Adequacy of the use of the EDC manual	1-1Evaluation by Japanese experts and C/P on improvement of maintenance work (daily/partial inspection/overhaul work) for pilot DG units 1-2Capacity assessment of trained maintenance staff and managers by Japanese experts 1-3Capacity assessment of trained operation staff and managers by Japanese experts 1-4Evaluation by Japanese experts and C/P on the use of EDC manual	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.	<Output 2> 2-1Number of training participants who learned the planning method of the Hybrid Power Generation System 2-2Number of training participants who are conducting O&M of RE facilities based on the learnings from the training program 2-3Preparation of related manuals for Hybrid Power Generation System 2-4Adequacy of the use of the related manuals for Hybrid Power Generation System	2-1Capacity assessment of trained staff and managers by Japanese experts 2-2Capacity assessment of trained O&M staff and managers by Japanese experts 2-3Evaluation by Japanese Experts on related manuals for Hybrid Power Generation System prepared by C/P 2-4Evaluation by Japanese experts and C/P on the use of the related manuals for Hybrid Power Generation System	
Activities <Output 1> 【Appropriate O&M System for DG】 1-1Operational conditions of the existing DGs are reviewed, including confirmation of objectively verifiable indicators for overall goal and project purpose. 1-2Specific fuel consumption of pilot DG units is measured. 1-3Improvement plan for the operation of pilot DG units is prepared. 1-4Existing spare parts and maintenance tools of pilot DG units are confirmed. 1-5Improvement plan for the operation of pilot DG units is implemented. 1-6The result of implementation of the improvement plan is evaluated, and improvement plan is updated. 1-7Necessary spare parts and maintenance tools for the pilot DG units are prepared. 1-8Maintenance work schedule for the pilot DG units is prepared. 1-9Check sheets and maintenance manuals for maintenance works for pilot DG units are prepared. 1-10Maintenance works (daily/partial inspection/overhaul work) for pilot DG units are conducted in accordance with the maintenance schedule. 1-11The 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. 1-12Specific fuel consumption of the pilot DG units is measured before and after implementation of the related project activities.	Inputs (Japanese side) 1. Dispatch of the Japanese experts <JICA long term expert, stationed in Fiji > - Hybrid Power Generation System <JICA Consultant Team> -Team Leader / Operation & Maintenance of DG -Economic operation of DG -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		
		(RMI 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	

1-13Related training programs for appropriate O&M system for DGs are implemented periodically. 1-14Knowledge on appropriate O&M of DGs is disseminated among stakeholders. 【Economical Operation of DGs (EDC)】 1-15EDC manual is prepared. 1-16Training program for Economic Dispatch Control (EDC) is conducted. 1-17EDC system is introduced at pilot DG power plants on trial basis. 1-18Knowledge on economical operation of DGs is disseminated among stakeholders. <Output 2> 2-1Current situation and future development plan of RE is reviewed. 2-2Planning manual for Hybrid Power Generation System is prepared. 2-3Planning manual for Hybrid Power Generation System is reviewed and updated in the target area. 2-4Operating conditions of the existing RE facilities are reviewed, including confirmation of objectively verifiable indicators for overall goal and project purpose. 2-5O&M manual for RE facilities is prepared. 2-6Maintenance works are conducted according to O&M manual of RE facilities. 2-7The result of maintenance works is evaluated, and future maintenance work schedule together with budget is prepared. 2-8Training program for Hybrid Power Generation System including O&M of RE facilities is conducted. 2-9Knowledge regarding Hybrid Power Generation System is disseminated among stakeholders.			Preconditions Contents of the current relevant policies on promotion of renewable energy and energy efficiency are not largely changed.

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)

Micronesia

DRD: Department of Resources and Development PUC:Pohnpei Utilities Corporation KUA: Kosrae Utilities Authority YSPSC:Yap State Public Service Corporation CPUC:Chuuk Public Utility 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	

<u>Project Purpose</u> Hybrid Power Generation System is introduced.	1. Improvement of specific fuel consumption of pilot DG units (better than the baseline data set at the beginning of the Project) 2. Number of the units Economic Dispatch Control (EDC) properly applied (Target number set at the beginning of the Project) 3. Improvement of performance ratio for the RE power generation systems (better than the baseline data set at the beginning of the Project) 4. Proper application of planning and O&M method of Hybrid Power Generation System <i>*Based on the review on result of Project activities, specific target numbers are to be determined.</i>	1. Record on specific fuel consumption of Pilot DG units by C/P, checked by Japanese experts 2. Evaluation by Japanese experts on C/P agencies' application of EDC 3. Record on operation of RE power generation systems 4. 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.
<u>Outputs</u> 1.Appropriate and economical system for O&M of Diesel Generators (DGs) i	<Output 1> 1-1Adequacy on the use of the work schedule, check sheets and manual for the maintenance work for the pilot DG units 1-2Number of training participants who are conducting operation and maintenance of DG based on the learnings from the training program 1-3Number of training participants who are operating DG based on the learnings from the training program of EDC 1-4Adequacy of the use of the EDC manual	1-1Evaluation by Japanese experts and C/P on improvement of maintenance work (daily/partial inspection/overhaul work) for pilot DG units 1-2Capacity assessment of trained maintenance staff and managers by Japanese experts 1-3Capacity assessment of trained operation staff and managers by Japanese experts 1-4Evaluation by Japanese experts and C/P on the use of EDC manual.	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.	<Output 2> 2-1Number of training participants who learned the planning method of the Hybrid Power Generation System 2-2Number of training participants who are conducting O&M of RE facilities based on the learnings from the training program 2-3Preparation of related manuals for Hybrid Power Generation System 2-4Adequacy of the use of the related manuals for Hybrid Power Generation System	2-1Capacity assessment of trained staff and managers by Japanese experts 2-2Capacity assessment of trained O&M staff and managers by Japanese experts 2-3Evaluation by Japanese Experts on related manuals for Hybrid Power Generation System prepared by C/P 2-4Evaluation by Japanese experts and C/P on the use of the related manuals for Hybrid Power Generation System	
<u>Activities</u> <Output 1> 【Appropriate O&M System for DG】 1-1Operational conditions of the existing DGs are reviewed, including confirmation of objectively verifiable indicators for overall goal and project purpose. 1-2Specific fuel consumption of pilot DG units is measured. 1-3Improvement plan for the operation of pilot DG units is prepared. 1-4Existing spare parts and maintenance tools of pilot DG units are confirmed. 1-5Improvement plan for the operation of pilot DG units is implemented. 1-6The result of implementation of the improvement plan is evaluated, and improvement plan is updated. 1-7Necessary spare parts and maintenance tools for the pilot DG units are prepared. 1-8Maintenance work schedule for the pilot DG units is prepared.	<u>Inputs</u>		<u>Preconditions</u> Contents of the current relevant policies on promotion of renewable energy and energy efficiency are not largely changed.
		(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	

1-9Check sheets and maintenance manuals for maintenance works for pilot DG units are prepared. 1-10Maintenance works (daily/partial inspection/overhaul work) for pilot DG units are conducted in accordance with the maintenance schedule. 1-11The 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. 1-12Specific fuel consumption of the pilot DG units is measured before and after implementation of the related project activities. 1-13Related training programs for appropriate O&M system for DGs are implemented periodically. 1-14Knowledge on appropriate O&M of DGs is disseminated among stakeholders. 【Economical Operation of DGs (EDC)】 1-15EDC manual is prepared. 1-16Training program for Economic Dispatch Control (EDC) is conducted. 1-17EDC system is introduced at pilot DG units on trial basis. 1-18Knowledge on economical operation of DGs is disseminated among stakeholders. <Output 2> 2-1Current situation and future development plan of RE is reviewed. 2-2Planning manual for Hybrid Power Generation System is prepared. 2-3Planning manual for Hybrid Power Generation System is reviewed and updated in the target area. 2-4Operating conditions of the existing RE facilities are reviewed, including confirmation of objectively verifiable indicators for overall goal and project purpose. 2-5O&M manual for RE facilities is prepared. 2-6Maintenance works are conducted according to O&M manual of RE facilities. 2-7The result of maintenance works is evaluated, and future maintenance work schedule together with budget is prepared. 2-8Training program for Hybrid Power Generation System including O&M of RE facilities is conducted 2-9Knowledge regarding Hybrid Power Generation System is disseminated among stakeholders.			

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: Republic of Kiribati

Target Area: Tarawa

Target Group: Related engineers and other technical staff in the target area (MPWU and PUB)

MPWU: Ministry of Public Works and Utilities PUB: Public Utilities Board

Kiribati

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumptions
<u>Overall Goal</u> 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	1.1 to 3. Reports of C/P agencies	
<u>Project Purpose</u> Hybrid Power Generation System is introduced.	1. Improvement of specific fuel consumption of pilot DG units (better than the baseline data set at the beginning of the Project) 2. Improvement of performance ratio for RE power generation systems (better than the baseline data set at the beginning of the Project) 3. Proper application of planning and O&M method of Hybrid Power Generation System	1. Record on specific fuel consumption of Pilot DG units by C/P, checked by Japanese experts 2. Record on operation of RE power generation systems 3. Evaluation by Japanese experts and C/P on plans and O&M 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.
<u>Outputs</u> 1.Appropriate and economical system for O&M of Diesel Generators (DGs) is enhanced.	<Output 1> 1-1Adequacy on the use of the work schedule, check sheets and manual for the maintenance work for the pilot DG units 1-2Number of training participants who are conducting operation and maintenance of DG based on the learnings from the training program	1-1Evaluation by Japanese experts and C/P on improvement of maintenance work (daily/partial inspection/overhaul work) for pilot DG units 1-2Capacity assessment of trained maintenance staff and managers by Japanese experts	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.	<Output 2> 2-1Number of training participants who learned the planning method of the Hybrid Power Generation System 2-2Number of training participants who are conducting O&M of RE facilities based on the learnings from the training program 2-3Preparation of related manuals for Hybrid Power Generation System 2-4Adequacy of the use of the related manuals for Hybrid Power Generation System	2-1Capacity assessment of trained staff and managers by Japanese experts 2-2Capacity assessment of trained O&M staff and managers by Japanese experts 2-3Evaluation by Japanese Experts on related manuals for Hybrid Power Generation System prepared by C/P 2-4Evaluation by Japanese experts and C/P on the use of the related manuals for Hybrid Power Generation System	
<u>Activities</u> <Output 1> 1-1Operational conditions of the existing DGs are reviewed, including confirmation of objectively verifiable indicators for overall goal and project purpose. 1-2Asset management plan of DG is reviewed including financial evaluation on overhaul. 1-3Specific fuel consumption of pilot DG units is measured. 1-4Improvement plan for the operation of pilot DG units is prepared. 1-5Existing spare parts and maintenance tools of pilot DG units are confirmed. 1-6Improvement plan for the operation of pilot DG units is implemented. 1-7The result of implementation of the improvement plan is evaluated, and improvement plan is updated. 1-8The concept of Economic Dispatch Control (EDC) is shared among operators and applied, if possible. 1-9Necessary spare parts and maintenance tools for the pilot DG units are prepared. 1-10Maintenance work schedule for the pilot DG units is prepared. 1-11Check sheets and maintenance manuals for maintenance works for pilot DG units are prepared.	<u>Inputs</u>		<u>Preconditions</u> Contents of the current relevant policies on promotion of renewable energy and energy efficiency are not largely changed.
	(Japanese side) 1. Dispatch of the Japanese experts <JICA long term expert, stationed in Fiji > - Hybrid Power Generation System <JICA Consultant Team> -Team Leader / Operation & Maintenance of DG -Economic operation of DG -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	(Kiribati 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	

1-12Maintenance works (daily/partial inspection/overhaul work) for pilot DG units are conducted in accordance with the maintenance schedule. 1-13The 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. 1-14Specific fuel consumption of the pilot DG units is measured before and after implementation of the related project activities. 1-15Related training programs for appropriate O&M system for DGs are implemented periodically. 1-16Knowledge on appropriate O&M of DGs is disseminated among stakeholders. <Output 2> 2-1Current situation and future development plan of RE is reviewed, including confirmation of objectively verifiable indicators for overall goal and project purpose. 2-2Planning manual for Hybrid Power Generation System is prepared. 2-3Planning manual for Hybrid Power Generation System is reviewed and updated in the target area. 2-4Operating conditions of the existing RE facilities are reviewed, including confirmation of objectively verifiable indicators for overall goal. 2-5O&M manual for RE facilities is prepared. 2-6Maintenance works are conducted according to O&M manual of RE facilities. 2-7The result of maintenance works is evaluated, and future maintenance work schedule together with budget is prepared. 2-8Training program for Hybrid Power Generation System including O&M of RE facilities is conducted. 2-9Knowledge regarding Hybrid Power Generation System is disseminated among stakeholders.			

5-2. Points to note for project implementation

The following points will be taken into consideration for project implementation:

(1) Utilizing know-how from power supply business operations in remote islands

Considering that the power system in the target countries except Fiji is quite small, due attention will be paid to utilize the accumulated know-how and technologies through the power supply business operations in remote islands with power system of relatively similar size with those of the target countries, especially related to the introduction and operation of the DG-RE Hybrid Power Generation System, for technology transfer. Continuation of appropriate technical transfer within the target countries will also be considered by making teaching materials not only in textbook format but also in video format, etc.

(2) Work plan and implementation structure for the project with a wide target area

As this project has a large target area encompassing Fiji, Tuvalu, and Kiribati in the northern hemisphere as well as FSM and RMI in the southern hemisphere, the physical distances between these countries are long, and the number of flights is not necessarily many. Work plan and implementation structure will be determined in due consideration for flight transfer, travel time, and safety. Efficient implementation of the project work will also be considered by scheduling field works in a balanced manner for each country without only focusing on particular countries.

(3) Collaboration with JICA Chief Advisor

JICA Chief Advisor oversees the entire project in order to strengthen the regional training system in Fiji related to development of the Hybrid Power Generation System, and to develop the Hybrid Power Generation System in Tuvalu, Kiribati, FSM, and RMI. In addition, the Chief Advisor will also follow-up on the on-site activities in each of the target countries by the Expert Team for technology transfer, as necessary. Therefore, the Chief Advisor conducts part of the work independently, and for matters concerning the entire project, the Chief Advisor will have consultations and coordination with the C/P of the target countries, based on suggestions and inputs from the Expert Team.

(4) Ensuring project flexibility and ownership

For technical cooperation projects aiming for technology transfer, flexibility in revising project activities in response to C/P performance and changes in project circumstances is necessary. To do so, the overall progress of the project and emerging outcomes will be closely followed for making suggestions on the direction of the project as needed. In addition, when conducting work, collaboration with the C/Ps will be made as much as possible for enhancing project sustainability with the C/Ps' project ownership cultivated through the collaboration.

5-3. Project monitoring

During the project implementation, based on the work implementation plan in the Plan of Operation (PO), Project Monitoring Sheet will be made for assessing the progress of the project jointly by JICA and implementing organizations of the target countries at the annual Joint Coordination Committee. In addition, during the implementation process, work progress reports will be prepared regularly (after one year for the first report, and every year in the following years) for reporting the implemented tasks to JICA.

6. Transition of the project

6-1. Revision of the Project Design Matrix (PDM)

No revision was made on the Project Design Matrix (hereinafter PDM) throughout the project period.

6-1-1 Holding JCC meetings

Revisions on the PDM are discussed at the annual JCC meetings and are formalized after both JICA and C/P sides agree with the revision. The JCC meetings with each target country were held as shown below.

	Fiji	Tuvalu	Kiribati	FSM	RMI
1st JCC meeting	Oct. 2, 2017	Sep. 11, 2017	Sep.20, 2017	Nov. 25, 2017	Dec. 4, 2017
	On-site	On-site	On-site	On-site	On-site
2nd JCC meeting	Dec.14, 2018	Nov. 5, 2018	Oct. 26, 2018	Jan. 29, 2019	Feb. 5, 2019
	On-site	On-site	On-site	On-site	On-site
3rd JCC meeting	Nov.15, 2019	Oct. 14, 2019	Oct. 3, 2019	Jan. 24, 2020	Jan.31,2020
	On-site	On-site	On-site	On-site	On-site
4th JCC meeting	Nov. 9, 2021	Oct. 27, 2021	Oct. 29, 2021	Oct. 26, 2021	Nov. 1, 2021
	Online	Online	Online	Online	Online
5th JCC meeting	Feb.10, 2023	May 9, 2023	Oct. 7, 2022	Apr. 7, 2023	Mar.22,2023
	On-site	Online	On-site	Online	On-site

6-1-2 Revisions on the PDM

Record of PDM revision at the abovementioned JCC meetings is shown below.

	Fiji	Tuvalu	Kiribati	Micronesia	Marshall
1st JCC meeting	Oct.2, 2017	Sep. 11, 2017	Sep.20, 2017	Nov. 25, 2017	Dec. 4, 2017
	No revision	No revision	No revision	No revision	No revision
2nd JCC meeting	Dec.14, 2018	Nov. 5, 2018	Oct. 26, 2018	Jan. 29, 2019	Feb. 5, 2019
	No revision	No revision	No revision	No revision	No revision
3rd JCC meeting	Nov.15, 2019	Oct. 14, 2019	Oct. 3, 2019	Jan. 24, 2020	Jan.31,2020
	No revision	No revision	No revision	No revision	No revision
4th JCC meeting	Nov. 9, 2021	Oct. 27, 2021	Oct. 29, 2021	Oct. 26, 2021	Nov. 1, 2021
	No revision	No revision	No revision	No revision	No revision
5th JCC meeting	Feb.10, 2023	May 9, 2023	Oct. 7, 2022	Apr. 7, 2023	Mar.22, 2023
	No revision	No revision	No revision	No revision	No revision

6-2. Revisions on the Plan of Operation (PO)

Plan of Operation (hereafter PO) is a document used to review the progress of the items written on

the PDM by comparing the plan and result at annual JCC meetings. PO is revised annually at the JCC meetings.

6-2-1 Holding JCC meetings.

In phase 2 of the project, revisions on the PO are discussed at the annual JCC meetings and are formalized after both JICA and C/P sides agree with the revision. The JCC meetings with each target country were held as shown below.

	Fiji	Tuvalu	Kiribati	Micronesia	Marshall
1st JCC meeting	Oct.2, 2017	Sep. 11, 2017	Sep.20, 2017	Nov. 25, 2017	Dec. 4, 2017
	On-site	On-site	On-site	On-site	On-site
2nd JCC meeting	Dec.14, 2018	Nov. 5, 2018	Oct. 26, 2018	Jan. 29, 2019	Feb. 5, 2019
	On-site	On-site	On-site	On-site	On-site
3rd JCC meeting	Nov.15, 2019	Oct. 14, 2019	Oct. 3, 2019	Jan. 24, 2020	Jan.31,2020
	On-site	On-site	On-site	On-site	On-site
4th JCC meeting	Nov. 9, 2021	Oct. 27, 2021	Oct. 29, 2021	Oct. 26, 2021	Nov. 1, 2021
	Online	Online	Online	Online	Online
5th JCC meeting	Feb.10, 2023	May 9, 2023	Oct. 7, 2022	Apr. 7, 2023	Mar.22, 2023
	On-site	Online	On-site	Online	On-site

6-2-2 Revisions on the PO

Record of PO revision at the abovementioned JCC meetings is shown below.

	Fiji	Tuvalu	Kiribati	Micronesia	Marshall
1st JCC meeting	Oct.2, 2017	Sep. 11, 2017	Sep.20, 2017	Nov. 25, 2017	Dec. 4, 2017
	Revised	Revised	Revised	Revised	Revised
2nd JCC meeting	Dec.14, 2018	Nov. 5, 2018	Oct. 26, 2018	Jan. 29, 2019	Feb. 5, 2019
	Revised	Revised	Revised	Revised	Revised
3rd JCC meeting	Nov.15, 2019	Oct. 14, 2019	Oct. 3, 2019	Jan. 24, 2020	Jan.31,2020
	Revised	Revised	Revised	Revised	Revised
4th JCC meeting	Nov. 9, 2021	Oct. 27, 2021	Oct. 29, 2021	Oct. 26, 2021	Nov. 1, 2021
	Revised	Revised	Revised	Revised	Revised
5th JCC meeting	Feb.10, 2023	May 9, 2023	Oct. 7, 2022	Apr. 7, 2023	Mar.22,2023
	Revised	Revised	Revised	Revised	Revised

6-3. Online training

Although this project was designed to provide technical support mainly through on-site activities, as COVID-19 pandemic made traveling overseas infeasible, online trainings in lieu of on-site trainings were conducted via Zoom, an online meeting platform. The online trainings were held for 190 times in total (88 times for DG, 102 times for RE) during the period of travel restriction between April 2020 and

March 2023. The details of the activities are described in sections 8-1 through 8-7.

For online trainings, precautions for preventing virus infections among lecturers were taken in the classroom used at the Japanese side, including seat arrangement that maintained physical distance, forced ventilation, and acrylic boards for droplet infection prevention.

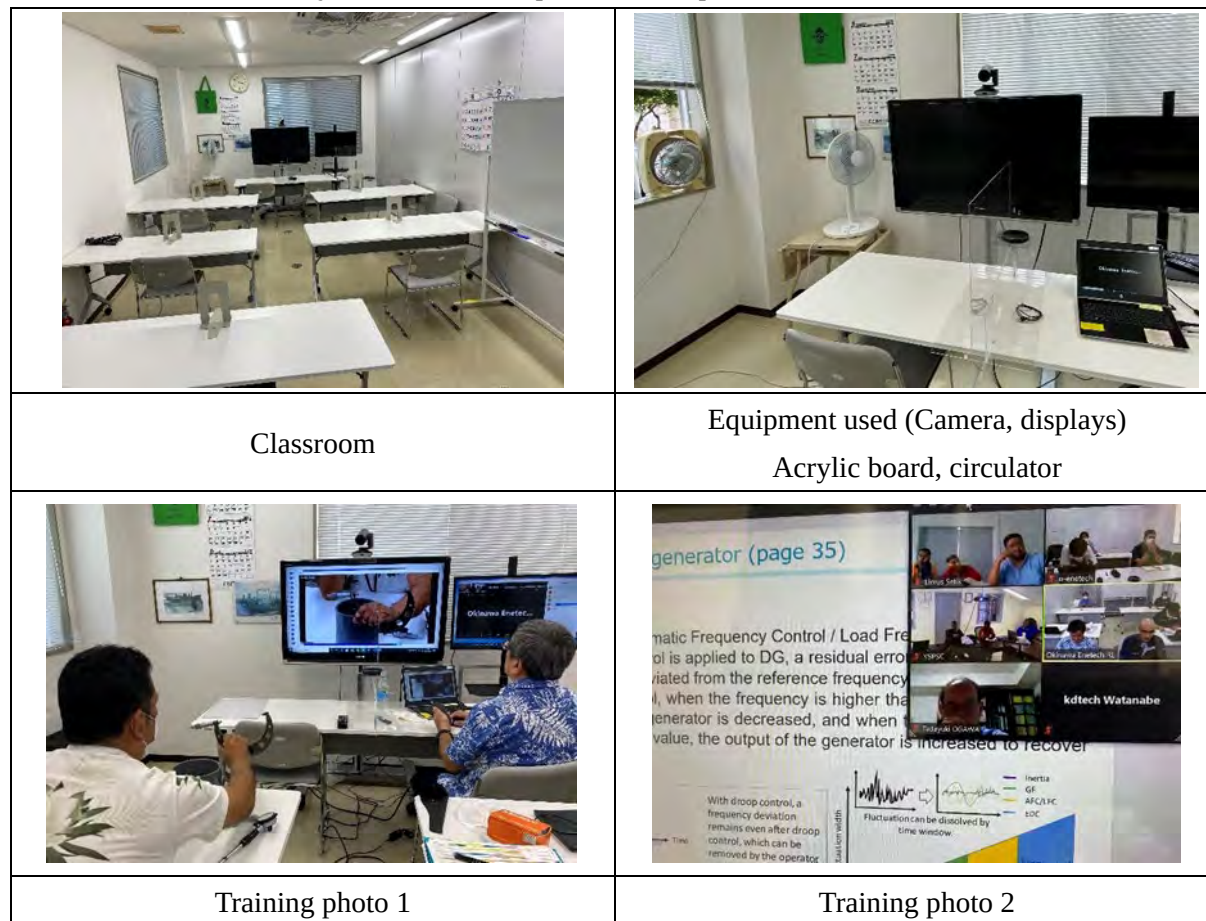


Figure 6.3.1 Classroom setup and photos of online trainings

6-4. Derivative works from the project

(1) Activity related to “System Analysis Simulation and Study of System Stabilization Measures in Samoa (Phase 1)”

① Background

It is expected that the energy sector in Oceania will connect more RE to the power system to supply power to consumers in the future. Samoa is no exception, with the goal of supplying 70% of domestic electricity with RE by 2031, and already in 2018, 50% of the Upolu's electricity is supplied by RE such as hydro, solar, and wind power. Among these, PV, which is variable RE, has been increasing in recent years.

When the supply ratio of these variable RE increases, a compensation function for maintaining the balance between supply and demand is required due to the output fluctuations which will require a complicated system operation. During times of low load on weekends, even at present, the power

demand can be met entirely with hydropower and PV, so Electric Power Corporation (hereafter EPC) has begun a study to realize a power supply with 100% RE temporarily by stopping the DGs. In addition, EPC is conducting a bid for an IPP operator to supply power generation from RE and grid stabilization services in order to achieve a 100% RE power supply, and the successful bidder plans to deploy facilities such as PV, wind power, and storage batteries in stages.

On the other hand, in order to stop all diesel generators and realize a 100% RE power supply, it is indispensable to consider in advance issues and countermeasures related to system stability such as the reduction in reactive power regulation capacity, reduction in short-circuit capacity, and reduction in inertia due to the decrease in the capacity of the synchronous generators connected to the power system.

In addition, EPC recognizes that it is necessary to investigate the stability of the entire power system, including all existing RE and the RE to be deployed by the IPP operator. As such, EPC conveyed its intention of requesting cooperation for the implementation of a grid simulation and consideration of necessary countermeasures. Although Samoa is not a target country of this project, its penetration of variable RE is very high, so it was deemed appropriate to conduct a case study in Samoa to increase RE penetration in the five target countries of this project by identifying issues and examining countermeasures through power system analysis and simulation, which led to the decision to conduct this study.

② Activity period

January 2021 - March 2022

③ Activity overview

Create a system model that simulates the Upolu power system of Samoa, perform a simulation analysis assuming a 100% RE power supply, identify issues, and study and propose necessary measures. In addition, the knowledge based on the activities and survey results will be shared with the five target countries of this project. Additionally, final report will be submitted as a deliverable. The front page and table of contents of the report are shown below.

**JICA Project for the Introduction of Hybrid Power
Generation System in Pacific Island Countries
【System Analysis Simulation and Study of System
Stabilization Measures in Samoa】**

Final Report

March 2022

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

Joint Venture

(Representative: Okinawa Enetech Co., Inc.

Constituent: Okinawa Electric Power Co., Inc.)

**(Subcontractor: Central Research Institute of Electric Power
Industry, Denryoku Computing Center, Ltd.)**

Figure 6.4.1 Front page of the final report

“System Analysis Simulation and Study of System Stabilization Measures in Samoa”

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3.2. Work overview for the target region

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3.4. Project implementation structure

3.5. Project cooperation period (Phase 2)

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4.2. Future RE integration plans and targets (Master Plan)

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5.3 Basic information on power facilities (generation, transmission, and distribution) such as system diagram and specifications of each facility

5.4 Information pertaining to power demand

5.5 Information pertaining to generation (including RE operation)

5.6 Basic information pertaining to storage battery and control system⁴⁶

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“System Analysis Simulation and Study of System Stabilization Measures in Samoa”

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“System Analysis Simulation and Study of System Stabilization Measures in Samoa”

(2) Activity related to “Survey and Analysis of Grid Stabilization in Tuvalu and Analysis of the Results”

① Background

PV has been integrated on Fongafale Island, where Funafuti, the capital of Tuvalu, is located, but at present, DG is used as the main power source. In the process of increasing RE penetration by replacing DG with PV and wind power, it will be essential to rebuild the power system while addressing the issues that are expected to arise. In particular, it is critical to understand how the reduction of DGs, which play an important role in the stable operation of the power system, could affect the system and to take the necessary countermeasures.

In this activity, the target area is Fongafale Island (Funafuti grid), and a survey on grid stabilization will be conducted to provide assistance in establishing an appropriate system for this grid, taking into account the transition in the power supply composition from DG to RE.

② Activity overview

In this study, technologies for mitigating RE output fluctuations and grid stabilization (hybrid power generation system technology) in small stand-alone grids will be surveyed and studied based on the expertise gained through demonstration tests conducted on such grids. In addition, challenges related to the integration of RE in the Funafuti grid will be identified, and countermeasure technologies for grid stabilization will be proposed to aid the construction of an appropriate system for the grid.

Since the results of this study are expected to serve as a reference for solving similar problems in many Pacific Island Countries aiming to supply 100% of their electricity with RE, the findings of this study will be shared with the other target countries (Fiji, Kiribati, FSM, and RMI) as a hint to aid them in solving similar challenges.

Additionally, final report will be submitted as a deliverable. The front page and table of contents of the report are shown below.

Tuvalu

Tuvalu Electricity Corporation (TEC)

Tuvalu

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

【Survey and Analysis of Grid Stabilization in Tuvalu and
Analysis of the Results】

Final Report

March 2022

Japan International
Cooperation Agency (JICA)

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

Figure 6.4.4 Front page of the final report

“Survey and Analysis of Grid Stabilization in Tuvalu and Analysis of the Results”

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 - 6.3. Overseas case studies

Figure 6.4.5 Table of contents of the final report
“Survey and Analysis of Grid Stabilization in Tuvalu and Analysis of the Results”

(3) Addition of participating countries for regional trainings (Third Country Training Program)

As a Third Country Training Program of this project, regional trainings for the core trainers from four of the target countries namely Tuvalu, Kiribati, FSM, and RMI, who were each in charge of a particular topic on “DG O&M”, “Hybrid Power Generation Plan”, and “RE O&M”, were originally planned to be held at the EFL-owned Lautoka Training Centre in Fiji under the EFL’s leading role. In addition to those, expanded regional trainings for seven additional countries, namely Samoa, Tonga, Cook Islands, Nauru, Papua New Guinea, Solomon Islands, and Palau, were held for three times during the project period.

The abovementioned seven countries are members of the Pacific Power Association (PPA), and they requested for participating in a Third Country Training Program at the PPA’s annual conference, so the decision was made to hold additional trainings for them.

②Activity overview (for details, see 8-7.(2))

1) Training record

The Expanded Regional Trainings for the seven additional countries were held as follows:

	Field	1st training (online)	2nd training (online)	3rd training (Fiji)
Date	DG	March 2 to March 10, 2021	March 29 to April 8, 2022	April 17 to April 21, 2023
	RE	March 16 to March 24, 2021	April 19 to April 28, 2022	April 24 to April 28, 2023
Number of participants	DG	From 7 countries 15 participants	From 7 countries 15 participants	16 (including 2 observers from Palau)
	RE	From 7 countries 16 participants	From 7 countries 13 participants	20 (1 participant from Tonga was absent)

2) Training overview

- Curriculum for the 1st Expanded Regional Training for the additional countries

【DG Training】

Schedule for DG O&M Expanded countries Training

(March 2nd to 10th, 2021)

No.	Contents	Trainer / Person in charge	Time
1st day • March 2nd, (Tue)			
1	• Introduction, Orientation, Objective of the Training	Kakefuku	13:00~13:05 (5 min) (JST 10:00~10:05)
2	• Greetings from JICA	Mrs. Ono Mr. Ogawa	13:05~13:15 (10 min) (JST 10:05~10:15)
3	• Greetings from EFL	Mr. Uate	13:15~13:20 (5 min) (JST 10:15~10:20)
4	• Greetings from each participant countries	Each country participants	13:20~13:30 (10 min) (JST 10:20~10:25)
5	• Country Report presentation and	Each country	13:30~16:00 (150min)

	discussion Cook Islands, Nauru, Palau, PNG, Samoa, Solomon Islands and Tonga	participants	(JST 10:30~13:00)
2nd day • March 3rd, (Wed)			
6	• Safety • Basic principle, basics symbols, features, composition of DEG • Operating procedure of power plant.	Mr. Epeli	13:00~15:00 (120 min) (JST 10:00~12:00)
7	• Main equipment of DEG (Mechanical)	Mr. Semesa	15:00~16:30 (90 min) (JST 12:00~13:30)
3rd day • March 4th, (Thu)			
8	• Management of operation of diesel power plant. Trouble shooting • EDC (Economical Load Dispatch Control)	Mr. Semesa	13:00~14:30 (90 min) (JST 10:00~11:30)
9	• Main equipment of DEG (Electrical)	Mr. Anasa	14:30~16:30 (120 min) (JST 10:00~12:00)
4th day • March 5th, (Fri)			
10	• Supply and Demand Management • EFL System Control (National Control Centre)	Mr. Sabitesh	13:00~14:00 (60 min) (JST 10:00~11:00)
11	• Power plant maintenance and inspection (Overview)	Mr. Sumendra Mr. Waisea	14:00~15:00 (60 min) (JST 11:00~12:00)
12	• Practice in the use of measuring equipment and special tools.	Mr. Rusiate	15:00~16:30 (90 min) (JST 12:00~13:00)
5th day • March 9th, (Tue)			
13	• Practice in the use of measuring equipment and special tools.	Mr. Rusiate	13:00~14:00 (60 min) (JST 10:00~11:00)
14	• Maintenance of DEG (Mechanical)	Mr. Tobia, Mr. Etika	14:00~16:00 (120 min) (JST 11:00~13:00)
6th day • March 10th, (Wed)			
15	• Maintenance of DEG (Electrical)	Mr. Neipolione	13:00~15:00 (120 min) (JST 10:00~12:00)
16	• Closing • Greetings from each country • Greetings from JICA	Mr. Ogawa	15 : 00~16:00

【RE Training】

Schedule for Expanded countries • RE Implementation, O&M Training

(March 16th to 24th, 2021)

No.	Contents	Trainer / Person in charge	Time
1st day • March 16th , (Tue)			
1	• Introduction Orientation	Kakefuku	13:00~13:05 (5 min) (JST 10:00~10:05)
2	• Greetings from JICA	Mrs. Ono Mr. Ogawa	13:05~13:15 (10 min) (JST 10:05~10:15)
3	• Greetings from EFL	Mr. Uate	13:15~13:20 (5 min)

			(JST 10:15~10:20)
4	• Greetings from each participant country	Each country participants	13:20~13:25 (5 min) (JST 10:20~10:30)
5	• Country Report presentation and discussion Cook Islands, Nauru, Palau, PNG, Samoa, Solomon Islands and Tonga	Each country participants	13:30~16:30 (180min) (JST 10:30~13:30)
2nd day • March 17th , (Wed)			
6	• Basic technology of Hybrid Power Generation Systems (HPGS) →Overview of RE, types, composition, etc.	Mr. Deepak	13:00~15:00 (120min) (JST 10:00~12:00)
7	→OTEC, Geothermal Power generation • Concept of Hybrid Power Generation system (HPGS)	Mr. Waisale	15:00~16:30 (90 min) (JST 12:00~13:30)
3rd day • March 18th , (Thu)			
8	• Integration of RE →Variability of RE (Solar & Wind) generation system →Possible impact on the grid operation by integrating RE generation systems	Mr. Sabitesh	13:00~14:00 (60 min) (JST 10:00~11:00)
9	• Integration of RE →Countermeasures for the mitigation of the impact on the grid →Planning methodology for the Roadmap of RE integration.	Mr. Krishneel	14:00~16:30 (150 min) (JST 11:00~16:30)
4th day • March 19th, (Fri)			
10	• PV plan & system design →FS study →Plan and Design	Mr. Jese	13:00~14:30 (90min) (JST 10:00~11:30)
11	• PV plan & system design →Design of PV array、Cable design、Lightning protection design、Grounding design、Metering device、Balance of system selection	~~Mr. Stiveni~~ Mr. Mitieli	14:30~16:30 (120 min) (JST 11:30~16:30)
5th day • March 23rd , (Tue)			
12	• PV plan & system design →Consideration of interconnection point、Estimation of PV power generation、Cost Estimation, Preparation of a basic specification	Mr. Maciu	13:00~14:30 (90 min) (JST 10:00~11:30)
13	• System Installation and Commissioning →Outline procedures for system installation and commissioning、Installation work for PV array、Installation works in extreme climate conditions、Installation work for balance of system (BOS)、Cable installation work、Safety management、Commissioning inspection	Mr. Maikeli	14:30~15:30 (60 min) (JST 11:30~12:30)
14	• Operation and maintenance of renewable energy equipment →Operation and maintenance system、General concept of inspection tour and	Mr. Josese	15:30~16:30 (60 min) (JST 12:30~13:30)

	periodical inspection (maintenance)		
6th day • March 24th, (Wed)			
15	• Operation and maintenance of renewable energy equipment →Daily inspection (inspection patrol) • Periodical inspection (maintenance) →Measurement using instruments (I/V checker, multimeters, line checker, etc.)	Mr. Filimoni	13:00~15:00 (120 min) (JST 10:00~12:00)
16	• Closing / Exchanges of opinions, advices - General evaluation • Greetings from each country • Greetings from JICA	Mr. Ogawa Mr. Kakefuku	15:00~16:00 (JST 12:00~13:00)

- Curriculum for the 2nd Regional Training for the additional countries

【DG Training】

Schedule for the 2nd Online Regional Training for DG O&M (for additional countries)

【3/29 (Tue) to 4/8 (Fri), 2022 】

No.	Content	Trainer	Fiji Time (Plan)
March 29th (Tuesday)			
1	• Introduction	Kakefuku Luis	13:00 (5 min.)
	• Greetings from Ministry of Infrastructure & Meteorological Services (MIMS)	Mr. Mikaele Belena	13:05 (5 min.)
	• Greetings from Energy Fiji Limited (EFL)	Mr. Karunesh Rao	13:10 (5 min.)
	• Greetings from Pacific Power Association (PPA)	Mr. Gordon Chang	13:15 (5 min.)
	• Greetings from JICA Headquarters Energy & Mining Group, Infrastructure Management Department	Mr. Kobayakawa Toru	13:20 (5 min.)
	• Greetings from Project Chief Advisor	Mr. Ogawa Tadayuki	13:25 (5 min.)
2	I . Safety • Safety measurements during overhaul works (Mechanical and electrical)	Mr. Epeli Rokodrokaya	13:30-16:00 (2.5 hrs.)
March 30th (Wednesday)			
3	II . Basic knowledge of DG • DGs utilities systems • Heat balance • Specific fuel consumption • Governor • Restoration from Blackout	Mr. Epeli Rokodrokaya	13:00-16:00 (3.0 hrs.)
March 31st (Thursday)			
4	II . Basic knowledge of DG • Main equipment of DG (Electrical)	Mr. Anasa Salabo	13:00-15:00 (2.0 hrs.)

5	III. Operation of DG • Operation of DG • Demand Supply Management • DGs Development Plan	Mr. Sabitesh Ajay Pal	15:00-16:00 (1.0 hrs.)
April 1st (Friday)			
6	III. Operation of DG • DGs Economical load Dispatch Control (EDC) • Economic Generation Dispatch	Mr. Sabitesh Ajay Pal	13:00-14:30 (1.5 hrs.)
7	IV. Maintenance of DG • Power plant maintenance and inspection management Preparation for OH works / safety / tags / running hours / overview of type of inspections / spare parts	Mr. Waisea Tuamoto	14:30-16:00 (1.5 hrs.)
April 5th (Tuesday)			
8	IV. Maintenance of DG (Mechanical) • Practice in the use of measuring equipment and special tools	Mr. Rusiate Jale Faivakibau	13:00-14:00 (1.0 hr.)
9	IV. Maintenance of DG (Mechanical) I • Cylinder head section • Auxiliary devices	Mr. Etika Rokobuli	14:00-16:00 (2.0 hrs.)
April 6th (Wednesday)			
10	IV. Maintenance of DG (Mechanical) II • Cylinder liner, piston, camshaft. • Auxiliary devices	Mr. Tobia Nayaqayaqa	13:00-16:00 (3.0 hrs.)
April 7th (Thursday)			
11	IV. Maintenance of DG (Electrical) • Maintenance of generators of CB • Inspection of electrical components	Mr. Anasa Salabo	13:00-16:00 (3.0 hrs.)
April 8th (Friday)			
12	IV. Maintenance of DG	Mr. Isimeli Nabalarua	13:00-15:30 (2.5 hrs.)
13	• Closing Remarks • Greetings from each country • Greetings from JICA	Mr. Ogawa Tadayuki	15:30-16:00 (0.5 hrs.)
End			

【RE Training】

**Schedule for the 2nd Online Regional Training for RE integration and RE O&M
(for additional countries)**

【4/19 (Tue) to 4/28 (Thu), 2022】

No.	Content	Trainer	Fiji Time (Plan)
April 19th (Tuesday)			

1	• Introduction	Kakefuku Luis	13:00 (5 min.)
	• Greetings from Ministry of Infrastructure & Meteorological Services (MIMS)	Mr. Mikaele Belena	13:05 (5 min.)
	• Greetings from Energy Fiji Limited (EFL)	Mr. Karunesh Rao	13:10 (5 min.)
	• Greetings from Pacific power Association (PPA)	Mr. Gordon Chang	13:15 (5 min.)
	• Greetings from JICA Headquarters Energy & Mining Group, Infrastructure Management Department	Mr. Kobayakawa Toru	13:20 (5 min.)
	• Greetings from Project Chief Advisor	Mr. Ogawa Tadayuki	13:25 (5 min.)
2	I . PV System Overview • PV integration on the outer islands of Fiji • Survey to introduce EVs funded by GGGI (Global Green Growth Institute).	Mr. Deepak Chand	13:30-16:00 (2.5 hrs.)
April 20th (Wednesday)			
3	I . PV System Overview • Power Conditioner FRT Function / Prevention of independent operation / MPPT Control / Smart Inverter • Battery Storage System Type of Batteries, characteristics, cost, design, inverters for BESS, etc. • Management Parameters Performance ratio / Capacity factor / Operation rate	Mr. Waisale Vulagi	13:00-14:30 (1.5 hrs.)
4	II . RE integration & planning • RE Integration • Promotion measures for RE integration in Fiji. Feed in tariff (FIT) / Net metering (NEM)	Mr. Sabitesh Ajay Pal	14:30-16:00 (1.5 hrs.)
April 21st (Thursday)			
5	II . RE integration & planning • Grid code System protection / Power quality / Frequency / voltage operating range	Mr. Krishneel Prasad	13:00-16:00 (3.0 hrs.)
April 22nd (Friday)			
6	II . RE integration & planning • System stabilization Grid forming inverter / System inertia	Mr. Krishneel Prasad	13:00-14:30 (1.5 hrs.)
7	III. PV System Plan • Basic design Consideration of interconnection point / Estimation of PV power generation(exercise) / Cost Estimation / Preparation of a basic specification	Mr. Maciu Waqaira	14:30-16:00 (1.5 hrs.)
April 26th (Tuesday)			

8	III. PV System Plan - Planning phase - Draft plan / site survey / consultation with related ministries and power utilities/ Technical requirements for grid interconnection (AU/NZ standards)	Mr. Jese Dautei	13:00-15:00 (2.0 hrs.)
9	III. PV System Plan - Detailed design - Design of PV array (exercise)	Mr. Mitieli Beranadoi	15:00-16:00 (1.0 hr.)
April 27th (Wednesday)			
10	IV. System Installation and Commissioning Procedures for system installation and commissioning (AU/NZ standards)	Mr. Maikeli L. Naciqa	13:00-15:00 (2.0 hrs.)
11	V. PV System maintenance Use of measurement instruments during PV facilities inspection (Line tracer, IV checker, etc.)	Mr. Filimoni Tarai	15:00-16:00 (1.0 hr.)
April 28th (Thursday)			
12	V. PV System maintenance Check sheets / records	Mr. Filimoni Tarai	13:00-14:00 (1.0 hr.)
13	V. PV System maintenance - Maintenance management - Maintenance method / maintenance staff Composition / necessary annual budget schedule / reports	Mr. Josese Atama	14:00-16:00 (2.0 hrs.)
14	- Closing Remarks - Greetings from each country - Greetings from JICA	Mr. Ogawa Tadayuki	16:00 (0.2 hrs.)
End			

- Curriculum for the 3rd Regional Training for the additional countries

【DG Training】

3rd Regional Training for Additional Countries DG Schedule (April 17th to 21st)						
Day	Start	End	Time	Topic	Detail	Trainer
1st Day (4/17) Mon	8:30	9:30	1:00	Opening ceremony /Remarks		
				DOE	Mr. Mikaele Belena, Director of Energy	
				EFL	Mr. Karunesh Rao, Executive Projects & Public Relations Manager	
				EFL	Mr. Uate Biutanaseva, Unit Leader	

					Renewables	
				PPA		
				JICA Fiji Office	Mr. Amaike Mayumi, Resident Representative	
				JICA Chief Advisor	Mr. Ogawa Tadayuki	
	9:30	10:30	1:00	Safety in OH works		Mr. Etika (Mr. Apenisa)
	10:30	10:45	0:15	Teatime		
	10:45	13:00	2:15	Preparation for OH	1.Preparation of the OH schedule/time frame 2.Arrangement of spare parts 3.Arrangement of special tools 4.Arrangement of consumables 5.Manpower	Mr. Rusiate Mr. Isimeli
	13:00	14:00	1:00	Lunch time		
2 nd Day (4/18) Tue	14:00	16:00	2:00	Preparation for OH	6.Outage request procedure (PS side) 7.HV Isolation procedures 8.Reverse switching 9.Monitoring of Operation parameters (Temperature, pressure, SFC, etc.)	Mr. Rusiate Mr. Isimeli
	16:00	16:30	0:30	Discussion		
	9:00	10:00	1:00	Operation of all PS in Viti Levu	NCC operation / NCC side procedure, verifications	Mr. Sabitesh
	10:00	10:15	0:15	Teatime		
	10:15	11:00	0:45	Outage request procedure		
	11:00	12:00	1:00	OH premeasurements OH Works	1.Crankshaft deflection, generator megger 2.Disassembly	Mr. Tobia
	12:00	13:00		OH Works	3.Cleaning	Mr. Ravneel
	12:00	14:00	2:00	Lunch time		
	14:00	14:30	0:30	OH Works	4.Inspection	Mr. Ravneel
	14:30	15:00	0:30		5.Adjustment 6.Replacement	Mr. Waisea
	15:00	15:30	0:30		7.Assembly	Mr. Tobia
	15:30	16:00	0:30		8.Calibration	Mr. Waisea
	16:00	16:30	0:30	Discussion		
3 rd Day (4/19) Wed	9:00	12:00	3:00	Visit any Power Station	Vuda or Nadi Isolation procedure (Safety)	All trainers
	12:00	13:00	1:00	Lunch time		
	13:00	15:00	2:00	Commissioning / Protection	Heat run contents, items verifications	Mr. Maikeli N / Mr. Etika
	15:00	16:00	1:00	Instrumentation	Explanation of Electrical measurement instruments	Mr. Apenisa
	16:00	16:30	0:30		Discussion	
4 th Day	9:00	16:00	7:00	Workshop	1.Precaution before start works 2.Drainage of oil, water, etc.	All trainers
	10:30	10:45	0:15	Teatime		

(4/20) Thu	9:00	16:00	7:00	Mechanical Hands-on training	Mechanical hands-on training / Deflection measurement	Mr. Rusiate Mr. Isimeli Mr. Etika Mr. Waisea Mr. Tobia Mr. Ravneel			
					Disassembly / Parts washing and inspection				
					Use of mechanical measurement instruments / Dye check				
					Manometers check / Replacement / Adjustment				
	13:00	14:00	1:00	Lunch time					
	9:00	16:00	7:00	Electrical Hands-on training	Electrical hands-on training / Generator Megger	Mr. Maikeli N. Mr. Apenisa Mr. Joseva			
Verification of diode / Temperature sensor verifications (RTD)									
Inspection of electrical boards , VCB, transformers, etc. Use of electrical measurement instruments									
16:00	16:30	0:30		Discussion					
5 th Day (4/21) Fri	9:00	13:00	4:00	Workshop	Assembly	All trainers			
					Commisioning contents				
				Teatime					
				Workshop					
	13:00	14:00	1:00	Lunch time					
	14:00	15:00	1:00	OH Report (EFL)	Report contents	Mr. Rusiate Mr. Isimeli			
				15:00	15:45	0:45	Test		All participants
				15:45	16:15	0:30	Disccusion		
				16:15	16:30	0:15	Closing		

【RE Training】

RE 3 rd Regional Trainng Schedule (April 24 th to 28 th)						
Day	Start	End	Hours	Topic	Detail	Trainer
1 st Day (4/24) Mon	8:30	9:30	1:00	Opening Remarks / Greetings		
				DOE	Mr. Mikaele Belena, Director of Energy	
				EFL	Mr. Karunesh Rao, Executive Projects & Public Relations Manager	
				EFL	Mr. Uate Biutanaseva, Unit Leader Renewables	
				PPA		
				JICA Fiji Office	Mr. Iwatani Makumo, Assistant Resident Representative	

				JICA Chief Advisor	Mr. Ogawa Tadayuki	
	9:30	9:45	0:15	Teatime	LaKaRo PV project	Mr. Deepak, Mr. Waisale, Mr. Filimoni
	9:45	13:00	2:45	DOE presentation	Financial plan, design, construction, operation.	
	13:00	14:00	1:00	Lunch time	Inspections, issues / Technical report (including Homer study and measurement results)	
	14:00	16:00	2:00	DOE presentation		
	16:00	16:30		Discussion		
2nd Day (4/25) Tue	9:00	10:30	1:30	RE integration	RE development plan in Fiji, (PV and Hydro) Discussion	Mr. Krishneel
	10:30	10:45	0:15	Teatime		
	10:45	13:00	2:45	Scada system	Basic of Scada system, Visit to Scada terminal	Mr. Samisoni Mr. Maikeli D
	13:00	14:00	1:00	Lunch time		
	14:00	16:00	2:30	RE integration & planning	Homer software use example	Mr. Sabitesh
	16:00	16:30	2:30	Discussion		
3rd Day (4/26) Wed	9:00	11:30	2:30	Operation and Maintenance of PV facilities	Measurement of I-V in Lautoka PV (Dirty / cleaned panels)	Mr. Rusiate Mr. Filimoni
	10:00	10:15	0:15	Teatime		
	11:30	13:00	1:30	RE integration & planning	NCC experiences in RE integration or Grid operation	Mr. Manoj
	13:00	14:00	1:00	Lunch time		
	14:00	16:00	2:00	Operation and Maintenance of PV facilities	Drawing up of I-V curve and explanation of the curve	
	16:00	16:30		Discussion		
4th Day (4/27) Thu	9:00	13:00	4:00	Visit PV facility	Inspection to Nadi Police Station PV facility / NCC	All trainers
	13:00	14:00	1:00	Lunch time		
	14:00	14:30	0:30	Operation and Maintenance of PV facilities	Management (Performance ratio, Efficiency of PV System, Estimation of PV power generation)	Mr. Maciu
	14:30	15:00	0:30		Inspection schedule, check sheets and measurement instruments, reports	Mr. Rusiate Mr. Filimoni
	15:00	16:00	1:00		Necessary budget for maintenance (Maintenance contents, Annual maintenance cost.)	Mr. Josese
	16:00	16:30	0:30	Discussion		
5th Day	9:00	10:30	1:30	BESS	BESS (Function, types, operation, cost)	Mr. Maikeli N

(4/28) Fri	10:30	10:45	0:15	Teatime		
	10:45	11:45	1:00		PV facilities design, general conditions, points to take in consideration.	Rishad Khan
	12:00	13:00	1:00			
	13:00	14:00	1:00	Lunch time	Challenges in RE integration, inspection of grid connected solar facilities.	Mohammed Ahzaaz
	14:00	15:00	1:00		Inspection of setup/ check of standard	
	15:00	16:00	1:00	Evaluation test / Questionnaire		All participants
	16:00	16:30	0:30	Closing remarks		

(4) Activity related to “System Analysis Simulation and Study of System Stabilization Measures in Samoa (Phase 2)”

①Activity period

July 2022 – June 2023

②Activity overview

In this activity, basic trainings on how to use system analysis tools and perform technical studies will be provided for staff members of Electric Power Corporation (EPC) of Samoa. In addition, additional data necessary for improving the accuracy of the system model developed during the Phase 1 in the previous year will be collected, and improvements on the model will be made.

In addition, the knowledge based on the activities and survey results will be shared with the five target countries of this project. Additionally, final report will be submitted as a deliverable. The front page and table of contents of the report are shown below.

JICA Project for the Introduction of Hybrid Power Generation System in Pacific
Island Countries
【Introductory Training on System Analysis Tools and
Upolu Power System Model improvement (Samoa)】

Final Report

August 2023

Project for the Introduction of Hybrid Power Generation System in Pacific Island Countries
Joint Venture (Representative: Okinawa Enetech Co., Inc. Constituent: Okinawa Electric Power
Co., Inc.)
(Subcontractor: Denryoku Computing Center, Ltd.)

Figure 6.4.6 Front page of the final report

“System Analysis Simulation and Study of System Stabilization Measures in Samoa”

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9.1.	Purpose.
9.2.	Survey on the measurement equipment
9.2.1.	Survey on the status of SCADA system introduction
9.2.2	SCADA measurements .
9.2.3	Measuring equipment (IED)
9.3.	On-site survey in Samoa .
9.3.1	Data measurement .
9.4.	Survey results
9.4.1	SCADA products and specifications
9.5.	Suggestions for additional installation.
9.5.1	Necessary data
9.5.2	Locations of additional installation
9.5.3	Measuring instrument specification

Figure 6.4.8 Table of contents of the final report (3/3)
“System Analysis Simulation and Study of System Stabilization Measures in Samoa”

7. Record of project inputs

7-1. Expert dispatch record

7-1-1. General overview

This project has the target countries of five island countries, of which the Federated States of Micronesia (FSM) and the Republic of the Marshall Islands (RMI) are located in the Northern Hemisphere, and Fiji, Tuvalu, and Kiribati in the Southern Hemisphere. Travel plans for dispatching experts were made by dividing the target region in two areas, namely Northern area and Southern area, for efficient project implementation.

For implementing trainings by dispatching experts, as mentioned in “2-4. The Purpose of the Project”, the training content for Fiji and that for the other four target countries are different due to the difference in the project components. For Fiji, the main project component is Training of Trainers (TOT), in order to contribute for the continuous utilization of the know-how and technology necessary for hybrid power generation system, through the enhancement of the regional training system on hybrid power generation system by preparing training programs for appropriate RE plan and O&M method. For the other four target countries, trainings for acquiring necessary techniques are provided in order to introduce hybrid power generation system through the enhancement of an appropriate and economical system for implementing DG O&M as well as establishment of appropriate RE power generation plan and O&M method, with the overall goal of improving energy security and reducing greenhouse gases through the reduction of fossil fuel consumption.

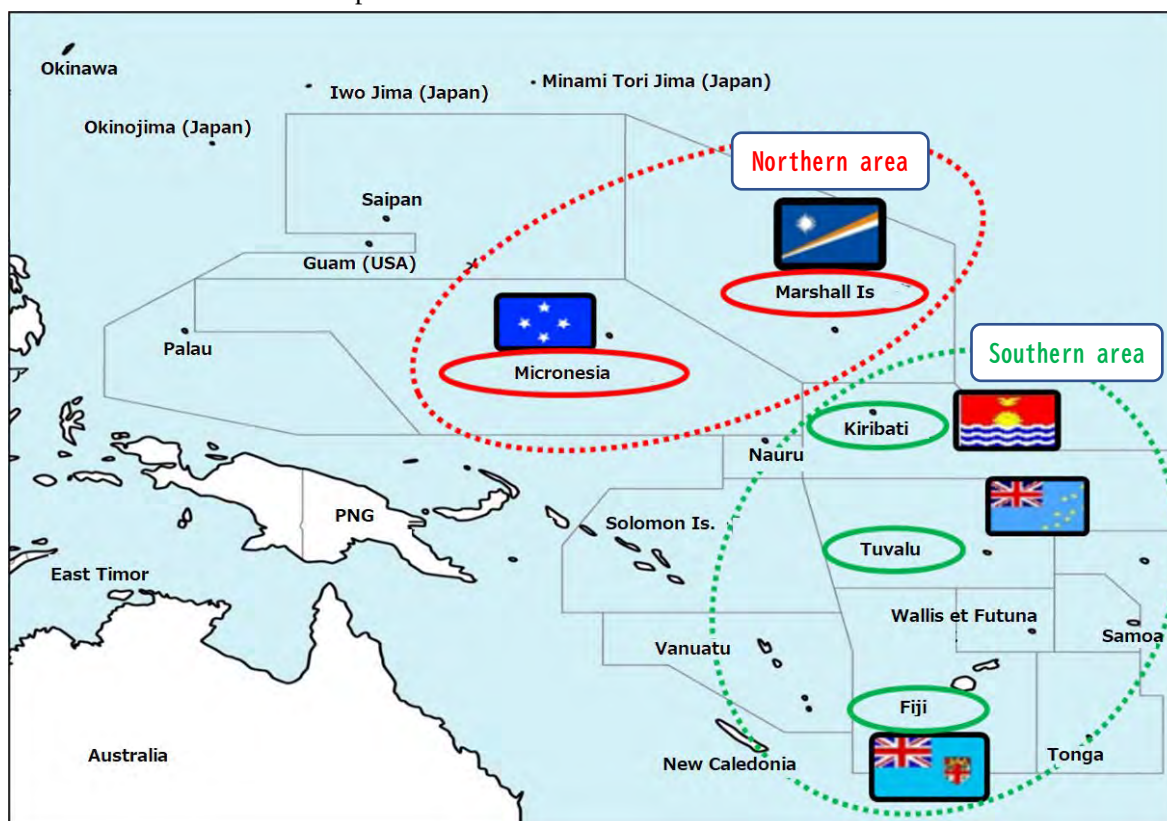


Figure 7.1.1 Grouping of the target countries in two areas

During the project period (June 2019 to June 2023), experts were dispatched for TOT trainings for four times, DG trainings for four times to the northern area and three times to the southern area, and RE trainings for four times to the northern area and two times to the southern area. When travel restrictions were in place due to COVID-19 pandemic, online trainings were held in lieu of dispatching the experts to the target countries. Online trainings were held individually for each of the target countries between June 2020 and March 2023.

Expert dispatch record is shown in Tables 7.1.1 and 7.1.2, and the dispatch schedules are shown in Figures 7.1.2 and 7.1.3. Overviews of training activities held in each of the target countries are given in the following sections from 7-1-2.

Table 7.1.1 Number of trainings held by dispatched experts (on-site training)

Activity	Area	Fiscal year				
		2019	2020	2021	2022	2023
TOT training (for Fiji)	Southern area	3	0	0	1	0
DG training (for the target countries except Fiji)	Northern area	2	0	0	2	0
	Southern area	2	0	0	1	0
RE training (for the target countries except Fiji)	Northern area	2	0	0	2	0
	Southern area	2	0	0	0	0

Table 7.1.2 Number of trainings held by experts (online training)

Target country	Field	Fiscal year				
		2019	2020	2021	2022	2023
Fiji	DG	0	3	5	2	1
	RE	0	3	4	3	1
Tuvalu	DG	0	5	4	3	0
	RE	0	5	4	5	0
Kiribati	DG	0	5	4	3	0
	RE	0	5	5	4	0
FSM (Pohnpei)	DG	0	5	4	3	0
	RE	0	5	5	4	0
FSM (Chuuk)	DG	0	5	4	2	0
	RE	0	5	5	4	0
FSM (Yap)	DG	0	5	4	3	0
	RE	0	5	5	4	0
FSM (Kosrae)	DG	0	5	3	3	0
	RE	0	5	4	5	0

RMI	DG	0	5	3	1	0
	RE	0	5	5	4	0

[2019]

activity item	April	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar
DG Training				South area (1回目)	North area (2回目)		South area (3回目)				North area (4回目)	
activity item	April	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar
RE Training				North area (1回目)		South area (2回目)	North area (3回目)				South area (4回目)	

[2020]

activity item	April	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar
DG Training												
activity item	April	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar
RE Training												

[2021]

activity item	April	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar
DG Training												
activity item	April	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar
RE Training												

[2022]

activity item	April	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar
DG Training							South area (5回目)			North area (6回目)		North area (7回目)
activity item	April	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar
RE Training										North area (5回目)		North area (6回目)

Figure 7.1.2 Record of expert dispatch schedule (on-site training)

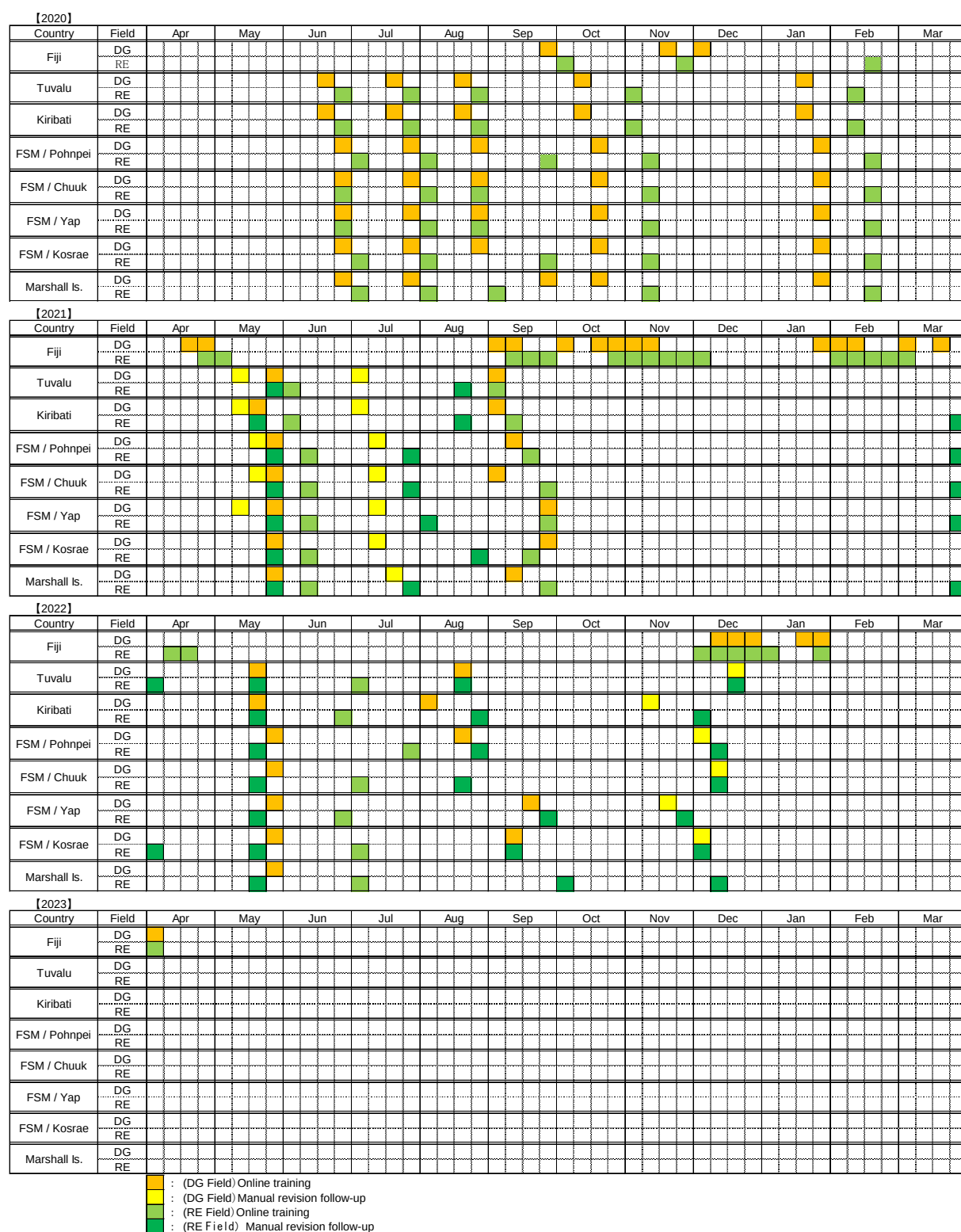


Figure 7.1.3 Record of expert input schedule (online training)

7-1-2. On-site training

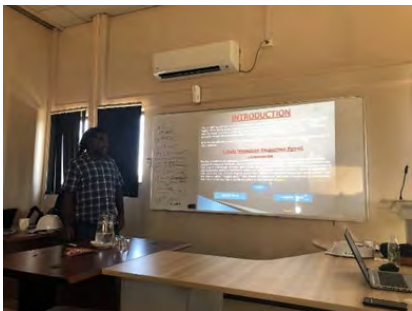
(1) Fiji

Overviews of the on-site trainings in Fiji are as follows.

【1st TOT training (DG)】

Purpose of visit	• Education on DG O&M • Progress assessment of Project Design Matrix	
On-site training period	2019/06/26～2019/06/27 (2 days) 2019/07/01～2019/07/05 (5 days)	
Visiting members (Expert team)	• Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Hideyasu Hokama (DG economic operation/C) • Ken Miyagi (DG maintenance-mechanical/A) • Masaji Miyazato (DG maintenance-mechanical/B) • Riki Oshiro (DG maintenance-electrical/A) • Tokumitsu Kakazu (DG maintenance-electrical/B)	
Counterparts	■ Energy Fiji Limited (EFL) • Uate Biutanaseva (Unit Leader Renewable Generation) • Epeli Rokodrakiya (Training officer mechanical) • Waisea Tuamoto (RE mechanical technician) • Tobia Waqanitabua Nayaqayaqa (Generation mechanical technician) • Neipolione Gatanitubei (Electrical Technician) • Etika Rokobuli (Generation mechanical technician) • Semesa Qalo (Team Leader Thermal Gen.) • Mitieli Beranadoi (Training officer electrical) • Jone Bakabaka (Electrical Technician)	
On-site activity content	① How to read diagrams (single line diagram, Sequence device No., etc.) ② Explanation on generator inspection ③ How to use measuring instruments (caliper, micrometer) ④ Circuit breaker (VCB) inspection ⑤ Presentation material preparation guideline ⑥ Regional training rehearsal ⑦ Proficiency test	
Photos of activities	 During the training	 Presentation by EFL
	 Hands-on practice of insulation resistance measurement	 Hands-on practice of measuring instruments

【1st TOT training (RE)】

Purpose of visit	• Education on RE O&M • Preparation training for Regional Training	
On-site training period	2019/09/02～2019/09/07 (6 days) 2019/09/26 (1 day)	
Visiting members (Expert team)	• Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Masanori Shimabuku (Deputy chief/ Hybrid power generation system human resource development/A) • Tomohiro Shiohama (RE integration plan/A) • Hirokazu Nakamura (RE O&M/A) • Manatsu Yonashiro (RE O&M/C)	
Counterparts	■ Energy Fiji Limited (EFL) • Maciu Waqaira (Team Leader Training Services) • Rusiate Jale Faivakibau (Team Leader Renewable (Nadarivatu) Mechanical Engineer) • Maikeli Lutunauro Nacipa (Team Leader Nadarivatu) ■ Department of Energy, Ministry of Infrastructure and Transport (DOE) • Waisale Vulagi (Technical Assistant) • Deepak Chand (Deputy secretary) • Filimoni Naigia (Technical Assistant)	
On-site activity content	① Disassembling and assembling of existing PV facility ② Introduction of RE case studies in Okinawa (Miyako Mega solar, Hateruma MG Set) ③ HOMER Overview and practice ④ Presentation material preparation guideline ⑤ Regional training rehearsal (mock lesson) ⑥ Proficiency test ⑦ Inspection method for residential PV system	
Photos of activities		
	PV assembling practice	HOMER Practice
		
	Mock lesson by DOE trainer	Mock lesson by EFL trainer

【2nd TOT training (RE)】

Purpose of visit	• Education on RE O&M • Review of the 1st Regional Training (held in Nov. 2019)	
On-site training period	(Lautoka) 2020/02/12~2020/02/14, 17 (4 days) 2020/02/24~2020/02/27 (4 days) (Suva) 2020/02/19~2020/02/20、2020/03/09 (3 days)	
Visiting members (Expert team)	• Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Masanori Shimabuku (Deputy chief/ Hybrid power generation system human resource development/A) • Tasuku Taira (RE integration plan/B) • Hirokazu Nakamura (RE O&M/A) • Manatsu Yonashiro (RE O&M/C)	
Counterparts	■ Energy Fiji Limited (EFL) • Krishneel Prasad (Unit Leader System Studies and Protection) • Karunesh Rao (Corporate Affairs & Communication Manager) • Rusiate Jale Faivakibau (Team Leader Renewable (Nadarivatu) Mechanical Engineer) • Josese Atama (Team Leader Renewable (Hydro)) • Jese Dautei (Training Officer (Regulatory & Metering)) • Mitieli Beranadoi (Training officer electrical generation) • Sabitesh Ajay Pal (System Control Engineer) • Neipolione Gatanitubei (Renewable Electrical Technician-Wind/Diesel) • Epeli Rokodrokaya (Training Officer (Mechanical)) • Waisea Tuamoto (Renewable Mechanical Technician-Wind) • Semesa Qalo (Team Leader Thermal Generation (Navutu workshop)) • Sumendra Prasad (Team Leader Thermal North) • Uate Biutanaseva (Unit Leader Renewable Generation) ■ Department of Energy, Ministry of Infrastructure and Transport • Deepak Chand (Deputy secretary) • Waisale Vulagi (Technical Assistant) • Filimoni Naigia (Technical Assistant)	
On-site activity content	① Commentary on the 1st Regional Training ② Request for support on the 2nd Regional Training and lecture content coordination ③ Coordination of lecture content for Expanded Regional Training	
Photos of activities		
	Meeting with DOE	Meeting with EFL

		
	Discussion with RE trainers	Discussion with RE trainers

【3rd TOT training (DG and RE)】

Purpose of visit	• Education on RE and DG O&M • Preparation for the 3rd Regional Training
On-site training period	(Suva) 2022/10/11~2022/10/13 (3 days) (Lautoka) 2022/10/14~2022/10/20 (5 days)
Visiting members (Expert team)	• Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Hideyasu Hokama (DG economic operation/C)
Counterparts	■ Energy Fiji Limited (EFL) • Karunesh Rao (Manager, Corporate Affairs & Communications) • Epeli Malo (Unit Leader Thermal Generation) • Ravendra Prasad (Acting Training Manager) • Krishneel Prasad (General Manager) • Kazuhisa Nada (Manager Strategic Planning) • Chitoshi Fukuda (Deputy Chief Executive Officer) • Rusiate Jale Faivakibau (Team Leader Renewable (Nadarivatu) Mechanical Engineer) • Isimeli Nabalarua (Mechanical Technician) • Waisea Tumoto (Renewable Mechanical Technician-Wind) • Maikeli.L Naciqa (Team Leader (Nandarivatu)) • Etika Rokobuli (Generation Mechanical Technician) • Apenisa Drotini (Electrical Technician) • Ravneel Nair (Training Officer Mechanical) • Maciu Waqaira (Team Leader Training Services) • Josese Atama (Team Leader Renewable Wailoa, Generation Department/Renewable) • Maikeli Drose (Training Officer Electrical Generation) • Sabitesh Ajay Chand (NCC System control engineer) ■ Department of Energy (DOE) • Belena Mikaele (Director, Energy Division, MIMS) • Deepak Chand (Deputy director) • Waisale Vulagi (RE technician) • Filimoni Naigia (RE technician)
On-site activity content	① Request for support on the 3rd Regional Training and lecture content coordination ② Coordination of lecture content for Expanded Regional Training ③ Updates on EFL and Fiji ④ Explanation on Capacity Assessment

Photos of activities		
	Meeting with DOE	Meeting with EFL
		
	Discussion with DG trainers	Discussion with RE trainers

(2) Tuvalu

Overviews of the on-site trainings in Tuvalu are as follows.

【1st DG training】

Purpose of visit	• Education on DG O&M • Progress assessment of Project Design Matrix
On-site training period	2019/07/06～2019/07/12 (5 days)
Visiting members (Expert team)	• Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Hideyasu Hokama (DG economic operation/C) • Ken Miyagi (DG maintenance-mechanical/A) • Masaji Miyazato (DG maintenance-mechanical/B) • Riki Oshiro (DG maintenance-electrical/A) • Tokumitsu Kakazu (DG maintenance-electrical/B)
Counterparts	■ Tuvalu Energy Corporation • Fatoga Talama (Generation Manager) • Tito Saosaoa (Mechanic) • Mika Kalele (Mechanic) • Teafa Tautu (Electrician) • William Teipauli (Mechanic) • Taaku Sekielu (Distribution Manager) • Scott. M (Operator)
On-site activity content	① How to read electrical diagrams (single line diagram, three-line diagram, etc.) ② How to read sequence diagrams

	③ Explanation on generator inspection ④ Generator Megger measurement (taking measurements) ⑤ How to use measuring instruments (caliper, micrometer) ⑥ Circuit breaker (VCB) inspection ⑦ Explanation on engine conditioning (Pmax adjustment, FO rack adjustment) ⑧ Specific fuel consumption measurement ⑨ Proficiency test	
Photos of activities	 Explanation on single line diagrams	 Generator megger measurement
	 Specific fuel consumption measurement	 Dye penetrant inspection of engine parts

【2nd DG training】

Purpose of visit	• Education on DG O&M • JCC meeting
On-site training	2019/10/09～2019/10/14 (4 days)
Visiting members (Expert team)	• Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Masaru Miyagi (Deputy chief/ Hybrid power generation system human resource development/B) • Hiroyuki Nakachi (DG economic operation/A) • Hideyasu Hokama (DG economic operation/C) • Ken Miyagi (DG maintenance-mechanical/A) • Riki Oshiro (DG maintenance-electrical/A)
Counterparts	■ Tuvalu Electricity Corporation (TEC) • Namoto Kelisinao (Generation Manager) • Teafa Tautu (Distribution Manager) • William Teipauli (Mechanic) • Uriam Iliala (Electrician) • Kiola Soa (Operator) • Iosua Tepaolo (Operator) • Scott Moeava (Operator)

On-site activity content	① DG O&M status assessment (measurement of various operational data) ② How to read electrical diagrams (single line diagram, three-line diagram, etc.) ③ How to use measuring instruments (caliper, micrometer) ④ Utilization of inspection record sheet ⑤ Specific fuel consumption measurement ⑥ Proficiency test ⑦ JCC meeting	
Photos of activities	 Noise measurement	 Vibration measurement
	 Exhaust temperature measurement	 Specific fuel consumption measurement

1st RE training】

Purpose of visit	• Education on RE O&M and expansion
On-site training period	2019/09/18～2019/09/20 (3 days) 2019/09/23 (1 day)
Visiting members (Expert team)	• Masanori Shimabuku (Deputy chief/ Hybrid power generation system human resource development/A) • Hirokazu Nakamura (RE O&M/A) • Manatsu Yonashiro (RE O&M/C)
Counterparts	■ Ministry of Public Utilities and Infrastructure (MPUI) • Tele. Siamua (Energy Project officer) ■ Tuvalu Electricity Corporation (TEC) • Namoto Kelisiano (Generation Manager) • Taaku Sekielu (Distribution Manager) • Tito. Tinilau (Mechanic) • Teafa Tautu (Electrician) • Uliamu .iliala (Electrician)
On-site activity content	① Basic knowledge of hybrid power generation system (lecture) ② PV inspection practice (open circuit voltage, insulation resistance, IV curve, string tracer) ③ Utilization of inspection record sheet ④ Introduction of RE case studies in Okinawa (Miyako Mega solar,

	Hateruma MG Set) ⑤ HOMER Overview and practice ⑥ Proficiency test	
Photos of activities	 Lecture ①	 Lecture ②
	 PV facility inspection ①	 PV facility inspection ②

【2nd RE training】

Purpose of visit	• Education on RE O&M and expansion
On-site training period	2020/03/02～2020/03/06 (5 days)
Visiting members (Expert team)	• Masanori Shimabuku (Deputy chief/ Hybrid power generation system human resource development/A) • Hirokazu Nakamura (RE O&M/A) • Manatsu Yonashiro (RE O&M/C)
Counterparts	■ Ministry of Public Utilities and Infrastructure (MPUI) • Tele. Siamua (Energy Project officer) • Papau Aselemo (Energy Technician) • Simona Kilei (Renewable Energy Specialist) ■ Tuvalu Electricity Corporation (TEC) • Namoto Kelisiano (Generation Manager) • Tito. Tinilau (Mechanic) • William Teupauli (Mechanic) • Iosua Tepaolo (Operator)
On-site activity content	① Basic knowledge of hybrid power generation system (lecture) ② PV inspection practice (open circuit voltage, insulation resistance, IV curve, string tracer) ③ Utilization of inspection record sheet ④ Basic knowledge of batteries (lecture) ⑤ PV facility design method ⑥ Proficiency test

Photos of activities		
	Lecture ①	Lecture ②
		
	PV facility inspection ①	PV facility inspection ②

(3) Kiribati

Overviews of the on-site trainings in Kiribati are as follows.

【1st DG training】

Purpose of visit	• Education on DG O&M • Progress assessment of Project Design Matrix
On-site training	2019/07/15～2019/07/20 (6 days)
Visiting members (Expert team)	• Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Hideyasu Hokama (DG economic operation/C) • Ken Miyagi (DG maintenance-mechanical/A) • Masaji Miyazato (DG maintenance-mechanical/B) • Riki Oshiro (DG maintenance-electrical/A) • Tokumitsu Kakazu (DG maintenance-electrical/B)
Counterparts	■ Public Utilities Board (PUB) • Tebwatia Takau (Mechanic) • Kirite Uriam (Mechanic) • Taibuwa Tabutoa (Mechanic) • Taarea Tekakoro (Mechanic) • Natanaera Ataia (Mechanic) • Mwatia Teeaa (Mechanic) • Bauro Mikaere (Electrician) • Tikoro Tanua (Electrician) • Tebike Asee (Electrician) • Ritene Ikaarau (Electrician)

On-site activity content	① How to read electrical diagrams (single line diagram, three-line diagram, etc.) ② How to use measuring instruments (caliper, micrometer) ③ Circuit breaker (VCB) inspection ④ Explanation on engine conditioning (Pmax adjustment, FO rack adjustment) ⑤ Specific fuel consumption measurement ⑥ Checking of spare parts and consumables in preparation for OH ⑦ Proficiency test	
Photos of activities	 Lecture on DG O&M	 Circuit breaker inspection (VCB)
	 Practice on the use of micrometer	 Explanation on DG conditioning and practice

【2nd DG training】

Purpose of visit	• Education on DG O&M • JCC meeting
On-site training period	2019/09/30～2019/10/04 (5 days)
Visiting members (Expert team)	• Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Masaru Miyagi (Deputy chief/ Hybrid power generation system human resource development/B) • Hiroyuki Nakachi (DG economic operation/A) • Hideyasu Hokama (DG economic operation/C) • Ken Miyagi (DG maintenance-mechanical/A) • Riki Oshiro (DG maintenance-electrical/A)
Counterparts	■ Public Utilities Board (PUB) • Tebwatia Takau (Mechanic) • Kirite Uriam (Mechanic) • Taibuwa Tabutoa (Mechanic) • Taarea Tekakoro (Mechanic)

	• Natanaera Ataia (Mechanic) • Mwatia Teeaa (Mechanic) • Tebakabu Tion (Mechanic) • Tiiroko Kakianako (Mechanic) • Bauro Mikaere (Electrician) • Tikoro Tanua (Electrician) • Tebike Aree (Electrician) • Ritene Ikaarou (Electrician)	
On-site activity content	① Status assessment of DG O&M ② How to use measuring instruments (caliper, micrometer) ③ Utilization of inspection record sheet ④ Specific fuel consumption measurement ⑤ Check on spare parts ⑥ Proficiency test ⑦ JCC meeting	
Photos of activities	 Lecture on DG O&M	 DG rotor insulation resistance measurement
	 Checking on instrument board	 Specific fuel consumption measurement

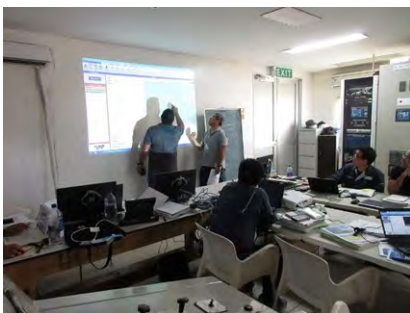
【3rd DG training】

Purpose of visit	• Education on DG O&M • JCC meeting
On-site training period	2022/10/4～2022/10/08 (5 days)
Visiting members (Expert team)	• Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Masaru Miyagi (Deputy chief/ Hybrid power generation system human resource development/B) • Hideyasu Hokama (DG economic operation/C) • Ken Miyagi (DG maintenance-mechanical/A)

	• Tsunemi Henna (DG maintenance-mechanical/C) • Tokumitsu Kakazu (DG maintenance-electrical/B)	
Counterparts	■ Public Utilities Board (PUB) • Teebwatia Takau (Mechanic) • Kirite Uriam (Mechanic) • Nawaia Ataake (Mechanic) • Takenteiti Tonana (Mechanic) • Bauro Mikaere (Electrician) • Tebike Aree (Electrician) • Ritene Ikaarou (Electrician)	
On-site activity content	• Specific fuel consumption measurement • Explosion pressure measurement, exhaust temperature measurement • #3 turbocharger stud bolt repair • Check of Improvement Plan • Generator cleaning and insulation resistance measurement • Lecture on how to use circuit breaker tester • Lecture on how to use the donated equipment • JCC meeting	
Photos of activities	 Lecture on DG O&M	 Lecture on how to use the donated equipment
	 Instrument board meter replacement	 JCC meeting

【1st RE training】

Purpose of visit	• Education on RE O&M and expansion
On-site training	2019/09/10～2019/09/13 (4 days)
Visiting members (Expert team)	• Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Masanori Shimabuku (Deputy chief/ Hybrid power generation system human resource development/A) • Tomohiro Shiohama (RE integration plan/A) • Hirokazu Nakamura (RE O&M/A) • Manatsu Yonashiro (RE O&M/C)

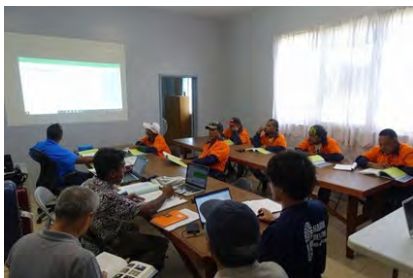
Counterparts	Public Utilities Board (PUB) • Bauro Mikaere (Electrician) • Tebwatia Takau (Mechanic) • Taibuwa Tabutoa (Mechanic) • Ritene Ikaarau (Electrician) • Baraniho Bahaie (Electrician) • Tebike Asee (Electrician) • Tororo Tiwin (Electrician)	
On-site activity content	① Basic knowledge of hybrid power generation system (lecture) ② PV inspection practice (open circuit voltage, insulation resistance, IV curve, string tracer) ③ Utilization of inspection record sheet ④ Introduction of RE case studies in Okinawa (Miyako Mega solar, Hateruma MG Set) ⑤ HOMER Overview and practice ⑥ Proficiency test	
Photos of activities	 Lecture	 HOMER Practice
	 PV facility inspection ①	 PV facility inspection ②

(4) FSM (Pohnpei, Chuuk, Yap, Kosrae)

Overviews of the on-site trainings in FSM are as follows.

【1st DG training (Chuuk)】

Purpose of visit	• Education on DG O&M • Progress assessment of Project Design Matrix
On-site training period	2019/08/12～2019/08/16 (5 days)
Visiting members	• Masaru Miyagi (Deputy chief/ Hybrid power generation system human

(Expert team)	resource development/B) • Hiroyuki Nakachi (DG economic operation/A) • Hideyasu Hokama (DG economic operation/C) • Ken Miyagi (DG maintenance-mechanical/A) • Tsunemi Henna (DG maintenance-mechanical/C) • Riki Oshiro (DG maintenance-electrical/A) • Toshio Yogi (DG maintenance-electrical/C)	
Counterparts	■ Chuuk Public Utility Corporation (CPUC) • Jimmy Reyes (Mechanic) • Augustine Hallers (Mechanic) • Dexter Tom (Mechanic) • Basiente kintin Jr. (Mechanic) • ED Kikenit (Mechanic) • Mellor Sirom (Mechanic) ■ Yap State Public Service Corporation (YSPSC) • Roroino Yardfaliut (Mechanic) • Cristopher Igem (Electric) ■ Kosrae Utilities Authority (KUA) • Careston Aloka (Mechanic) • Mellor Sirom (Electric)	
On-site activity content	① How to read electrical diagrams (single line diagram, three-line diagram, etc.) ② How to use measuring instruments (caliper, micrometer, dial gauge) ③ Circuit breaker (VCB, ACB) inspection ④ Inspection method of DC power source (battery) ⑤ Specific fuel consumption measurement ⑥ Proficiency test	
Photos of activities	 Lecture on DG O&M	 Circuit breaker (VCB) inspection
	 Practice on the use of micrometer	 Lecture on battery inspection

【2nd DG training (Yap)】

Purpose of visit	• Education on DG O&M • Progress assessment of Project Design Matrix
On-site training	2020/01/20～2019/01/24 (5 days)

period		
Visiting members (Expert team)	• Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Masaru Miyagi (Deputy chief/ Hybrid power generation system human resource development/B) • Hiroyuki Nakachi (DG economic operation/A) • Hideyasu Hokama (DG economic operation/C) • Ken Miyagi (DG maintenance-mechanical/A) • Tsunemi Henna (DG maintenance-mechanical/C) • Riki Oshiro (DG maintenance-electrical/A) • Tokumitsu Kakazu (DG maintenance-electrical/B)	
Counterparts	■ Yap State Public Service Corporation (YSPSC) • Rowino Yarofaliut (Mechanic) • Cristopher Igem (Electric) • Casmero Yithemang (Mechanic) • Sylvester Maiwemai (Mechanic) • Sebastian Marliyang (Mechanic) • Raymond Tangmang (Mechanic) ■ Chuuk Public Utility Corporation (CPUC) • Jimmy Reyes (Mechanic) • Dennis Triana (Mechanic) ■ Pohnpei Utilities Corporation (PUC) • Winfred Yamada (Mechanic) • Elpert Elias (Mechanic) ■ Kosrae Utilities Authority (KUA) • Careston Alokoa (Mechanic) • Ronald Albert (Electric)	
On-site activity content	① DG O&M status assessment (measurement of various operational data) ② Explanation on inspection record ③ Troubleshooting (mechanical, electrical) ④ Explanation on EDC ⑤ Proficiency test ⑥ JCC meeting	
Photos of activities	 Lecture on DG O&M	 Vibration measurement
	 Battery inspection (internal resistance measurement)	 Battery inspection (specific gravity measurement)

【3rd DG training (Pohnpei)】

Purpose of visit	• Education on DG O&M • Progress assessment of O&M manual revision	
On-site training period	2023/01/17～2023/01/20 (4 days)	
Visiting members (Expert team)	• Masaru Miyagi (Deputy chief/ Hybrid power generation system human resource development/B) • Hideyasu Hokama (DG economic operation/C) • Ken Miyagi (DG maintenance-mechanical/A) • Masaji Miyazato (DG maintenance-mechanical/B) • Tokumitsu Kakazu (DG maintenance-electrical/B)	
Counterparts	■ Pohnpei Utilities Corporation (PUC) • Dackson Solomon (Chief of Power Generation) • Ericson Semens (Mechanic Foreman) • Elpert Elias (Lead Mechanic) • Marcus Hallens (Mechanic) • Don Jack (Mechanic) • Kurt Falcam (Mechanic) • Tedrickson Melander (Mechanic) • Elly Amore (Electrician) • Richard Lohn (Electrician) • Nixon Helgeberger (Electrician) • David Tewodrose (Electrician) • Joseph Suldán (Electrician) • David Tewodrose (Supply Technician) • Joseph Suldán (Janitor)	
On-site activity content	① Specific fuel consumption measurement ② Fuel injector maintenance ③ Coupling alignment ④ Lecture on generator inspection ⑤ Lecture on circuit breaker inspection ⑥ Lecture on battery inspection ⑦ Lecture on how to use the donated equipment ⑧ Disassembling and assembling of fuel flow meter ⑨ Progress assessment of O&M manual revision	
Photos of activities	 Disassembling and assembling of fuel flow meter	 Fuel injector maintenance

		
	Battery inspection (internal resistance measurement)	Circuit breaker inspection

【4th DG training (Kosrae)】

Purpose of visit	• Education on DG O&M • Progress assessment of Project Design Matrix	
On-site training period	2023/01/24～2023/02/01 (4 days)	
Visiting members (Expert team)	• Masaru Miyagi (Deputy chief/ Hybrid power generation system human resource development/B) • Hideyasu Hokama (DG economic operation/C) • Ken Miyagi (DG maintenance-mechanical/A) • Masaji Miyazato (DG maintenance-mechanical/B) • Tokumitsu Kakazu (DG maintenance-electrical/B)	
Counterparts	■ Kosrae Utilities Authority (KUA) • Ronald Albert (Operation Manager) • Ronald D. Albert (Supervisor of Operator) • Tedrick Joseph (Mechanic) • Gifford Sigrah (Distribution Foreman) • Rinson Sigrah (Lineman)	
On-site activity content	① Specific fuel consumption measurement ② Fuel injector maintenance ③ Coupling alignment ④ Lecture on generator inspection ⑤ Lecture on circuit breaker inspection ⑥ Lecture on battery inspection ⑦ Lecture on how to use the donated equipment ⑧ Troubleshooting case examples ⑨ Progress assessment of O&M manual revision ⑩ Fuel leak check	
Photos of activities		
	Fuel injector maintenance	Battery inspection (internal resistance measurement)

	 Circuit breaker inspection	 Lecture on the use of relay tester

【5th DG training (Chuuk)】

Purpose of visit	• Education on DG O&M • Progress assessment of Project Design Matrix	
On-site training period	2023/3/14～2023/03/17 (4 days)	
Visiting members (Expert team)	• Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Hideyasu Hokama (DG economic operation/C) • Ken Miyagi (DG maintenance-mechanical/A) • Tsunemi Henna (DG maintenance-mechanical/C) • Tokumitsu Kakazu (DG maintenance-electrical/B)	
Counterparts	■ Chuuk Public Utility Corporation (CPUC) • Dennis Triana (Mechanic) • Jimmy Reyes (Mechanic) • Besiente Kintin Jr (Mechanic) • Mellow Sirom (Mechanic)	
On-site activity content	① Specific fuel consumption measurement ② Fuel injector maintenance ③ Coupling alignment ④ Lecture on generator inspection ⑤ Lecture on circuit breaker inspection ⑥ Lecture on battery inspection ⑦ Lecture on how to use the donated equipment ⑧ Troubleshooting case examples ⑨ Progress assessment of O&M manual revision	
Photos of activities	 Coupling alignment	 Fuel injector maintenance

	 Battery inspection (internal resistance measurement)	 Circuit breaker inspection

【1st RE training (Yap)】

Purpose of visit	• Education on RE O&M • Progress assessment of Project Design Matrix
On-site training period	2019/07/22～2019/07/26 (5 days)
Visiting members (Expert team)	• Masanori Shimabuku (Deputy chief/ Hybrid power generation system human resource development/A) • Yusuke Kuniba (RE integration plan/A) • Hirokazu Nakamura (RE O&M/A) • Kaoru Ikehara (RE O&M/B)
Counterparts	■ Yap State Public Service Corporation (YSPSC) • John Chieng (IT) • Jacob J. Choay (PV Technician) • Steven Ken • Charley Laman ■ Chuuk Public Utility Corporation (CPUC) • Albert Francis (Chief Operation Officer) • Chris Killion (RE Technician) / • Limus Setik (RE Technician) ■ Pohnpei Utilities Corporation (PUC) • Sidney Kilmete (Manager, Renewable Energy) • Julian Pelep (Lineman) ■ Kosrae Utilities Authority (KUA) • Robert Taulupe (Operation Manager) • Gerardo Protacio (Electrical Engineer)
On-site activity content	① Basic knowledge of RE (lecture) ② PV facility inspection practice (open circuit voltage, insulation resistance, IV curve, string tracer) ③ Utilization of inspection record sheet ④ Introduction of RE case studies in Okinawa (Miyako Mega solar, Hateruma MG Set) ① HOMER Overview and practice ② Explanation on performance ratio ③ Proficiency test

Photos of activities		
	Lecture on basic knowledge of RE	PV facility inspection practice ①
		
	PV facility inspection practice ②	HOMER Practice

【2nd RE training (Pohnpei)】

Purpose of visit	• Education on RE O&M • Progress assessment of Project Design Matrix
On-site training period	2019/10/28～2019/11/01 (5 days)
Visiting members (Expert team)	• Masanori Shimabuku (Deputy chief/ Hybrid power generation system human resource development/A) • Tasuku Taira (RE integration plan/B) / • Hirokazu Nakamura (RE O&M/A) / • Kaoru Ikehara (RE O&M/B)
Counterparts	■ Yap State Public Service Corporation (YSPSC) • John Chieng (Engineering Manager) / • Sebastian Marleyang (Solar Operator) ■ Chuuk Public Utility Corporation (CPUC) • Chris Killion (RE Technician) / • Limus Setik (RE Technician) ■ Pohnpei Utilities Corporation (PUC) • Sidney Kilmete (Manager, Renewable Energy) • Julian Pelep (Solar Technician) / • Albert Ligo Jr. (Hydro Operator) • Johnny Cantero (Solar Technician) • McCaffrey Gilmete (Solar Technician) ■ Kosrae Utilities Authority (KUA) • Robert (Atelea) Taualupe (Operation Manager) • Gerardo Protacio (Electrical Engineer)
On-site activity content	① Basic knowledge of RE (lecture) ② PV facility inspection practice (open circuit voltage, insulation resistance, IV curve, string tracer) ③ Utilization of inspection record sheet ④ Basic knowledge of system simulation (lecture)

	⑤ PV facility design method (lecture and practice) ⑥ HOMER Practice ⑦ Proficiency test	
Photos of activities	 PV facility inspection practice	 Basic knowledge of system simulation (lecture)

【3rd RE training (Pohnpei)】

Purpose of visit	• Follow-up on RE O&M • Progress assessment of Project Design Matrix	
On-site training period	2023/1/24～2023/1/27 (4 days)	
Visiting members (Expert team)	• Hirokazu Nakamura (RE O&M/A) • Kaoru Ikehara (RE O&M/B)	
Counterparts	■ Pohnpei Utilities Corporation (PUC) • Sidney Kilmete (Manager Renewable Energy) • Julian Pelep (Solar Technician) • Albert Ligo Jr. (Hydro Operator) • Johnny Cantero (Solar Technician) • McCaffrey Gilmete (Solar Technician)	
On-site activity content	① Confirmation of the utilization of daily inspection check sheet (recording inspection data, data management, etc.) ② Inquiry on current status of RE facility operation ③ Follow-up on RE O&M ④ Follow-up on manual revision, etc. ⑤ Determining the capacity of grid stabilizer (lecture)	
Photos of activities	 PV facility on-site practice and testing	 Status assessment of PV operation

	 Evaluation of measured data of existing PV facility	 Follow-up on manual revision, etc.

【4th RE training (Kosrae)】

Purpose of visit	• Follow-up on RE O&M • Progress assessment of Project Design Matrix	
On-site training period	2023/3/21～2023/3/27 (5 days)	
Visiting members (Expert team)	• Masaru Miyagi (Deputy chief/ Hybrid power generation system human resource development/B) • Hirokazu Nakamura (RE O&M/A) • Kaoru Ikehara (RE O&M/B)	
Counterparts	■ Kosrae Utilities Authority (KUA) • Robert (Atelea) Taulupe (KUA Operation Manager) • Gerardo Protacio (KUA Electrical Engineer) • Gifford I. Sigrah (KUA Distribution Foreman) • Casey Freddy (KUA Assistant general Manager) • Ronnie George (KUA Lineman) • Tabert Nena (KUA Lineman) • Rinson Sigrah (KUA Lineman) • Hairom Livale (Customer Service Supervisor)	
On-site activity content	① Confirmation of the utilization of daily inspection check sheet (recording inspection data, data management, etc.) ② Inquiry on current status of RE facility operation ③ Follow-up on RE O&M ④ Follow-up on manual revision, etc. ⑤ Determining the capacity of grid stabilizer (lecture)	
Photos of activities	 PV facility on-site practice and testing	 Current status of RE facility operation (EU PV)

	 Evaluation of measured data of existing PV facility	 Follow-up on manual revision, etc.

【5th RE training (Chuuk)】

Purpose of visit	• Follow-up on RE O&M • Progress assessment of Project Design Matrix	
On-site training period	2023/3/29～2023/4/3 (4 days)	
Visiting members (Expert team)	• Masaru Miyagi (Deputy chief/ Hybrid power generation system human resource development/B) • Hirokazu Nakamura (RE O&M/A) • Kaoru Ikehara (RE O&M/B)	
Counterparts	■ Chuuk Public Utility Corporation (CPUC) • Dennis Triana (CPUC Head of power generation and maintenance) • Albert Francis (CPUC Regional Utility manager) • Chris Killion (CPUC RE Technician) • Limus Setik (CPUC RE Technician) • Bruno Puas (CPUC RE Technician)	
On-site activity content	① Confirmation of the utilization of daily inspection check sheet (recording inspection data, data management, etc.) ② Inquiry on current status of RE facility operation ③ Follow-up on RE O&M ④ Follow-up on manual revision, etc. ⑤ Determining the capacity of grid stabilizer (lecture)	
Photos of activities	 PV facility on-site practice and testing	 Status assessment of PV operation (PEC PV)

	 Evaluation of measured data of existing PV facility	 Follow-up on manual revision, etc.

(5) RMI

Overviews of the on-site trainings in RMI are as follows.

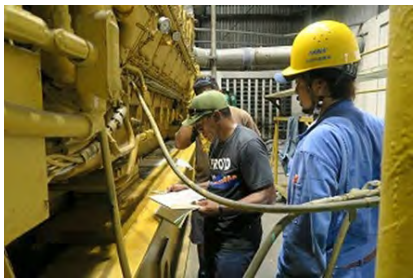
【1st DG training】

Purpose of visit	• Education on DG O&M • Progress assessment of Project Design Matrix
On-site training period	2019/08/19～2019/08/23 (5 days)
Visiting members (Expert team)	• Masaru Miyagi (Deputy chief/ Hybrid power generation system human resource development/B) • Hiroyuki Nakachi (DG economic operation/A) • Hideyasu Hokama (DG economic operation/C) • Ken Miyagi (DG maintenance-mechanical/A) • Tsunemi Henna (DG maintenance-mechanical/C) • Riki Oshiro (DG maintenance-electrical/A) • Toshio Yogi (DG maintenance-electrical/C)
Counterparts	■ Marshalls Energy Company (MEC) • Falani Boreham (Mechanic) • Richard Reimers (Mechanic) • David John (Mechanic) • Bertin Rilang (Mechanic) • Ijaak Hisaiah (Mechanic) • Mike Jeik (Mechanic) • Albious Korean (Mechanic) • Paulson Laiden (Electrician)
On-site activity content	① How to read electrical diagrams (single line diagram, three-line diagram, etc.) ② How to use measuring instruments (caliper, micrometer, dial gauge) ③ Circuit breaker (VCB) inspection ④ DG inspection guideline ⑤ Specific fuel consumption measurement ⑥ Proficiency test

Photos of activities		
	Lecture on DG O&M	Circuit breaker (VCB) inspection
		
	Dial gauge practice	Dye penetrant inspection of parts

【2nd DG training】

Purpose of visit	• Education on DG O&M • Progress assessment of Project Design Matrix
On-site training period	2020/01/27～2019/01/31 (5 days)
Visiting members (Expert team)	• Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Masaru Miyagi (Deputy chief/ Hybrid power generation system human resource development/B) • Hiroyuki Nakachi (DG economic operation/A) • Hideyasu Hokama (DG economic operation/C) • Ken Miyagi (DG maintenance-mechanical/A) • Tsunemi Henna (DG maintenance-mechanical/C) • Riki Oshiro (DG maintenance-electrical/A) • Tokumitsu Kakazu (DG maintenance-electrical/B)
Counterparts	■ Marshalls Energy Company (MEC) • Francis Takatsuki (PV Technician) • Richard Reimers (Mechanic) • Paulson Laiden (Mechanic) • Raul Paul (Mechanic) • Billy Enos (Mechanic) ■ Kwajalein Atoll Joint Utility Resources (KAJUR) • Sheldon Jacob (Mechanic) • Lomona Thomas (Mechanic)
On-site activity content	① DG O&M status assessment (measurement of various operational data) ② Explanation on inspection record ③ Troubleshooting (mechanical, electrical) ④ Explanation on EDC ⑤ Proficiency test ⑥ JCC meeting

Photos of activities		
	Lecture on DG O&M	Vibration measurement
		
	Noise measurement	Battery inspection (internal resistance measurement)

【3rd DG training】

Purpose of visit	• Education on DG O&M • Progress assessment of Project Design Matrix • JCC meeting
On-site training period	2023/03/20～2023/03/24 (4 days)
Visiting members (Expert team)	• Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Hideyasu Hokama (DG economic operation/C) • Ken Miyagi (DG maintenance-mechanical/A) • Tsunemi Henna (DG maintenance-mechanical/C) • Tokumitsu Kakazu (DG maintenance-electrical/B)
Counterparts	■ Marshalls Energy Company (MEC) • Mr. Raul Paul (Mechanic) • Mr. Vilive Lasaga (Mechanic) • Mr. Richard Reimaers Jr. (Mechanic) • Mr. Paulson Laiden (Electric)
On-site activity content	① Specific fuel consumption measurement ② Fuel injector maintenance ③ Coupling alignment ④ Lecture on generator inspection ⑤ Lecture on circuit breaker inspection ⑥ Lecture on battery inspection ⑦ Lecture on how to use the donated equipment ⑧ Troubleshooting case examples ⑨ Progress assessment of O&M manual revision

Photos of activities		
	Fuel injector overhaul	Coupling alignment
		
	Battery inspection (internal resistance measurement)	Troubleshooting

【1st RE training】

Purpose of visit	• Education on RE O&M • Progress assessment of Project Design Matrix
On-site training period	2019/07/15～2019/07/19 (5 days)
Visiting members (Expert team)	• Masanori Shimabuku (Deputy chief/ Hybrid power generation system human resource development/A) • Yusuke Kuniba (RE integration plan/A) • Hirokazu Nakamura (RE O&M/A) • Kaoru Ikehara (RE O&M/B)
Counterparts	■ National Energy Office (NEO) • Benjamin Wakefield (Deputy Director) • Wesley Lokeijak (Energy Awatenesl) ■ Marshall Energy Company (MEC) • Billy Schutz (Solar Technician) / Francis Takatsuki (Solar Technician) • Metom Aikuj (trainee) ■ Kwajalein Atoll Joint Utility Resources (KAJUR) • Joe Jorlanin (Electrical Solar) / Noel Patrick (Electrical Engineer)
On-site activity content	① Basic knowledge of RE (lecture) ② PV facility inspection practice (open circuit voltage, insulation resistance, IV curve, string tracer) ③ Utilization of inspection record sheet ④ Introduction of RE case studies in Okinawa (Miyako Mega solar, Hateruma MG Set) ⑤ HOMER Overview and practice ⑥ Proficiency test

Photos of activities		
	Lecture on basic knowledge of RE	PV facility inspection practice①
		
	PV facility inspection practice ②	HOMER Practice

【2nd RE training】

Purpose of visit	• Education on RE O&M • Progress assessment of Project Design Matrix
On-site training	2019/10/21～2019/10/25 (5 days)
Visiting members (Expert team)	• Masanori Shimabuku (Deputy chief/ Hybrid power generation system human resource development/A) • Tasuku Taira (RE integration plan/B) • Hirokazu Nakamura (RE O&M/A) • Kaoru Ikehara (RE O&M/B)
Counterparts	■ National Energy Office (NEO) • Benjamin Wakefield (Deputy Director) ■ Marshall Energy Company (MEC) • Billy Schutz (Solar Technician) / • Ned Nathan (Solar Technician) • Joe Henry (Solar Technician) / • Joten Isaac (Solar Technician) • Meton Aikuj (Solar Technician) / • David Jorju (Solar Technician) • Mikat Kattil (Solar Technician) / • Tonnyio David (Solar Technician) • Nine Bill (MEC) / • Lusen Jeik (MEC) ■ Kwajalein Atoll Joint Utility Resources (KAJUR) • Noel Patrick (Electrical Engineer)
On-site activity content	① Basic knowledge of RE (lecture) ② PV facility inspection practice (open circuit voltage, insulation resistance, IV curve, string tracer) ③ Utilization of inspection record sheet ④ Basic knowledge of system simulation (lecture) ⑤ PV facility design method (lecture and practice) ⑥ Proficiency test

Photos of activities		
	PV facility inspection practice	Inspection record sheet revision
		
	Basic knowledge of simulation (lecture)	PV facility design method (lecture)

【3rd RE training】

Purpose of visit	• Follow-up on RE O&M • Progress assessment of Project Design Matrix
On-site training	2023/1/31～2023/2/6 (5 days)
Visiting members (Expert team)	• Hirokazu Nakamura (RE O&M/A) • Kaoru Ikehara (RE O&M/B)
Counterparts	■ Marshall Energy Company (MEC) • Francis Takatsuki (RE Supervisor/Administrator) ■ Kwajalein Atoll Joint Utility Resources (KAJUR) • Joe Jorlanin (Electrical Engineer) • Noel Patrick (Electrical Engineer) ■ National Energy Office (NEO) • Banton Nathan (RE Technician)
On-site activity content	① Confirmation of the utilization of daily inspection check sheet (recording inspection data, data management, etc.) ② Inquiry on current status of RE facility operation ③ Follow-up on RE O&M ④ Follow-up on manual revision, etc. ⑤ Determining the capacity of grid stabilizer (lecture)

Photos of activities	 PV facility on-site practice and testing	 Evaluation of measured data of existing PV facility

7-1-3. Online training

(1) Fiji

Overviews of the online trainings for Fiji are shown below.

【1st TOT training (DG)】

Purpose	Check and advise on lecture material for regional training	
Training dates	2020/9/29,30	
Participants from JICA side (Senior Advisor/ Expert Team)	■ JICA Senior Advisor • Tadayuki Ogawa ■ Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Masanori Shimabuku (Deputy chief/ Hybrid power generation system human resource development/A) • Masaru Miyagi (Deputy chief/ Hybrid power generation system human resource development/B) • Hideyasu Hokama (DG economic operation/C) • Hirokazu Nakamura (RE O&M/A)	
Trainer/ Lecture material	■ Energy Fiji Limited (EFL)	
	Trainer	Lecture material (title)
	Semesa Qalo	• Main equipment of DEG (Mechanical)
	Anasa Salobo	• Main equipment of DEG (Electrical)
	Neipolione Gatanitubei	• Maintenance of DEG (Electrical)
	Sabitesh Ajay Pal	• Supply and Demand Management
	Rusiate Jale Faivakibau	• Practice in the use of measuring equipment and special tools
	Tobia Waqanitabua Nayaqayaqa	• Maintenance of DEG (Mechanical)
	Waisea Tuamoto	• Power plant maintenance and inspection procedure (Hands-on)

【2nd TOT training (DG)】

Purpose	Check and advise on lecture material for regional training	
Training dates	• 2020/11/17,19~20 • 2020/12/3	
Participants from JICA side (Senior Advisor/ Expert Team)	■ JICA Senior Advisor • Tadayuki Ogawa ■ Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource	

	development) • Masanori Shimabuku (Deputy chief/ Hybrid power generation system human resource development/A) • Masaru Miyagi (Deputy chief/ Hybrid power generation system human resource development/B) • Hiroyuki Nakachi (DG economic operation/A) • Hisashi Shimabukuro (DG economic operation/B) • Hideyasu Hokama (DG economic operation/C) • Ken Miyagi (DG maintenance-mechanical/A) • Riki Oshiro (DG maintenance-electrical/A) • Takahisa Watanabe (Work coordination/ monitoring/A)	
Trainer/ Lecture material	■Energy Fiji Limited (EFL)	
	Trainer	Lecture material (title)
	Epeli Rokodrakiya	• Diesel Power Generation Overhaul Training • Safety • Basic principle, basic symbols, features, composition of DEG
	Semesa Qalo	• Main Equipment of Diesel Generation
	Anasa Salobo	• Main Equipment of Diesel Generation Electrical Devices
	Tobia Waqanitabua	• Maintenance Of DEG (Mechanical)
	Neipolione Gatanitubei	• Maintenance of DEG (Electrical)
	Waisea Tuamoto	• Power Plant maintenance and inspection procedure
	Sabitesh Ajay Pal	• Supply and Demand Management

【3rd TOT training (DG)】

Purpose	Check and advise on lecture material for regional training	
Training dates	• 2021/2/8,9,10 • 2021/2/15	
Participants from JICA side (Senior Advisor/ Expert Team)	■JICA Senior Advisor • Tadayuki Ogawa ■Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Masaru Miyagi (Deputy chief/ Hybrid power generation system human resource development/B) • Hiroyuki Nakachi (DG economic operation/A) • Hisashi Shimabukuro (DG economic operation/B) • Hideyasu Hokama (DG economic operation/C) • Ken Miyagi (DG maintenance-mechanical/A) • Riki Oshiro (DG maintenance-electrical/A) • Takahisa Watanabe (Work coordination/ monitoring/A) • Gaku Hashimoto (Work coordination/ monitoring/B)	
Trainer/ Lecture material	■Energy Fiji Limited (EFL)	
	Trainer	Lecture material (title)
	Epeli Rokodrakiya	• Diesel Power Generation Overhaul Training
	Sabitesh Ajay Pal	• Supply and Demand Management
	Neipolione Gatanitubei	• Maintenance of DEG Electrical
	Waisea Tuamoto	• Power Plant Maintenance and Inspection Procedure
	Anasa Salobo	• Main equipment of DEG (Electrical)

	Tobia Nayaqayaqa/Etika Rokobuli	• Maintenance of DEG (Mechanical)
	Rusiate Jale Faivakibau	• Practice in the use of measuring equipment and special tools • Tools for Diesel Power Generation Maintenance

【4th TOT training (DG)】

Purpose	Check and advise on lecture material for regional training	
Training dates	• 2021/4/20,22,23,26,27	
Participants from JICA side (Senior Advisor/ Expert Team)	■ JICA Senior Advisor • Tadayuki Ogawa ■ Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Masanori Shimabuku (Deputy chief/ Hybrid power generation system human resource development/A) • Masaru Miyagi (Deputy chief/ Hybrid power generation system human resource development/B) • Hideyasu Hokama (DG economic operation/C) • Ken Miyagi (DG maintenance-mechanical/A) • Hirokazu Nakamura (RE O&M/A) • Takahisa Watanabe (Work coordination/ monitoring/A) • Gaku Hashimoto (Work coordination/ monitoring/B)	
Trainer/ Lecture material	■ Energy Fiji Limited (EFL)	
	Trainer	Lecture material (title)
	Epeli Rokodrakiya	• Safety • Basic principle, basics symbols, features, composition of DEG • Operating procedure of power plant
	Anasa Salobo	• Main equipment of DEG (Electrical)
	Neipolione Gatanitubei	• Maintenance of DEG (Electrical)
	Sabitesh Ajay Pal	• Supply and Demand Management
	Waisea Tuamoto	• Power plant maintenance and inspection
	Rusiate Jale Faivakibau	• Tools for DG maintenance

【5th TOT training (DG)】

Purpose	Check and advise on lecture material for regional training	
Training dates	• 2021/9/3,9,10,21 • 2021/10/7	
Participants from JICA side (Senior Advisor/ Expert Team)	■ JICA Senior Advisor • Tadayuki Ogawa ■ Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Masanori Shimabuku (Deputy chief/ Hybrid power generation system human resource development/A) • Hideyasu Hokama (DG economic operation/C) • Hirokazu Nakamura (RE O&M/A) • Takahisa Watanabe (Work coordination/ monitoring/A) • Gaku Hashimoto (Work coordination/ monitoring/B)	
Trainer/ Lecture material	■ Energy Fiji Limited (EFL)	
	Trainer	Lecture material (title)

	Epeli Rokodrakiya	• Safety • Main equipment of DEG (Mechanical)
	Anasa Salobo	• Main equipment of DEG (Electrical) • Maintenance of DEG (Electrical)
	Tobia Nayaqayaqa	• Maintenance of DEG (Mechanical)
	Isimeli Nabalarua	• Maintenance of DEG (Mechanical)
	Etika Rokobuli	• Maintenance of DEG (Mechanical)
	Sabitesh Ajay Pal	• Supply and Demand Management
	Waisea Tuamoto	• Power Plant Maintenance and Inspection procedure

【6th TOT training (DG)】

Purpose	Check and advise on lecture material for regional training	
Training dates	• 2021/10/19,20,21,26,27,29 • 2021/11/8,9,12,18	
Participants from JICA side (Senior Advisor/ Expert Team)	■ JICA Senior Advisor • Tadayuki Ogawa ■ Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Masanori Shimabuku (Deputy chief/ Hybrid power generation system human resource development/A) • Hideyasu Hokama (DG economic operation/C) • Hirokazu Nakamura (RE O&M/A) • Gaku Hashimoto (Work coordination/ monitoring/B)	
Trainer/ Lecture material	■ Energy Fiji Limited (EFL)	
	Trainer	Lecture material (title)
	Epeli Rokodrakiya	• Safety • Basic Principle, basic symbols, features & composition of Diesel Generator • Basic knowledge of DG's (Mechanical) • Basic knowledge of Diesel generators
	Rusiate Jale Faivakibau	• Tools for diesel power generation maintenance – electrical • Maintenance of DGs (Mechanical)
	Anasa Wainimala	• Main Equipment of Diesel Generation-Electrical device • Maintenance of DEG (Electrical)
	Tobia Nayaqayaqa	• Maintenance of Diesel Engine Generator
	Isimeli Nabalarua	• Diesel Engine Maintenance
	Sabitesh Ajay Pal	• Operation of Diesel Generators
	Waisea Tuamoto	• Power plant maintenance and inspection(Overview)
	Etika Rokobuli	• Maintenance of DGs (Mechanical) • Maintenance of DG (Mechanical) I
	Isimeli Nabalarua	• Maintenance of DG

【7th TOT training (DG)】

Purpose	Check and advise on lecture material for regional training	
Training dates	• 2022/1/31 • 2022/2/1,2,8,9 • 2022/3/8	
Participants from JICA side (Senior Advisor/ Expert Team)	■ JICA Senior Advisor • Tadayuki Ogawa ■ Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Hideyasu Hokama (DG economic operation/C) • Hirokazu Nakamura (RE	

	O&M/A) • Gaku Hashimoto (Work coordination/ monitoring/B)	
Trainer/ Lecture material	■Energy Fiji Limited (EFL)	
	Trainer	Lecture material (title)
	Epeli Rokodrakiya	• Safety • Basic Principle, basic symbols, features & composition of Diesel Generator
	Waisea Tuamoto	• Power plant maintenance and inspection management • Preparation for OH works / safety / tags / running hours / overview of type of inspections / spare parts
	Anasa Salobo	• Main equipment of DG (Electrical) • Maintenance of generators of CB • Inspection of electrical components
	Tobia Nayaqayaqa	• Cylinder liner, piston, camshaft. • Auxiliary devices
	Isimeli Nabalarua	• Maintenance of DG
	Sabitesh Ajay Pal	• DGs Economical load Dispatch Control (EDC) • Economic Generation Dispatch
	Rusiate Jale Faivakibau	• Practice in the use of measuring equipment and special tools • Safety • Basic Principle, basic symbols, features & composition of Diesel Generator
	Etika Rokobuli	• Cylinder head section • Auxiliary devices

【8th TOT training (DG)】

Purpose	Check and advise on lecture material for regional training	
Training dates	• 2022/3/22,23,24,25	
Participants from JICA side (Senior Advisor/ Expert Team)	■JICA Senior Advisor • Tadayuki Ogawa ■Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Masanori Shimabuku (Deputy chief/ Hybrid power generation system human resource development/A) • Hideyasu Hokama (DG economic operation/C) • Gaku Hashimoto (Work coordination/ monitoring/B)	
Trainer/ Lecture material	■Energy Fiji Limited (EFL)	
	Trainer	Lecture material (title)
	Rusiate Jale Faivakibau	• Practice in the use of measuring equipment and special tools • Safety • Basic Principle, basic symbols, features & composition of Diesel Generator
	Maikeli L. Naciqa	• Main equipment of DG (Electrical) • Maintenance of generators of CB • Inspection of electrical components
	Sabitesh Ajay Pal	• DGs Economical load Dispatch Control (EDC) • Economic Generation Dispatch
	Isimeli Nabalarua	• Maintenance of DG
	Waisea Tuamoto	• Power plant maintenance and inspection management • Preparation for OH works / safety / tags / running hours / overview of type of inspections / spare parts

【9th TOT training (DG)】

Purpose	Check and advise on lecture material for regional training	
Training dates	• 2022/12/12,13,27,28	
Participants from JICA side (Senior Advisor/ Expert Team)	■ JICA Senior Advisor • Tadayuki Ogawa ■ Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Hideyasu Hokama (DG economic operation/C) • Gaku Hashimoto (Work coordination/ monitoring/B)	
Trainer/ Lecture material	■ Energy Fiji Limited (EFL)	
	Trainer	Lecture material (title)
	Rusiate Jale Faivakibau Isimeli Nabalarua	• Preparation for OH • Preparation of the OH schedule/time frame / • Arrangement of spare parts • Arrangement of special tools • Arrangement of consumables • Manpower • Outage request procedure (PS side) • HV Isolation procedures
	Etika Rokobuli Apenisa Drotini	• Safety in OH works • Commissioning • Protection • Switching procedure • Explanation of measurement instruments
	Waisea Tuamoto	• OH premeasurements • Disassembly • Cleaning • Inspection • Adjustment • Replacement • Installation • Calibration
	Tobia Nayaqayaqa	• OH premeasurements • Disassembly • Cleaning • Inspection • Adjustment • Replacement • Installation • Calibration
	Maikeli L. Naciqa	• Commissioning • Protection • Switching procedure

【10th TOT training (DG)】

Purpose	Check and advise on lecture material for regional training	
Training dates	2023/1/18,19,20,23,24,25	
Participants from JICA side (Senior Advisor/ Expert Team)	■ JICA Senior Advisor • Tadayuki Ogawa ■ Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Takahisa Watanabe (Work coordination/ monitoring/A) • Gaku Hashimoto (Work coordination/ monitoring/B)	

Trainer/ Lecture material	■Energy Fiji Limited (EFL)	
	Trainer	Lecture material (title)
	Tobia Nayaqaya Ravneel Nair	• Crankshaft deflection, Generator megger • Dissassembly • Cleaning • Inspection • Adjustment • Replacement • Installation • Calibration
	Rusiate Jale Faivakibau	• Preparation for OH • Preparation of the OH schedule/time frame • Arrangement of spare parts • Arrangement of special tools • Arrangement of consumables • Manpower • Outage request procedure (PS side) • HV Isolation procedures
	Waisea Tuamoto	• Adjustment / • Replacement • Calibration
	Apenisa Drotini	• Safety in OH Works • Measurement Instruments
	Etika Rokobuli	• Safety in OH Works
	Isimeli Nabalarua	• Preparation for OH • Preparation of the OH schedule/time frame • Arrangement of spare parts • Arrangement of special tools • Arrangement of consumables • Manpower • Outage request procedure (PS side) • HV Isolation procedures
	Sabitesh Ajay Pal	• Operation of all PS in Viti Levu

【11th TOT training (DG)】

Purpose	Check and advise on lecture material for regional training	
Training dates	2023/4/4, 10	
Participants from JICA side (Senior Advisor/ Expert Team)	■JICA Senior Advisor • Tadayuki Ogawa ■Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Hideyasu Hokama (DG economic operation/C) • Takahisa Watanabe (Work coordination/ monitoring/A)	
Trainer/ Lecture material	■Energy Fiji Limited (EFL)	
	Trainer	Lecture material (title)
	Rusiate Jale Faivakibau	• Preparation for OH • Preparation of the OH schedule/time frame • Arrangement of spare parts • Arrangement of special tools • Arrangement of consumables • Manpower • Outage request procedure (PS side)

		• HV Isolation procedures
	Isimeli Nabalarua	• Preparation for OH • Preparation of the OH schedule/time frame • Arrangement of spare parts • Arrangement of special tools • Arrangement of consumables • Manpower • Outage request procedure (PS side) • HV Isolation procedures
	Tobia Nayaqaya Ravneel Nair	• Crankshaft deflection, Generator megger • Disassembly • Assembly • OH Works
	Waisea Tuamoto	• OH Works • Adjustment • Replacement • Calibration
	Ravneel Karan Nair	• OH Works • Cleaning • Inspection
	Joseva Ravue	• Instrumentation • Explanation of Electrical • Measurement Instruments
	Maikeli Naciqa	• Commissioning • Protection
	Sabitesh Ajay Pal	• Site Visit (Vuda Power station) • NCC operation, • NCC side procedure, verifications

【1st TOT training (RE)】

Purpose	Check and advise on lecture material for regional training	
Training dates	2020/10/06～2020/10/23	
Participants from JICA side (Senior Advisor/ Expert Team)	■ JICA Senior Advisor • Tadayuki Ogawa ■ Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Masanori Shimabuku (Deputy chief/ Hybrid power generation system human resource development/A) • Tomohiro Shiohama (RE integration plan/A) • Tasuku Taira (RE integration plan/B) • Yuma Uezu (RE integration plan/C) • Hirokazu Nakamura (RE O&M/A) • Manatsu Yonashiro (RE O&M/C) • Takahisa Watanabe (Work coordination/ monitoring/A) / • Hashimoto, Gaja	
Trainer/ Lecture material	■ Energy Fiji Limited (EFL)	
	Trainer	Lecture material (title)
	Krishneel Prasad	「 Technical Considerations for Grid Integration of a Variable Renewable Energy Source」
	Jese Dautei	PV plan & system design
	Mitieli Beranadoi	RE INTEGRATION IN THE PACIFIC

	Maciu Waqaira	PV System
	Josese Atama	Operation and Maintenance of PV Systems

【2nd TOT training (RE)】

Purpose	Check and advise on lecture material for regional training	
Training dates	2020/11/24～2020/11/26	
Participants from JICA side (Senior Advisor/ Expert Team)	■ JICA Senior Advisor • Tadayuki Ogawa ■ Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Masanori Shimabuku (Deputy chief/ Hybrid power generation system human resource development/A) • Tomohiro Shiohama (RE integration plan/A) • Tasuku Taira (RE integration plan/B) / Yuma Uezu (RE integration plan/C) • Hirokazu Nakamura (RE O&M/A) / Manatsu Yonashiro (RE O&M/C) • Takahisa Watanabe (Work coordination/) / • Hashimoto, Gaja	
Trainer/ Lecture material	■ Energy Fiji Limited (EFL)	
	Trainer	Lecture material (title)
	Krishneel Prasad	「 Technical Considerations for Grid Integration of a Variable Renewable Energy Source」
	Jese Dautai	PV plan & system design
	Mitieli Beranadoi	RE INTEGRATION IN THE PACIFIC
	Maciu Waqaira	PV System
	Josese Atama	Operation and Maintenance of PV Systems

【3rd TOT training (RE)】

Purpose	Check and advise on lecture material for regional training	
Training dates	2021/2/16～2021/2/19	
Participants from JICA side (Senior Advisor/ Expert Team)	■ JICA Senior Advisor • Tadayuki Ogawa ■ Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Masanori Shimabuku (Deputy chief/ Hybrid power generation system human resource development/A) • Tasuku Taira (RE integration plan/B) • Hirokazu Nakamura (RE O&M/A) • Manatsu Yonashiro (RE O&M/C) • Hashimoto, Gaja	
Trainer/ Lecture material	■ Energy Fiji Limited (EFL)	
	Trainer	Lecture material (title)
	Sabitesh Pal	Integration of Renewable Energy
	Mitieli Beranadoi	Hybrid power generation system in the Pacific
	Maikeli Naciqa	Solar System Installation and Commissionin

【4th TOT training (RE)】

Purpose	Check and advise on lecture material for regional training	
Training dates	2021/4/28～2021/5/10	
Participants from JICA side (Senior Advisor/ Expert Team)	■JICA Senior Advisor • Tadayuki Ogawa ■Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Masanori Shimabuku (Deputy chief/ Hybrid power generation system human resource development/A) • Tomohiro Shiohama (RE integration plan/A) / • Tasuku Taira (RE integration plan/B) / • Hirokazu Nakamura (RE O&M/A) / • Takahisa Watanabe (Work coordination/ monitoring/A) / • Gaku Hashimoto	
Trainer/ Lecture material	■Energy Fiji Limited (EFL)、 ■Department of Energy (DOE)	
	Trainer	Lecture material (title)
	Mitieli Beranadoi	Feedback on the 1st Expanded Regional Training Lecture content for the 2nd Regional Training
	Maikeli Lutunauro Naciqa	Lecture content for the 2nd Regional Training
	Jese Dautei	Lecture content for the 2nd Regional Training
	Josese Atama	Operation and Maintenance of PV Systems
	Sitiveni Smith Tuisaravere	PV Plan & System Design
	Sabitesh Pal	Integration_of_Renewable_Energy
	Deepak Chand	Overview of RE Generation Types and Characteristics of Renewable Energy
	Waisale Vulagi	Concept of Hybrid Power Generation system (HPGS)
	Filimoni Tarai	General Concept of Inspection Patrol and Periodical Inspection (Maintenance)
	Maciu Waqaira	PV Plan & System Design

【5th TOT training (RE)】

Purpose	Check and advise on lecture material for regional training	
Training dates	2021/9/10～2021/9/28	
Participants from JICA side (Senior Advisor/ Expert Team)	■JICA Senior Advisor • Tadayuki Ogawa ■Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Masanori Shimabuku (Deputy chief/ Hybrid power generation system human resource development/A) • Tomohiro Shiohama (RE integration plan/A) • Tasuku Taira (RE integration plan/B) / • Hirokazu Nakamura (RE O&M/A) / • Kaoru Ikehara (RE O&M/B) • Manatsu Yonashiro (RE O&M/C) • Takahisa Watanabe (Work coordination/ monitoring/A) • Gaku Hashimoto	

Trainer/ Lecture material	■Energy Fiji Limited (EFL)、 ■Department of Energy (DOE)	
	Trainer	Lecture material (title)
	Sabitesh Pal	Renewable Energy Integration
	Josese Atama	Operation and Maintenance of PV
	Maciu Waqaira	PV Plan & Design
	Jese Dautei	PV Plan & System Design
	Krishneel Prasad	RE integration & Planning
	Maikeli Lutunauro Naciqa	Installation Work
	Mitieli Beranadoi	PV System Planning、 Sketch Up Software
	Deepak Chand,	Overview of RE Generation
	Waisale Vulagi,	Overview of RE Generation
	Filimoni Tarai	Maintenance of PV installation

【6th TOT training (RE)】

Purpose	Check and advise on lecture material for regional training	
Training dates	2021/10/25～2021/12/7	
Participants from JICA side (Senior Advisor/ Expert Team)	■JICA Senior Advisor • Tadayuki Ogawa ■Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Masanori Shimabuku (Deputy chief/ Hybrid power generation system human resource development/A) • Hirokazu Nakamura (RE O&M/A) • Gaku Hashimoto	
Trainer/ Lecture material	■Energy Fiji Limited (EFL)、 ■Department of Energy (DOE)	
	Trainer	Lecture material (title)
	Josese Atama	PV System maintenance Operations and maintenance of PV systems
	Sabitesh Ajay Pal	Promotion measures for RE integration in Fiji
	Mitieli Beranadoi	PV Systems Plan PV Systems Plan (HOMER)
	Maikeli Naciqa	Solar System Installation and Commissioning
	Jese Dautei	PV Systems Plan
	Maciu Waqaira	PV Systems Plan
	Krishneel Prasad	RE integration & Planning
	Deepak Chand	PV System Overview
	Filimoni Tarai	PV Systems Maintenance
	Waisale Vulagi	PV System Overview

【7th TOT training (RE)】

Purpose	Check and advise on lecture material for regional training	
Training dates	2022/2/2～2022/3/8	

Participants from JICA side (Senior Advisor/ Expert Team)	■ JICA Senior Advisor • Tadayuki Ogawa ■ Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Hirokazu Nakamura (RE O&M/A) • Gaku Hashimoto (Work coordination/ monitoring/B)	
Trainer/ Lecture material	■ Energy Fiji Limited (EFL)、 ■ Department of Energy (DOE)	
	Trainer	Lecture material (title)
	Maciu Waqaira,	Basic design
	Jese Dautei,	Planning phase
	Krishneel Prasad	Grid code System stabilization
	Mitieli Beranadoi,	Detailed design
	Josese Atama	Maintenance management
	Sabitesh Ajay Pal	Promotion measures for RE integration in Fiji. Feed in tariff (FIT) / Net metering
	Deepak Chand	PV integration on the outer islands of Fiji Survey to introduce EVs funded by GGGI (Global Green Growth Institute).
	Maikeli L. Naciqa	Procedures for system installation and commissioning (AU/NZ standards)
	Waisale Vulagi	• Power Conditioner • Battery Storage System • Management Parameters
	Filimoni Tarai	Use of measurement instruments during PV facilities inspection (Line tracer, IV checker, etc.)
	Ashnil Aranesh Kumar	Detailed design Design of PV array (exercise)

【8th TOT training (RE)】

Purpose	Check and advise on lecture material for regional training	
Training dates	2022/4/12～2022/4/22	
Participants from JICA side (Senior Advisor/ Expert Team)	■ JICA Senior Advisor • Tadayuki Ogawa ■ Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Hirokazu Nakamura (RE O&M/A) • Gaku Hashimoto (Work coordination/ monitoring/B)	
Trainer/ Lecture material	■ Energy Fiji Limited (EFL)	
	Trainer	Lecture material (title)
	Maikeli Drose	Planning phase
	Maikeli Naciqa	Solar System Installation and Commissioning
	Josese Atama	Maintenance management
	Sabitesh Ajay Pal	Promotion measures for RE integration in Fiji. Feed in tariff (FIT) / Net metering (NEM)

	Krishneel Prasad	Grid code System stabilization
	Maikeli Drose	PV DESIGN PLANNING PHASE

【9th TOT training (RE)】

Purpose	Check and advise on lecture material for regional training	
Training dates	2022/12/6～2023/1/5	
Participants from JICA side (Senior Advisor/ Expert Team)	■JICA Senior Advisor • Tadayuki Ogawa ■Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Hirokazu Nakamura (RE O&M/A) • Takahisa Watanabe (Work coordination/ monitoring/A) • Hideyasu Hokama (DG economic operation/C) • Gaku Hashimoto (Work coordination/ monitoring/B)	
Trainer/ Lecture material	■Energy Fiji Limited (EFL)、 ■Department of Energy (DOE)	
	Trainer	Lecture material (title)
	Filimoni Tarai (Rusiate Faivakibau)	Operation and Maintenance of PV facilities
	Manoj Kumar	RE integration & planning
	Josese Atama	Operation and Maintenance of PV facilities
	Maikeli Drose	SCADA system
	Deepak Chand	LaKaRo PV project
	Waisale Vulagi	Financial plan, design, construction, operation. Inspections, issues / Technical report (including Homer study and measurement results)
	Filimoni Tarai	
	Maikeli L Naciqa	BESS (Function, types, operation, cost)
	Krishneel Prasad	RE development plan in Fiji, (PV and Hydro) Discussion

【10th TOT training (RE)】

Purpose	Check and advise on lecture material for regional training	
Training dates	2023/1/23～2023/1/26	
Participants from JICA side (Senior Advisor/ Expert Team)	■JICA Senior Advisor • Tadayuki Ogawa ■Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Takahisa Watanabe (Work coordination/ monitoring/A)	
Trainer/ Lecture material	■Energy Fiji Limited (EFL)、 ■Department of Energy (DOE)	
	Trainer	Lecture material (title)
	Deepak Chand Waisale Vulagi	LaKaRo PV project, financial plan, design, construction, operation.

		Financial plan, design, construction, operation. Inspections, issues /Technical report
	Filimoni Tarai	Operation and Maintenance of PV facilities
	Maciu Waqaira	Management (Performance ratio, Efficiency of PV System, Estimation of PV power generation)
	Rusiate Faivakibau	Operation and Maintenance of PV
	Sabitesh Pal	RE integration & planning; Homer software use example
	Josese Atama	Operation and Maintenance of PV facilities: Necessary budget for maintenance (Maintenance contents. Annual maintenance cost.)
	Maikeli Drose	Scada system
	Maikeli Naciqa	BESS
	Louis Willson	Solar project 99%RE in Tau'u American Samoa.

【11th TOT training (RE)】

Purpose	Check and advise on lecture material for regional training	
Training dates	2023/4/3～2023/4/5	
Participants from JICA side (Senior Advisor/ Expert Team)	■JICA Senior Advisor • Tadayuki Ogawa ■Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Hideyasu Hokama (DG economic operation/C) • Takahisa Watanabe (Work coordination/ monitoring/A)	
Trainer/ Lecture material	■Energy Fiji Limited (EFL)、 ■Department of Energy (DOE)	
	Trainer	Lecture material (title)
	Deepak Chand Waisale Vulagi	LaKaRo PV project • Financial plan, • Design, • Construction • Operation. • Inspections, issues • Technical report
	Maciu Waqaira	Management (Performance ratio, Efficiency of PV System, Estimation of PV power generation)
	Mohammed Ahzaaz	Challenges in RE integration of grid connected solar facilities. Inspection of setup/check of standard
	Manoj Kumar	NCC experiences in RE integration or Grid operation
	Filimoni Tarai Rusiate Jale Faivakibau	Operation and Maintenance of PV Facilities
	Maikeli Drose Samisoni Savulimoala	Necessary budget for maintenance

	Josese Atama	Necessary budget for maintenance
	Sabitesh pal	Homer Software use example
	Maikeli Naciqa	BESS (Function, types, operation, cost)

(2) Tuvalu

Overviews of the online trainings for Tuvalu are shown below.

【1st Online training (DG)】

Purpose	To hold online trainings to supplement for TOT trainings that cannot be held on-site due to travel restrictions
Training dates	2020/6/18
Participants from JICA side (Senior Advisor/ Expert Team)	■ JICA Senior Advisor • Tadayuki Ogawa • Torahiko Osaki ■ Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Masaru Miyagi (Deputy chief/ Hybrid power generation system human resource development/B) • Hiroyuki Nakachi (DG economic operation/A) • Hisashi Shimabukuro (DG economic operation/B) • Hideyasu Hokama (DG economic operation/C) • Tokumitsu Kakazu (DG maintenance-electrical/B) • Takahisa Watanabe (Work coordination/ monitoring/A)
Participants from Tuvalu	■ Tuvalu Electricity Corporation (TEC) • Mafalu Lotolua • Namoto Kelisinao • Tito Saosao • Sepulona Mika • Kiola Soa • Iosua Tepaolo ■ Ministry of Transport Energy & Tourism (TMTI) • Utala Taloka • Siaosi Taake
Training content	• Explanation on online training schedule, greeting • Basic knowledge of DG (each system) • Explanation on DG daily inspection (Pmax adjustment, exhaust temperature measurement, FO rack adjustment) • How to read electrical diagrams (single line diagram, three-line diagram, sequence diagram) • Specific fuel consumption measurement method • Information on the next training

【2nd Online training (DG)】

Purpose	To hold online trainings to supplement for TOT trainings that cannot be held on-site due to travel restrictions
Training dates	2020/7/21
Participants from JICA side (Senior Advisor/ Expert Team)	■ JICA Senior Advisor • Tadayuki Ogawa ■ Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Masaru Miyagi (Deputy chief/ Hybrid power generation system human resource development/B) • Hisashi Shimabukuro (DG economic operation/B) • Hideyasu Hokama (DG economic operation/C) • Ken Miyagi (DG maintenance-mechanical/A) • Riki Oshiro (DG maintenance-electrical/A) • Takahisa Watanabe (Work coordination/ monitoring/A)

	• Gaku Hashimoto (Work coordination/ monitoring/B)
Participants from Tuvalu	■ Tuvalu Electricity Corporation (TEC) • Mafalu Lotolua • Namoto Kelisinao • Tito Saosaoa • William Teipauli • Iosua Tepaolo ■ Ministry of Transport Energy & Tourism (TMTI) • Opeta Tavau ■ Tuvalu maritime training school • two other participants
Training content	• Explanation on online training schedule, greeting • How to use measuring instruments (caliper, micrometer, dial gauge) • How to use digital measuring instruments (RTD, TC, pressure gauge) • Power plant operation • Status assessment of power plant improvement

【3rd Online training (DG)】

Purpose	To hold online trainings to supplement for TOT trainings that cannot be held on-site due to travel restrictions
Training dates	2020/8/20
Participants from JICA side (Senior Advisor/ Expert Team)	■ JICA Senior Advisor • Tadayuki Ogawa ■ Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Masaru Miyagi (Deputy chief/ Hybrid power generation system human resource development/B) • Hisashi Shimabukuro (DG economic operation/B) • Hideyasu Hokama (DG economic operation/C) • Ken Miyagi (DG maintenance-mechanical/A) • Riki Oshiro (DG maintenance-electrical/A) • Takahisa Watanabe (Work coordination/ monitoring/A) • Gaku Hashimoto (Work coordination/ monitoring/B)
Participants from Tuvalu	■ Tuvalu Electricity Corporation (TEC) • Mafalu Lotolua • Namoto Kelisiano • Taaku Sekielu • Tito Saosaoa • William Teipauli • Sepulona Mika
Training content	• Orientation of online trainings • O&M manual revision • DG maintenance method (mechanical) • Inquiry on floating solar • Fuel tank inspection • Progress on power plant improvement and specific fuel consumption measurement

【4th Online training (DG)】

Purpose	To hold online trainings to supplement for TOT trainings that cannot be held on-site due to travel restrictions
Training dates	2020/10/15
Participants from JICA side	■ JICA Senior Advisor • Tadayuki Ogawa

(Senior Advisor/ Expert Team)	■ Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Masaru Miyagi (Deputy chief/ Hybrid power generation system human resource development/B) • Hiroyuki Nakachi (DG economic operation/A) • Hideyasu Hokama (DG economic operation/C) • Ken Miyagi (DG maintenance-mechanical/A) • Riki Oshiro (DG maintenance-electrical/A) • Takahisa Watanabe (Work coordination/ monitoring/A) • Gaku Hashimoto (Work coordination/ monitoring/B)
Participants from Tuvalu	■ Tuvalu Electricity Corporation (TEC) • Mafalu Lotolua • Namoto Kelisinao • Taaku Sekielu • Tito Saosaoa • Iosua Tepaolo
Training content	• O&M manual revision • DG maintenance method (mechanical) • DG turbocharger maintenance • Remote island power source development plan • Points to confirm (power plant improvement plan, specific fuel consumption, OH schedule, generator operation record)

【5th Online training (DG)】

Purpose	To hold online trainings to supplement for TOT trainings that cannot be held on-site due to travel restrictions
Training dates	2021/1/21
Participants from JICA side (Senior Advisor/ Expert Team)	■ JICA Senior Advisor • Tadayuki Ogawa ■ Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Masaru Miyagi (Deputy chief/ Hybrid power generation system human resource development/B) • Hiroyuki Nakachi (DG economic operation/A) • Hisashi Shimabukuro (DG economic operation/B) • Ken Miyagi (DG maintenance-mechanical/A) • Riki Oshiro (DG maintenance-electrical/A) • Takahisa Watanabe (Work coordination/ monitoring/A) • Gaku Hashimoto (Work coordination/ monitoring/B)
Participants from Tuvalu	■ Tuvalu Electricity Corporation (TEC) • Mafalu Lotolua • Namoto Kelisinao • Taaku Sekielu • Tito Saosaoa
Training content	• Orientation of online trainings • O&M manual revision • DG daily maintenance method (mechanical) • Case study of MG set introduction in Hateruma Island • Generator inspection • Points to confirm (improvement plan, specific fuel consumption, OH schedule, power plant operation data)

【6th Online training (DG)】

Purpose	To hold online trainings to supplement for TOT trainings that cannot be held on-site due to travel restrictions
Training dates	2021/5/27
Participants from JICA	■ Expert Team

side (Senior Advisor/ Expert Team)	• Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Masaru Miyagi (Deputy chief/ Hybrid power generation system human resource development/B) • Hisashi Shimabukuro (DG economic operation/B) • Hideyasu Hokama (DG economic operation/C) • Ken Miyagi (DG maintenance-mechanical/A) • Riki Oshiro (DG maintenance-electrical/A) • Takahisa Watanabe (Work coordination/ monitoring/A) • Gaku Hashimoto (Work coordination/ monitoring/B)
Participants from Tuvalu	■ Tuvalu Electricity Corporation (TEC) • Mafalu Lotolua • Namoto Kelisinao • Taaku Sekielu • Tito Saosaoa • William Teipauli
Training content	• Orientation of online trainings • Circuit breaker inspection • Non-destructive inspection (dye penetrant testing, magnetic particle testing) • Blackout recovery procedure • Heat exchanger • Points to confirm (power plant improvement plan, specific fuel consumption, comprehension test)

【7th Online training (DG)】

Purpose	To hold online trainings to supplement for TOT trainings that cannot be held on-site due to travel restrictions
Training dates	2021/9/2
Participants from JICA side (Senior Advisor/ Expert Team)	■ Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Masaru Miyagi (Deputy chief/ Hybrid power generation system human resource development/B) • Hisashi Shimabukuro (DG economic operation/B) • Hideyasu Hokama (DG economic operation/C) • Ken Miyagi (DG maintenance-mechanical/A) • Riki Oshiro (DG maintenance-electrical/A) • Gaku Hashimoto (Work coordination/ monitoring/B)
Participants from Tuvalu	■ Tuvalu Electricity Corporation (TEC) • Mafalu Lotolua • Namoto Kelisinao • William Teipauli
Training content	• Orientation of online trainings • O&M manual revision • Governor control • Heat balance • Basics of relays • Basics of sequence control • Points to confirm (power plant improvement plan, specific fuel consumption, OH schedule, comprehension test)

【8th Online training (DG)】

Purpose	To hold online trainings to supplement for TOT trainings that cannot be held on-site due to travel restrictions
Training dates	2022/5/24

Participants from JICA side (Senior Advisor/ Expert Team)	■ Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Hideyasu Hokama (DG economic operation/C) • Riki Oshiro (DG maintenance-electrical/A) • Gaku Hashimoto (Work coordination/ monitoring/B)
Participants from Tuvalu	■ Tuvalu Electricity Corporation (TEC) • Mafalu Lotolua • Namoto Kelisinao • Taaku Sekielu • William Teipauli
Training content	• Orientation of online trainings • O&M manual revision • Specific fuel consumption • Power plant improvement plan/ overhaul • Troubleshooting case examples

【9th Online training (DG)】

Purpose	To hold online trainings to supplement for TOT trainings that cannot be held on-site due to travel restrictions
Training dates	2022/8/2
Participants from JICA side (Senior Advisor/ Expert Team)	■ JICA Senior Advisor • Tadayuki Ogawa ■ Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Masaru Miyagi (Deputy chief/ Hybrid power generation system human resource development/B) • Hideyasu Hokama (DG economic operation/C) • Gaku Hashimoto (Work coordination/ monitoring/B)
Participants from Tuvalu	■ Tuvalu Electricity Corporation (TEC) • Mafalu Lotolua • Namoto Kelisinao • Taaku Sekielu • William Teipauli
Training content	• Orientation of online trainings • O&M manual revision • Specific fuel consumption • Power plant improvement plan/ overhaul • Troubleshooting case examples

【1st DG manual revision meeting】

Purpose	Progress assessment and advice on O&M manual revision
Date	2021/5/11
Participants from JICA side (Senior Advisor/ Expert Team)	■ Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Masaru Miyagi (Deputy chief/ Hybrid power generation system human resource development/B) • Hideyasu Hokama (DG economic operation/C) • Takahisa Watanabe (Work coordination/ monitoring/A) • Gaku Hashimoto (Work coordination/ monitoring/B)
Participants from	■ Tuvalu Electricity Corporation (TEC) • Mafalu Lotolua • Namoto Kelisiano • Tito Saosao

Tuvalu	
Materials	• 5.2 Maintenance of diesel generators (mechanical)rev 4

【2nd DG manual revision meeting】

Purpose	Progress assessment and advice on O&M manual revision
Date	2021/7/6
Participants from JICA side (Senior Advisor/ Expert Team)	■ Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Takahisa Watanabe (Work coordination/ monitoring/A) • Gaku Hashimoto (Work coordination/ monitoring/B)
Participants from Tuvalu	■ Tuvalu Electricity Corporation (TEC) • Namoto Kelisiano • Tito Saosao
Materials	• 5.2 Maintenance of diesel generators (mechanical)rev 4

【3rd DG manual revision meeting】

Purpose	Progress assessment and advice on O&M manual revision
Date	2022/12/16
Participants from JICA side (Senior Advisor/ Expert Team)	■ Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Hideyasu Hokama (DG economic operation/C)
Participants from Tuvalu	■ Tuvalu Electricity Corporation (TEC) • Namoto Kelisiano • William Teipauli • Eliata Vaeluaga
Materials	1.Safety 2.Basic principle, basics symbols, features, composition of DG 3.1 Main Equipment of Diesel Generation (Mechanical) 3.2 Main Equipment of Diesel Generation (Electrical) 4.1 Operating procedure of diesel power plant 5.2 Maintenance of diesel generators (mechanical) 5.3 Maintenance of diesel generators (Electrical)

【1st Online training (RE)】

Purpose	To hold online trainings to supplement for RE trainings that cannot be held on-site due to travel restrictions
Training dates	2020/6/26
Participants from JICA side (Senior Advisor/ Expert Team)	■ JICA Senior Advisor • Tadayuki Ogawa ■ Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development)

	• Masanori Shimabuku (Deputy chief/ Hybrid power generation system human resource development/A) • Tomohiro Shiohama (RE integration plan/A) • Tasuku Taira (RE integration plan/B) • Hirokazu Nakamura (RE O&M/A) • Kaoru Ikehara (RE O&M/B)
Participants from Tuvalu	■ Tuvalu Maritime Training Institute (TMTI) • Tele. Siamua (Energy Project officer) ■ Tuvalu Electricity Corporation (TEC) • Mafalu Lotolua • Namoto Kelisiano (Generation Manager) • Tito. Tinilau (Mechanic)
Training content	• Basic Hybrid Power Generation System (HPGS) technology • Status of performance ratio measurement • Basic knowledge for Hybrid Power Generation planning manual drafting and review

【2nd Online training (RE)】

Purpose	To hold online trainings to supplement for RE trainings that cannot be held on-site due to travel restrictions
Training dates	2020/7/29
Participants from JICA side (Senior Advisor/ Expert Team)	■ JICA Senior Advisor • Tadayuki Ogawa ■ Expert Team • Masanori Shimabuku (Deputy chief/ Hybrid power generation system human resource development/A) • Tomohiro Shiohama (RE integration plan/A) • Tasuku Taira (RE integration plan/B) • Hirokazu Nakamura (RE O&M/A) • Kaoru Ikehara (RE O&M/B) • Manatsu Yonashiro (RE O&M/C) • Takahisa Watanabe (Work coordination/ monitoring/A)
Participants from Tuvalu	■ Ministry of Transport, Energy and Tourism (MTET) • Tele. Siamua • Papau Aselemo • Simona Kilei ■ Tuvalu Maritime Training Institute (TMTI) • Utala Taloka • Siaosi Taake ■ Tuvalu Electricity Corporation (TEC) • Mafalu Lotolua • Taaku Sekielu • Teafa Tautu (Electrician) • Viliamu Teupauli • Uliamu .iliala (Electrician)
Training content	• Basic knowledge in preparation for RE O&M manual drafting and revision • System configuration and explanation on O&M • Patrol, daily inspection, periodic inspection • Inspection check sheet preparation and recording (method, frequency, etc.) • Basic knowledge for Hybrid Power Generation planning manual drafting and review • Frequency fluctuation • Interview on operating conditions • Performance ratio • Overview and summary of measurement method • Status assessment, evaluation, verification

【3rd Online training (RE)】

Purpose	To hold online trainings to supplement for RE trainings that cannot be held on-site due to travel restrictions
Training dates	2020/8/27, 2020/9/28 (supplementary lecture)
Participants from JICA side (Senior Advisor/ Expert Team)	■ Expert Team • Masanori Shimabuku (Deputy chief/ Hybrid power generation system human resource development/A) • Tomohiro Shiohama (RE integration plan/A) • Tasuku Taira (RE integration plan/B) • Yuma Uezu (RE integration plan/C) • Hirokazu Nakamura (RE O&M/A) • Manatsu Yonashiro (RE O&M/C) • Takahisa Watanabe (Work coordination/ monitoring/A)
Participants from Tuvalu	■ Ministry of Transport, Energy and Tourism (MTET) • Papau Aselemo • Simona Kilei ■ Tuvalu Maritime Training Institute (TMTI) • Utala Taloka • Siaosi Taake • Lagafaoa Maui • Opeta Tavau ■ Tuvalu Electricity Corporation (TEC) • Mafalu Lotolua • Namoto Kelisiano • Taaku Sekielu • Teafa Tautu • William Teipauli • Viliamu Teupauli • Uliamu .iliala • Tito. Tinilau
Training content	• Basic knowledge in preparation for RE O&M manual drafting and revision - System configuration and explanation on O&M - Patrol, daily inspection, periodic inspection • Inspection check sheet preparation and recording (method, frequency, etc.) • Basic knowledge for Hybrid Power Generation planning manual drafting and review - Frequency fluctuation • Interview on operating conditions • Performance ratio (overview and summary of measurement method, status assessment, evaluation, verification) • PV facility inspection, generation cost calculation

【4th Online training (RE)】

Purpose	To hold online trainings to supplement for RE trainings that cannot be held on-site due to travel restrictions
Training dates	2020/11/5, 2020/11/13 (supplementary lecture)
Participants from JICA side (Senior Advisor/ Expert Team)	■ JICA Senior Advisor • Tadayuki Ogawa ■ Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Masanori Shimabuku (Deputy chief/ Hybrid power generation system human resource development/A) • Tomohiro Shiohama (RE integration plan/A) • Tasuku Taira (RE integration plan/B) • Hirokazu Nakamura (RE O&M/A) • Manatsu Yonashiro (RE O&M/C) • Takahisa Watanabe (Work coordination/ monitoring/A)
Participants from Tuvalu	■ Ministry of Transport, Energy and Tourism (MTET) • Tele Siamua ■ Tuvalu Electricity Corporation (TEC)

	• Mafalu Lotolua • Taaku Sekielu • Teafa Tautu • William Teipauli
Training content	• RE O&M manual revision • Performance ratio • Interconnection and operation of RE grid (grid stabilization method) - Output fluctuation mitigation control (ΔP control) - Frequency fluctuation mitigation control (ΔF control) • Case example of RE expansion in Okinawa - Hybrid Power Generation System in Yonaguni Island • Explanation on Plan of Operation (PO) - Future maintenance system and budget

【5th Online training (RE)】

Purpose	To hold online trainings to supplement for RE trainings that cannot be held on-site due to travel restrictions
Training dates	2021/2/12
Participants from JICA side (Senior Advisor/ Expert Team)	■ Expert Team • Masanori Shimabuku (Deputy chief/ Hybrid power generation system human resource development/A) • Tomohiro Shiohama (RE integration plan/A) • Tasuku Taira (RE integration plan/B) • Hirokazu Nakamura (RE O&M/A) • Manatsu Yonashiro (RE O&M/C) • Takahisa Watanabe (Work coordination/ monitoring/A)
Participants from Tuvalu	■ Ministry of Transport, Energy and Tourism (MTET) • Tele Siamua • Papau Aselemo ■ Tuvalu Electricity Corporation (TEC) • Mafalu Lotolua • Taaku Sekielu • Teafa Tautu • William Teipauli
Training content	• Discussion on RE O&M manual revision • Performance ratio - How to obtain solar irradiation data (utilizing NASA data) • RE grid interconnection and operation - Grid code (grid interconnection rules) - Grid interconnection procedure - Operation (output curtailment) *case example • Future maintenance system and maintenance budget - Maintenance system - Maintenance budget - Support details by other donors

【6th Online training (RE)】

Purpose	To hold online trainings to supplement for RE trainings that cannot be held on-site due to travel restrictions
Training dates	2021/6/3
Participants from JICA side (Senior Advisor/ Expert Team)	■ JICA Senior Advisor • Tadayuki Ogawa ■ Expert Team • Masanori Shimabuku (Deputy chief/ Hybrid power generation system human resource development/A) • Tomohiro Shiohama (RE integration plan/A) • Hirokazu Nakamura (RE O&M/A) • Manatsu Yonashiro (RE O&M/C)

	• Takahisa Watanabe (Work coordination/ monitoring/A)
Participants from Tuvalu	■ Ministry of Transport, Energy and Tourism (MTET) • Tele Siamua • Simona Kilei ■ Tuvalu Electricity Corporation (TEC) • Mafalu Lotolua • Taaku Sekielu
Training content	• Performance ratio • RE integration case examples in Okinawa - Abu Mega solar demonstration research - Ogimi Wind Power Generation Demonstration Research Facility - Output fluctuation control (ΔP control and ΔF control) • Future maintenance system and budget - Setting up maintenance system, human resource planning (collaborative work) - O&M schedule planning for 2021 (collaborative work)

【7th Online training (RE)】

Purpose	To hold online trainings to supplement for RE trainings that cannot be held on-site due to travel restrictions
Training dates	2021/9/6
Participants from JICA side (Senior Advisor/ Expert Team)	■ JICA Senior Advisor • Tadayuki Ogawa ■ Expert Team • Masanori Shimabuku (Deputy chief/ Hybrid power generation system human resource development/A) • Tomohiro Shiohama (RE integration plan/A) • Tasuku Taira (RE integration plan/B) • Hirokazu Nakamura (RE O&M/A) • Kaoru Ikehara (RE O&M/B) • Manatsu Yonashiro (RE O&M/C) • Takahisa Watanabe (Work coordination/ monitoring/A)
Participants from Tuvalu	■ Tuvalu Electricity Corporation (TEC) • Mafalu Lotolua • Taaku Sekielu • Scott Moeava
Training content	• RE manual revision training (Chapter 1) • Performance ratio • Discussion on facility inspection - PV facility inspection record - Advice and discussion on inspection work - PV facility inspection method • Future maintenance system - Setting up maintenance system, human resource planning

【8th Online training (RE)】

Purpose	To hold online trainings to supplement for RE trainings that cannot be held on-site due to travel restrictions
Training dates	2022/7/8
Participants from JICA side (Senior Advisor/	■ JICA Senior Advisor • Tadayuki Ogawa ■ Expert Team

Expert Team)	• Masanori Shimabuku (Deputy chief/ Hybrid power generation system human resource development/A) • Tasuku Taira (RE integration plan/B) • Hirokazu Nakamura (RE O&M/A) • Kaoru Ikehara (RE O&M/B)
Participants from Tuvalu	■ Tuvalu Electricity Corporation (TEC) • Mafalu Lotolua • Taaku Sekielu
Training content	• Performance ratio • RE integration plan RE manual revision (Chapter 1) Lecture: Regional micro-grid construction project in Kurima Island • RE O&M RE manual revision (Chapter 2)

【1st RE manual revision meeting】

Purpose	Progress assessment and giving advice on RE manual revision
Dates	2021/5/28、2021/6/21 (supplementary lecture)
Participants from JICA side (Senior Advisor/ Expert Team)	■ JICA Senior Advisor • Tadayuki Ogawa ■ Expert Team • Masanori Shimabuku (Deputy chief/ Hybrid power generation system human resource development/A) • Tasuku Taira (RE integration plan/B) • Hirokazu Nakamura (RE O&M/A) • Takahisa Watanabe (Work coordination/ monitoring/A)
Participants from Tuvalu	■ Ministry of Transport, Energy and Tourism (MTET) • Tele Siamua • Simona Kilei ■ Tuvalu Electricity Corporation (TEC) • Mafalu Lotolua • Taaku Sekielu
Follow-up content	1. Give comments on the revised manual (Chapter 1) 2. Procedure for manual revision Revising procedure (overview) Revising procedure (step 1: organizing information on RE integration plan) Revising procedure (step 2: make a table of contents) Revising procedure (step 3: draft contents) Others

【2nd RE manual revision meeting】

Purpose	Progress assessment and giving advice on RE manual revision
Dates	2021/8/19
Participants from JICA side (Senior Advisor/ Expert Team)	■ JICA Senior Advisor • Tadayuki Ogawa ■ Expert Team • Masanori Shimabuku (Deputy chief/ Hybrid power generation system human resource development/A) • Tomohiro Shiohama (RE integration plan/A) • Tasuku Taira (RE integration plan/B)

	• Hirokazu Nakamura (RE O&M/A) • Takahisa Watanabe (Work coordination/ monitoring/A) • Gaku Hashimoto
Participants from Tuvalu	■ Tuvalu Electricity Corporation (TEC) • Taaku Sekielu
Follow-up content	1. RE manual (Chapter 1) revising work Status of information collection Overview of reference material in Kiribati, legislature, demand curve, system diagram, generation facilities, frequency/voltage fluctuation, system constant

【3rd RE manual revision meeting】

Purpose	Progress assessment and giving advice on RE manual revision
Dates	2022/4/1
Participants from JICA side (Senior Advisor/ Expert Team)	■ Expert Team • Masanori Shimabuku (Deputy chief/ Hybrid power generation system human resource development/A) • Tomohiro Shiohama (RE integration plan/A) • Tasuku Taira (RE integration plan/B) • Hirokazu Nakamura (RE O&M/A)
Participants from Tuvalu	■ Ministry of Transport, Energy and Tourism (MTET) • Tele Siamua • Simona Kilei ■ Tuvalu Electricity Corporation (TEC) • Mafalu Lotolua • Taaku Sekielu
Follow-up content	1. Status of RE manual (Chapter 1) revision work 2. Other announcements and confirmation

【4th RE manual revision meeting】

Purpose	Progress assessment and giving advice on RE manual revision
Dates	2022/5/18
Participants from JICA side (Senior Advisor/ Expert Team)	■ JICA Senior Advisor • Tadayuki Ogawa ■ Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Masanori Shimabuku (Deputy chief/ Hybrid power generation system human resource development/A) • Tomohiro Shiohama (RE integration plan/A) • Tasuku Taira (RE integration plan/B) • Hirokazu Nakamura (RE O&M/A) • Takahisa Watanabe (Work coordination/ monitoring/A)
Participants from Tuvalu	■ Ministry of Transport, Energy and Tourism (MTET) • Simona Kilei ■ Tuvalu Electricity Corporation (TEC) • Mafalu Lotolua

	• Taaku Sekielu • Teafa Tautu
Follow-up content	1. Status of RE manual (Chapter 1) revision work, advice, discussion 2. Other announcements and confirmation

【5th RE manual revision meeting】

Purpose	Progress assessment and giving advice on RE manual revision
Dates	2022/8/17
Participants from JICA side (Senior Advisor/ Expert Team)	■ JICA Senior Advisor • Tadayuki Ogawa ■ Expert Team • Masanori Shimabuku (Deputy chief/ Hybrid power generation system human resource development/A) • Tomohiro Shiohama (RE integration plan/A) • Tasuku Taira (RE integration plan/B) • Hirokazu Nakamura (RE O&M/A) • Kaoru Ikehara (RE O&M/B) • Takahisa Watanabe (Work coordination/ monitoring/A)
Participants from Tuvalu	■ Ministry of Transport, Energy and Tourism (MTET) • Simona Kilei ■ Tuvalu Electricity Corporation (TEC) • Mafalu Lotolua • Taaku Sekielu • Teafa Tautu
Follow-up content	1. Status of RE manual (Chapter 1) revision work, advice 2. Inspection record sheet, performance ratio 3. Others

【6th RE manual revision meeting】

Purpose	Progress assessment and giving advice on RE manual revision
Dates	2022/12/16
Participants from JICA side (Senior Advisor/ Expert Team)	■ JICA Senior Advisor • Tadayuki Ogawa ■ Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Tasuku Taira (RE integration plan/B) • Hirokazu Nakamura (RE O&M/A) • Kaoru Ikehara (RE O&M/B)
Participants from Tuvalu	■ Ministry of Transport, Energy and Tourism (MTET) • Simona Kilei ■ Tuvalu Electricity Corporation (TEC) • Mafalu Lotolua • Taaku Sekielu (Distribution Manager) • Teafa Tautu (Electrician)
Follow-up content	1. Status of RE manual revision by TEC, MTET (Tuvalu) 2. Follow-up on the revised RE manual (Chapter 1: Integration) draft 3. Follow-up on the revised RE manual draft (Chapter 2: RE O&M)

	4. RE O&M work plan drafting

(3) Kiribati

Overviews of the online trainings for Kiribati are shown below.

【1st Online training (DG)】

Purpose	To hold online trainings to supplement for TOT trainings that cannot be held on-site due to travel restrictions
Training dates	2020/6/17
Participants from JICA side (Senior Advisor/ Expert Team)	■ JICA Senior Advisor • Tadayuki Ogawa ■ Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Masaru Miyagi (Deputy chief/ Hybrid power generation system human resource development/B) • Hiroyuki Nakachi (DG economic operation/A) • Hisashi Shimabukuro (DG economic operation/B) • Hideyasu Hokama (DG economic operation/C) • Tokumitsu Kakazu (DG maintenance-electrical/B) • Takahisa Watanabe (Work coordination/ monitoring/A) • Gaku Hashimoto (Work coordination/ monitoring/B)
Participants from Kiribati	■ Public Utilities Board(PUB) • Tenikoria Katauea • Bauro Mikaere • Kirite Uriam • Tebakabu Tion • Tikoro Tanua • Rifene Ikaarau
Training content	• Explanation on online training schedule, greeting • Basic knowledge of DG (each system) • Explanation on DG daily inspection (Pmax adjustment, exhaust temperature measurement, FO rack adjustment) • How to read electrical diagrams (single line diagram, three-line diagram, sequence diagram) • Specific fuel consumption measurement method • Information on the next training

【2nd Online training (DG)】

Purpose	To hold online trainings to supplement for TOT trainings that cannot be held on-site due to travel restrictions
Training dates	2020/7/22
Participants from JICA side (Senior Advisor/ Expert Team)	■ JICA Senior Advisor • Tadayuki Ogawa ■ Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Masaru Miyagi (Deputy chief/ Hybrid power generation system human resource development/B) • Hiroyuki Nakachi (DG economic operation/A) • Hideyasu Hokama (DG economic operation/C) • Ken Miyagi (DG maintenance-mechanical/A) • Riki Oshiro (DG maintenance-electrical/A) • Gaku Hashimoto (Work coordination/ monitoring/B)

Participants from Kiribati	■ Public Utilities Board(PUB) • Tenikoria Katauea • Tebwatia Takau • Taibuwa Tabutoa • Tebakabu Tion • Bauro Mikaere • Tikoro Kirite • Tebike Aree • Teariki, Tom
Training content	• Explanation on online training schedule, greeting • How to use measuring instruments (caliper, micrometer, dial gauge) • How to use digital measuring instruments (RTD, TC, pressure gauge) • Power plant operation • Status assessment of power plant improvement • Others

【3rd Online training (DG)】

Purpose	To hold online trainings to supplement for TOT trainings that cannot be held on-site due to travel restrictions
Training dates	2020/8/19
Participants from JICA side (Senior Advisor/ Expert Team)	■ JICA Senior Advisor • Tadayuki Ogawa ■ Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Masaru Miyagi (Deputy chief/ Hybrid power generation system human resource development/B) • Hisashi Shimabukuro (DG economic operation/B) • Hideyasu Hokama (DG economic operation/C) • Ken Miyagi (DG maintenance-mechanical/A) • Riki Oshiro (DG maintenance-electrical/A) • Takahisa Watanabe (Work coordination/ monitoring/A) • Gaku Hashimoto (Work coordination/ monitoring/B)
Participants from PUB	■ Public Utilities Board(PUB) • Tenikoria Katauea • Bauro Mikaere • Uriam Kirite • Tikoro Kirite • Rifene Ikaarau
Training content	• Orientation of online trainings • O&M manual revision • DG maintenance method (mechanical) • Fuel tank inspection • Progress on power plant improvement and specific fuel consumption measurement

【4th Online training (DG)】

Purpose	To hold online trainings to supplement for TOT trainings that cannot be held on-site due to travel restrictions
Training dates	2020/10/14
Participants from JICA side (Senior Advisor/ Expert Team)	■ JICA Senior Advisor • Tadayuki Ogawa ■ Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Masaru Miyagi (Deputy chief/ Hybrid power generation system human resource development/B) • Hisashi Shimabukuro (DG economic operation/B) • Hideyasu Hokama (DG economic operation/C) • Ken Miyagi (DG maintenance-mechanical/A) • Takahisa Watanabe (Work coordination/ monitoring/A)

	• Gaku Hashimoto (Work coordination/ monitoring/B)
Participants from Kiribati	■ Public Utilities Board(PUB) • Tenikoria Katauea • Uriam Kirite • Tikoro Kirite • Taibwa Tabutoa • Ritene Ikaarau • Takenteiti Tonana • Natanaera Ataia
Training content	• O&M manual revision • DG maintenance method (mechanical) • DG turbocharger maintenance method • Points to confirm (power plant improvement plan, specific fuel consumption, OH schedule)

【5th Online training (DG)】

Purpose	To hold online trainings to supplement for TOT trainings that cannot be held on-site due to travel restrictions
Training dates	2021/1/19
Participants from JICA side (Senior Advisor/ Expert Team)	■ JICA Senior Advisor • Tadayuki Ogawa ■ Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Masaru Miyagi (Deputy chief/ Hybrid power generation system human resource development/B) • Hiroyuki Nakachi (DG economic operation/A) • Hisashi Shimabukuro (DG economic operation/B) • Ken Miyagi (DG maintenance-mechanical/A) • Riki Oshiro (DG maintenance-electrical/A) • Takahisa Watanabe (Work coordination/ monitoring/A) • Gaku Hashimoto (Work coordination/ monitoring/B)
Participants from Kiribati	■ Public Utilities Board(PUB) • Tenikoria Katauea • Uriam Kirite • Tikoro Kirite • Natanaera Ataia • Taerea Tekakoro • Taibwa Tabutoa • Bauro Mikaere
Training content	• Orientation of online trainings • O&M manual revision • DG daily maintenance method (mechanical) • Case study of MG set introduction in Hateruma Island • Generator inspection • Points to confirm (improvement plan, specific fuel consumption, OH schedule, power plant operational data)

【6th Online training (DG)】

Purpose	To hold online trainings to supplement for TOT trainings that cannot be held on-site due to travel restrictions
Training dates	2021/5/18
Participants from JICA side (Senior Advisor/ Expert Team)	■ JICA Senior Advisor • Tadayuki Ogawa ■ Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Masaru Miyagi (Deputy chief/ Hybrid power generation system human resource development/B) • Hisashi Shimabukuro (DG economic operation/B) • Hideyasu Hokama (DG economic operation/C) • Ken Miyagi (DG maintenance-mechanical/A) • Riki Oshiro (DG maintenance-electrical/A)

	• Takahisa Watanabe (Work coordination/ monitoring/A) • Gaku Hashimoto (Work coordination/ monitoring/B)
Participants from Kiribati	■ Public Utilities Board(PUB) • Tenikoria Katauea • Teebwatia Takau • Uriam Kirite • Taerea Tekakoro • Ziemingka Karotu • Mary Rui • Teariki Toani • Bauro Mikaere
Training content	• Orientation of online trainings • O&M manual revision • Circuit breaker inspection • Asset management plan, ADB project • Blackout recovery procedure • Heat exchanger • Points to confirm (power plant improvement plan, specific fuel consumption, comprehension test)

【7th Online training (DG)】

Purpose	To hold online trainings to supplement for TOT trainings that cannot be held on-site due to travel restrictions
Training dates	2021/9/1
Participants from JICA side (Senior Advisor/ Expert Team)	■ JICA Senior Advisor • Tadayuki Ogawa ■ Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Masaru Miyagi (Deputy chief/ Hybrid power generation system human resource development/B) • Hisashi Shimabukuro (DG economic operation/B) • Hideyasu Hokama (DG economic operation/C) • Ken Miyagi (DG maintenance-mechanical/A) • Riki Oshiro (DG maintenance-electrical/A) • Gaku Hashimoto (Work coordination/ monitoring/B)
Participants from Kiribati	■ Public Utilities Board(PUB) • Teebwatia Takau • Uriam Kirite • Bauro Mikaere
Training content	• Orientation of online trainings • O&M manual revision • Governor control • Heat balance • Basics of relays • Basics of sequence control • Points to confirm (power plant improvement plan, specific fuel consumption, OH schedule, comprehension test)

【8th Online training (DG)】

Purpose	To hold online trainings to supplement for TOT trainings that cannot be held on-site due to travel restrictions
Training dates	2022/5/23
Participants from JICA side (Senior Advisor/ Expert Team)	■ Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Hideyasu Hokama (DG economic operation/C) • Riki Oshiro (DG maintenance-electrical/A) • Gaku Hashimoto (Work coordination/ monitoring/B)
Participants from Kiribati	■ Public Utilities Board(PUB) • Teebwatia Takau • Bauro Mikaere

Training content	• Orientation of online trainings • O&M manual revision • Specific fuel consumption • Power plant improvement plan • Overhaul (turbocharger) • Troubleshooting case examples

【9th Online training (DG)】

Purpose	To hold online trainings to supplement for TOT trainings that cannot be held on-site due to travel restrictions
Training dates	2022/8/4
Participants from JICA side (Senior Advisor/ Expert Team)	■ JICA Senior Advisor • Tadayuki Ogawa ■ Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Riki Oshiro (DG maintenance-electrical/A) • Gaku Hashimoto (Work coordination/ monitoring/B)
Participants from Kiribati	■ Public Utilities Board(PUB) • Teebwatia Takau • Bauro Mikaere • Bauro Mikaere • Kirite Uriam • Takenteiti Tonana • Taerea Takakoro • Ataria Teriaki • Zieminga Karotu
Training content	• Orientation of online trainings • O&M manual revision • Specific fuel consumption • Power plant improvement plan • Overhaul • Troubleshooting case examples

【1st DG manual revision meeting】

Purpose	Progress assessment of O&M manual revision
Training dates	2021/5/12
Participants from JICA side (Senior Advisor/ Expert Team)	■ Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Masaru Miyagi (Deputy chief/ Hybrid power generation system human resource development/B) • Hideyasu Hokama (DG economic operation/C) • Takahisa Watanabe (Work coordination/ monitoring/A) • Gaku Hashimoto (Work coordination/ monitoring/B)
Participants from Kiribati	■ Public Utilities Board(PUB) • James Young • Robert Matthews • Tenikoria Katauea • Teebwatia Taakau • Taibwa Tabutoa • Ziemingka Karotu
Materials	• 5.2 Maintenance of diesel generators (mechanical)rev 4 • 5.3 Maintenance of diesel generators (Electrical)

【2nd DG manual revision meeting】

Purpose	Progress assessment of O&M manual revision
Training dates	2021/7/7

Participants from JICA side (Senior Advisor/ Expert Team)	■ JICA Senior Advisor • Tadayuki Ogawa ■ Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Takahisa Watanabe (Work coordination/ monitoring/A) • Gaku Hashimoto (Work coordination/ monitoring/B)
Participants from Kiribati	■ Public Utilities Board(PUB) • Teebwatia Taakau • Bauro Mikaere • Tenikoria Katauea
Materials	• 5.2 Maintenance of diesel generators (mechanical)rev 4

【3rd DG manual revision meeting】

Purpose	Progress assessment of O&M manual revision
Training dates	2022/11/15
Participants from JICA side (Senior Advisor/ Expert Team)	■ Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Hideyasu Hokama (DG economic operation/C)
Participants from Kiribati	■ Public Utilities Board(PUB) • Bauro Mikaere • Teebwatia Taakau
Materials	• 5.3 Maintenance of diesel generators (electrical) • Maintenance of diesel generators (electrical) Attachment 1~9

【1st Online training (RE)】

Purpose	To hold online trainings to supplement for RE trainings that cannot be held on-site due to travel restrictions
Training dates	2020/6/25
Participants from JICA side (Senior Advisor/ Expert Team)	■ JICA Senior Advisor • Tadayuki Ogawa ■ Expert Team • Masanori Shimabuku (Deputy chief/ Hybrid power generation system human resource development/A) • Tomohiro Shiohama (RE integration plan/A) • Tasuku Taira (RE integration plan/B) • Hirokazu Nakamura (RE O&M/A) • Kaoru Ikehara (RE O&M/B) • Takahisa Watanabe (Work coordination/ monitoring/A)
Participants from Kiribati	■ Public Utilities Board (PUB) • Bauro Mikaere • Tikoro Tanua
Training content	• Basic Hybrid Power Generation System (HPGS) technology • Status of performance ratio measurement • Basic knowledge for Hybrid Power Generation planning manual drafting and review Frequency fluctuation • Basic knowledge in preparation for RE O&M manual drafting and

	revision • Q&A on PV maintenance

【2nd Online training (RE)】

Purpose	To hold online trainings to supplement for RE trainings that cannot be held on-site due to travel restrictions
Training dates	2020/7/30
Participants from JICA side (Senior Advisor/ Expert Team)	■ JICA Senior Advisor • Tadayuki Ogawa ■ Expert Team • Masanori Shimabuku (Deputy chief/ Hybrid power generation system human resource development/A) • Tomohiro Shiohama (RE integration plan/A) • Tasuku Taira (RE integration plan/B) • Hirokazu Nakamura (RE O&M/A) • Kaoru Ikehara (RE O&M/B) • Takahisa Watanabe (Work coordination/ monitoring/A)
Participants from Kiribati	■ Public Utilities Board (PUB) • Bauro Mikaere • Ritene Ikaarau • Tebike Aare • Teariki Toani • Tamton Itinrerei Tiitau • Baraniko Bakaie • Thompson Teananga ■ Ministry of Infrastructure and Sustainable Energy (MISE) • Thomas Taoaba (joined in midway)
Training content	• Basic knowledge in preparation for RE O&M manual drafting and revision System configuration and explanation on O&M Patrol, daily inspection, periodic inspection Inspection check sheet preparation and recording (method, frequency, etc.) • Basic knowledge for Hybrid Power Generation planning manual drafting and review • Frequency fluctuation (system constant, algebraic method) • Performance ratio (overview and summary of measurement method, status assessment, evaluation, verification) • O&M manual revision Request for revising Chapter 1

【3rd Online training (RE)】

Purpose	To hold online trainings to supplement for RE trainings that cannot be held on-site due to travel restrictions
Training dates	2020/8/26、2020/9/4 (supplementary lecture)
Participants from JICA side (Senior Advisor/ Expert Team)	■ JICA Senior Advisor • Tadayuki Ogawa ■ Expert Team • Masanori Shimabuku (Deputy chief/ Hybrid power generation system human resource development/A) • Tomohiro Shiohama (RE integration plan/A) • Tasuku Taira (RE integration plan/B) • Yuma Uezu (RE integration plan/C) • Hirokazu Nakamura (RE O&M/A) • Kaoru Ikehara (RE O&M/B) • Manatsu Yonashiro (RE O&M/C) • Takahisa Watanabe (Work coordination/ monitoring/A)

Participants from Kiribati	■Public Utilities Board (PUB) • Bauro Mikaere • Tikoro Kirite • Tebike Aree • Ritene Ikaarau • Tearili Toani • Tamton Itirerei
Training content	• O&M manual revision • Basic knowledge for Hybrid Power Generation planning manual drafting and review - Review exercise • Basic knowledge in preparation for RE O&M manual drafting and revision - Review exercise • Performance ratio • PV facility inspection - Generation cost calculation

【4th Online training (RE)】

Purpose	To hold online trainings to supplement for RE trainings that cannot be held on-site due to travel restrictions
Training dates	2020/11/4
Participants from JICA side (Senior Advisor/ Expert Team)	■JICA Senior Advisor • Tadayuki Ogawa ■Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Masanori Shimabuku (Deputy chief/ Hybrid power generation system human resource development/A) • Tomohiro Shiohama (RE integration plan/A) • Tasuku Taira (RE integration plan/B) • Hirokazu Nakamura (RE O&M/A) • Manatsu Yonashiro (RE O&M/C) • Takahisa Watanabe (Work coordination/ monitoring/A)
Participants from Kiribati	■Public Utilities Board (PUB) • Bauro Mikaere • Tikoro Kirite • Tebike Aree • Ritene Ikaarau • Tearili Toani • Tamton Itirerei ■Ministry of Infrastructure and Sustainable Energy (MISE) • Thomas Tebateki (11:00~)
Training content	• O&M manual revision • Performance ratio • Case example of RE expansion in Okinawa - Hybrid Power Generation System in Yonaguni Island • Interconnection and operation of RE grid (grid stabilization method) - Output fluctuation mitigation control (ΔP control) - Frequency fluctuation mitigation control (ΔF control) • Explanation on Plan of Operation (PO) • Future maintenance system and budget

【5th Online training (RE)】

Purpose	To hold online trainings to supplement for RE trainings that cannot be held on-site due to travel restrictions
Training dates	2021/2/10
Participants from JICA side	■Expert Team • Masanori Shimabuku (Deputy chief/ Hybrid power generation system

(Senior Advisor/ Expert Team)	human resource development/A) • Tomohiro Shiohama (RE integration plan/A) • Tasuku Taira (RE integration plan/B) • Hirokazu Nakamura (RE O&M/A) • Kaoru Ikehara (RE O&M/B) • Manatsu Yonashiro (RE O&M/C) • Takahisa Watanabe (Work coordination/ monitoring/A)
Participants from Kiribati	■Public Utilities Board (PUB) • Bauro Mikaere • Ritene Ikaarau • Baraniko Bakaie • Teariki Toani
Training content	• Discussion on manual revision • Performance ratio How to obtain solar irradiation data (utilizing NASA data) • RE grid interconnection and operation Grid code (grid interconnection rules) Grid interconnection procedure Operation (output curtailment) *case example • MG set introduction • Future maintenance system and maintenance budget Maintenance system Maintenance budget Support details by other donors

【6th Online training (RE)】

Purpose	To hold online trainings to supplement for RE trainings that cannot be held on-site due to travel restrictions
Training dates	2021/6/2、2021/6/9 (supplementary lecture)
Participants from JICA side (Senior Advisor/ Expert Team)	■JICA Senior Advisor • Tadayuki Ogawa ■Expert Team • Masanori Shimabuku (Deputy chief/ Hybrid power generation system human resource development/A) • Tomohiro Shiohama (RE integration plan/A) • Tasuku Taira (RE integration plan/B) • Hirokazu Nakamura (RE O&M/A) • Kaoru Ikehara (RE O&M/B) • Manatsu Yonashiro (RE O&M/C) • Takahisa Watanabe (Work coordination/ monitoring/A)
Participants from Kiribati	■Public Utilities Board (PUB) • Mary Rui • Bauro Mikaere • Baraniko Bakaie • Tenikoria Katauea,
Training content	• Performance ratio, periodic inspection • (RE integration plan) RE integration case examples in Okinawa Abu Mega solar demonstration research Ogimi Wind Power Generation Demonstration Research Facility Output fluctuation control (ΔP control and ΔF control) • (RE O&M) Future maintenance system and budget Setting up maintenance system, human resource planning (collaborative work) O&M schedule planning for 2021 (collaborative work)

【7th Online training (RE)】

Purpose	To hold online trainings to supplement for RE trainings that cannot be held on-site due to travel restrictions
Training dates	2021/9/15
Participants from JICA side (Senior Advisor/ Expert Team)	■ JICA Senior Advisor • Tadayuki Ogawa ■ Expert Team • Masanori Shimabuku (Deputy chief/ Hybrid power generation system human resource development/A) • Tomohiro Shiohama (RE integration plan/A) • Tasuku Taira (RE integration plan/B) • Hirokazu Nakamura (RE O&M/A) • Kaoru Ikehara (RE O&M/B) • Manatsu Yonashiro (RE O&M/C) • Takahisa Watanabe (Work coordination/ monitoring/A)
Participants from Kiribati	■ Public Utilities Board (PUB) • Mary Rui • Baraniko Bakaie • Ritene Ikaarau ■ Ministry of Infrastructure and Sustainable Energy (MISE) • Thomas Taoaba
Training content	• RE manual revision training (Chapter 1) • Performance ratio • Discussion on facility inspection - PV facility inspection record - Advice and discussion on inspection work - PV facility inspection method • Future maintenance system - Setting up maintenance system, human resource planning

【8th Online training (RE)】

Purpose	To hold online trainings to supplement for RE trainings that cannot be held on-site due to travel restrictions
Training dates	2022/6/28
Participants from JICA side (Senior Advisor/ Expert Team)	■ Expert Team • Masanori Shimabuku (Deputy chief/ Hybrid power generation system human resource development/A) • Tomohiro Shiohama (RE integration plan/A) • Tasuku Taira (RE integration plan/B) • Hirokazu Nakamura (RE O&M/A) • Kaoru Ikehara (RE O&M/B)
Participants from Kiribati	■ Public Utilities Board (PUB) • Mary Rui
Training content	• Performance ratio • RE integration plan - RE manual revision (Chapter 1) - Lecture: Regional micro-grid construction project in Kurima Island • RE O&M - RE manual revision (Chapter 2)

【1st RE manual revision meeting】

Purpose	Progress assessment and giving advice on RE manual revision
Dates	2021/5/25, 2021/6/21 (supplementary lecture)
Participants from JICA side (Senior Advisor/ Expert Team)	■JICA Senior Advisor • Tadayuki Ogawa ■Expert Team • Masanori Shimabuku (Deputy chief/ Hybrid power generation system human resource development/A) • Tasuku Taira (RE integration plan/B) • Hirokazu Nakamura (RE O&M/A) • Takahisa Watanabe (Work coordination/ monitoring/A)
Participants from Kiribati	■Public Utilities Board (PUB) • Mary Rui • Bauro Mikaere • Ritene Ikaarau • Baraniko Bakaie • Teariki Toani
Follow-up content	1. RE manual overview 2. Manual revision procedure Work on RE integration plan / Drafting a table of contents of the manual / Others

【2nd RE manual revision meeting】

Purpose	Progress assessment and giving advice on RE manual revision
Dates	2021/8/18
Participants from JICA side (Senior Advisor/ Expert Team)	■JICA Senior Advisor • Tadayuki Ogawa ■Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Tomohiro Shiohama (RE integration plan/A) • Tasuku Taira (RE integration plan/B) • Hirokazu Nakamura (RE O&M/A)
Participants from Kiribati	■Public Utilities Board (PUB) • Mary Rui • Ritene Ikaarau • Baraniko Bakaie • Teariki Toani • Tororo • Baraniko Bakaie
Follow-up content	1. Advice on the revised RE manual (Chapter 1) draft Legislation, demand curve, system diagram, DG facility, PV facility, frequency, system constant, summary

【3rd RE manual revision meeting】

Purpose	Progress assessment and giving advice on RE manual revision
Dates	2022/3/29
Participants from JICA side (Senior Advisor/ Expert Team)	■Expert Team • Tomohiro Shiohama (RE integration plan/A) • Tasuku Taira (RE integration plan/B) • Hirokazu Nakamura (RE O&M/A)
Participants from	■Public Utilities Board (PUB) • Mary Rui

Kiribati	
Follow-up content	1. Status of RE manual (Chapter 1) revision work 2. Advice on the revisions made on RE manual (Chapter 1) 3. Other announcements and confirmation

【4th RE manual revision meeting】

Purpose	Progress assessment and giving advice on RE manual revision
Dates	2022/5/19
Participants from JICA side (Senior Advisor/ Expert Team)	■ JICA Senior Advisor • Tadayuki Ogawa ■ Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Masanori Shimabuku (Deputy chief/ Hybrid power generation system human resource development/A) • Tasuku Taira (RE integration plan/B) • Hirokazu Nakamura (RE O&M/A) • Takahisa Watanabe (Work coordination/ monitoring/A)
Participants from Kiribati	■ Public Utilities Board (PUB) • Mary Rui • Tikoro Uriam
Follow-up content	1. Status of RE manual (Chapter 1) revision work, advice, discussion 2. Other announcements and confirmation

【5th RE manual revision meeting】

Purpose	Progress assessment and giving advice on RE manual revision
Dates	2022/8/23
Participants from JICA side (Senior Advisor/ Expert Team)	■ JICA Senior Advisor • Tadayuki Ogawa ■ Expert Team • Masanori Shimabuku (Deputy chief/ Hybrid power generation system human resource development/A) • Tomohiro Shiohama (RE integration plan/A) • Tasuku Taira (RE integration plan/B) • Hirokazu Nakamura (RE O&M/A) • Kaoru Ikehara (RE O&M/B) • Takahisa Watanabe (Work coordination/ monitoring/A)
Participants from Kiribati	■ Public Utilities Board (PUB) • Mary Rui
Follow-up content	1. Status of RE manual (Chapter 1: Integration) revision work and advice

【6th RE manual revision meeting】

Purpose	Progress assessment and giving advice on RE manual revision
Dates	2022/12/2
Participants from JICA side (Senior Advisor/	■ Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development)

Expert Team)	• Masanori Shimabuku (Deputy chief/ Hybrid power generation system human resource development/A) • Tomohiro Shiohama (RE integration plan/A) • Tasuku Taira (RE integration plan/B) • Hirokazu Nakamura (RE O&M/A)
Participants from Kiribati	■ Public Utilities Board (PUB) • Mary Rui
Follow-up content	1. Status of RE manual revision (Kiribati) 2. Follow-up on the revised RE manual (Chapter 1: Integration) draft 3. Follow-up on the revised RE manual draft (Chapter 2: RE O&M) 4. RE O&M work plan drafting

(3) Pohnpei (FSM)

Overviews of the online trainings for Pohnpei are shown below.

【1st Online training (DG)】

Purpose	To hold online trainings to supplement for TOT trainings that cannot be held on-site due to travel restrictions
Training date	2020/6/24
Participants from JICA side (Senior Advisor/ Expert Team)	■ JICA Senior Advisor • Tadayuki Ogawa • Orahiko Osaki • Shingo Takeda ■ Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Masaru Miyagi (Deputy chief/ Hybrid power generation system human resource development/B) • Hiroyuki Nakachi (DG economic operation/A) • Hisashi Shimabukuro (DG economic operation/B) • Hideyasu Hokama (DG economic operation/C) • Ken Miyagi (DG maintenance-mechanical/A) • Riki Oshiro (DG maintenance-electrical/A) • Takahisa Watanabe (Work coordination/ monitoring/A)
Participants from Pohnpei	■ Pohnpei Utilities Corporation (PUC) • Dackson Solomon • Winfred Yamada • Elpert Elias (Mechanic) • Two other members
Training content	• Explanation on online training schedule, greeting • Basic knowledge of DG (each system) • Explanation on DG daily inspection (Pmax adjustment, exhaust temperature measurement, FO rack adjustment) • How to read electrical diagrams (single line diagram, three-line diagram, sequence diagram) • Specific fuel consumption measurement method • Specific fuel consumption calculation exercise • Information on the next training

【2nd Online training (DG)】

Purpose	To hold online trainings to supplement for TOT trainings that cannot be held on-site due to travel restrictions

Training date	2020/7/30
Participants from JICA side (Senior Advisor/ Expert Team)	■ JICA Senior Advisor • Shingo Takeda ■ Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Masaru Miyagi (Deputy chief/ Hybrid power generation system human resource development/B) • Hisashi Shimabukuro (DG economic operation/B) • Hideyasu Hokama (DG economic operation/C) • Ken Miyagi (DG maintenance-mechanical/A) • Gaku Hashimoto (Work coordination/ monitoring/B)
Participants from Pohnpei	■ Pohnpei Utilities Corporation (PUC) • Dackson Solomon • Winfred Yamada • Elpert Elias • Richard Lohn • Nixon Helgenberger • Marcus Alans • Kurt Falcam (Mechanic)
Training content	• Explanation on online training schedule, greeting • How to use measuring instruments (caliper, micrometer, dial gauge) • How to use digital measuring instruments (RTD, TC, pressure gauge) • Power plant operation • Status assessment of power plant improvement • Others

【3rd Online training (DG)】

Purpose	To hold online trainings to supplement for TOT trainings that cannot be held on-site due to travel restrictions
Training date	2020/8/25
Participants from JICA side (Senior Advisor/ Expert Team)	■ JICA Senior Advisor • Tadayuki Ogawa • Shingo Takeda ■ Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Masaru Miyagi (Deputy chief/ Hybrid power generation system human resource development/B) • Hisashi Shimabukuro (DG economic operation/B) • Hideyasu Hokama (DG economic operation/C) • Ken Miyagi (DG maintenance-mechanical/A) • Gaku Hashimoto (Work coordination/ monitoring/B)
Participants from Pohnpei	■ Pohnpei Utilities Corporation (PUC) • Dackson Solomon • Winfred Yamada • Elpert Elias • Erickson Semens • Petrus Efram • Marcus Hallens • Don Jack • David Tewodrose • Kurt Falcam
Training content	• Orientation of online trainings • O&M manual revision • DG maintenance method (mechanical) • Fuel tank inspection • Progress on power plant improvement and specific fuel consumption measurement

【4th Online training (DG)】

Purpose	To hold online trainings to supplement for TOT trainings that cannot be held on-site due to travel restrictions

Training date	2020/10/20
Participants from JICA side (Senior Advisor/ Expert Team)	■ JICA Senior Advisor • Tadayuki Ogawa • Shingo Takeda ■ Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Masaru Miyagi (Deputy chief/ Hybrid power generation system human resource development/B) • Hisashi Shimabukuro (DG economic operation/B) • Hideyasu Hokama (DG economic operation/C) • Ken Miyagi (DG maintenance-mechanical/A) • Riki Oshiro (DG maintenance-electrical/A) • Gaku Hashimoto (Work coordination/ monitoring/B)
Participants from Pohnpei	■ Pohnpei Utilities Corporation (PUC) • Dackson Solomon • Winfred Yamada • Erickson Semens • Nixon Helgenberger
Training content	• O&M manual revision • DG maintenance method (mechanical) • DG turbocharger maintenance method • Remote island power source development plan • Points to confirm (power plant improvement plan, specific fuel consumption, OH schedule, operation record)

【5th Online training (DG)】

Purpose	To hold online trainings to supplement for TOT trainings that cannot be held on-site due to travel restrictions
Training date	2021/1/26
Participants from JICA side (Senior Advisor/ Expert Team)	■ JICA Senior Advisor • Tadayuki Ogawa • Shingo Takeda ■ Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Masaru Miyagi (Deputy chief/ Hybrid power generation system human resource development/B) • Hisashi Shimabukuro (DG economic operation/B) • Ken Miyagi (DG maintenance-mechanical/A) • Takahisa Watanabe (Work coordination/ monitoring/A)
Participants from Pohnpei	■ Pohnpei Utilities Corporation (PUC) • Dackson Solomon • Winfred Yamada • Elpert Elias • Erickson Semens • Petrus Efram • Don Jack • Nixon Helgenberger • Elly Amor
Training content	• Orientation of online trainings • O&M manual revision • DG daily maintenance method (mechanical) • Generator inspection • Periodic inspection planning for small remote islands • Points to confirm (improvement plan, specific fuel consumption, OH schedule, power plant operational data)

【6th Online training (DG)】

Purpose	To hold online trainings to supplement for TOT trainings that cannot be held on-site due to travel restrictions

Training date	2021/5/26
Participants from JICA side (Senior Advisor/ Expert Team)	■ JICA Senior Advisor • Tadayuki Ogawa ■ Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Masaru Miyagi (Deputy chief/ Hybrid power generation system human resource development/B) • Hisashi Shimabukuro (DG economic operation/B) • Hideyasu Hokama (DG economic operation/C) • Ken Miyagi (DG maintenance-mechanical/A) • Riki Oshiro (DG maintenance-electrical/A) • Takahisa Watanabe (Work coordination/ monitoring/A) • Gaku Hashimoto (Work coordination/ monitoring/B)
Participants from Pohnpei	■ Pohnpei Utilities Corporation (PUC) • Dackson Solomon • Winfred Yamada • Elpert Elias • Erickson Semens • Richard Lohn • Nixon Helgenberger • Eram Petrus
Training content	• Orientation of online trainings • Circuit breaker inspection • Non-destructive inspection (dye penetrant testing, magnetic particle testing) • Blackout recovery procedure • Heat exchanger • Points to confirm (power plant improvement plan, specific fuel consumption, OH schedule, comprehension test)

【7th Online training (DG)】

Purpose	To hold online trainings to supplement for TOT trainings that cannot be held on-site due to travel restrictions
Training date	2021/9/7
Participants from JICA side (Senior Advisor/ Expert Team)	■ JICA Senior Advisor • Tadayuki Ogawa • Shingo Takeda ■ Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Masaru Miyagi (Deputy chief/ Hybrid power generation system human resource development/B) • Hiroyuki Nakachi (DG economic operation/A) • Hideyasu Hokama (DG economic operation/C) • Ken Miyagi (DG maintenance-mechanical/A) • Riki Oshiro (DG maintenance-electrical/A) • Gaku Hashimoto (Work coordination/ monitoring/B)
Participants from Pohnpei	■ Pohnpei Utilities Corporation (PUC) • Dackson Solomon • Winfred Yamada • Elpert Elias • Nixon Helgenberger • Ely Amor • Kurt Falcam • David Tewodrose • Don Jack
Training content	• Orientation of online trainings • O&M manual revision • Governor control • Heat balance • Basics of relays

	• Basics of sequence control • Points to confirm (power plant improvement plan, specific fuel consumption, status of flow meter installation)

【8th Online training (DG)】

Purpose	To hold online trainings to supplement for TOT trainings that cannot be held on-site due to travel restrictions
Training date	2022/5/27
Participants from JICA side (Senior Advisor/ Expert Team)	■ Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Hideyasu Hokama (DG economic operation/C) • Riki Oshiro (DG maintenance-electrical/A) • Gaku Hashimoto (Work coordination/ monitoring/B)
Participants from Pohnpei	■ Pohnpei Utilities Corporation (PUC) • Dackson Solomon • Winfred Yamada • Elpert Elias • Nixon Helgenberger • Ely Amor • Kurt Falcam • David Tewodrose • Don Jack • Marcus Hallens • Richard Lohn • Tedrickson Malender,
Training content	• Orientation of online trainings • O&M manual revision • Specific fuel consumption/ installing fuel flow meter • Power plant improvement plan • Troubleshooting case examples

【9th Online training (DG)】

Purpose	To hold online trainings to supplement for TOT trainings that cannot be held on-site due to travel restrictions
Training date	2022/8/22
Participants from JICA side (Senior Advisor/ Expert Team)	■ JICA Senior Advisor • Tadayuki Ogawa ■ Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Hideyasu Hokama (DG economic operation/C) • Ken Miyagi (DG maintenance-mechanical/A) • Riki Oshiro (DG maintenance-electrical/A) • Takahisa Watanabe (Work coordination/ monitoring/A) • Gaku Hashimoto (Work coordination/ monitoring/B)
Participants from Pohnpei	■ Pohnpei Utilities Corporation (PUC) • Dackson Solomon • Erickson Semens • Elpert Elias • Nixon Helgenberger • Elly Amor • Kurt Falcam • David Tewodrose • Don Jack • Marcus Hallens • Tedrickson Malender • Kayolani Inos • Iosep Suldan
Training content	• Orientation of online trainings • O&M manual revision • Specific fuel consumption • Power plant improvement plan • Troubleshooting case examples

【1st DG manual revision meeting】

Purpose	To hold online trainings to supplement for TOT trainings that cannot be held on-site due to travel restrictions
Training date	2021/5/19
Participants from JICA side (Senior Advisor/ Expert Team)	■ Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Masaru Miyagi (Deputy chief/ Hybrid power generation system human resource development/B) • Hideyasu Hokama (DG economic operation/C) • Takahisa Watanabe (Work coordination/ monitoring/A) • Gaku Hashimoto (Work coordination/ monitoring/B)
Participants from Pohnpei	■ Pohnpei Utilities Corporation (PUC) • Solomon Dackson
Materials	• 5.2 Maintenance of diesel generators (mechanical)rev 4 • 5.3 Maintenance of diesel generators (Electrical)

【2nd DG manual revision meeting】

Purpose	To hold online trainings to supplement for TOT trainings that cannot be held on-site due to travel restrictions
Training date	2021/7/13
Participants from JICA side (Senior Advisor/ Expert Team)	■ Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Hideyasu Hokama (DG economic operation/C) • Takahisa Watanabe (Work coordination/ monitoring/A) • Gaku Hashimoto (Work coordination/ monitoring/B)
Participants from Pohnpei	■ Pohnpei Utilities Corporation (PUC) • Winfred Yamada
Materials	001-DG Manual_updating_schedule (tentative) 20210712

【3rd DG manual revision meeting】

Purpose	To hold online trainings to supplement for TOT trainings that cannot be held on-site due to travel restrictions
Training date	2022/12/1
Participants from JICA side (Senior Advisor/ Expert Team)	■ Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Hideyasu Hokama (DG economic operation/C) • Gaku Hashimoto (Work coordination/ monitoring/B)
Participants from PUC	■ Pohnpei Utilities Corporation (PUC) • Dackson Solomon • Elpert Elias • David Tewodrose • Elly Amor • Richard Loan • Don Jack • Kurt Falcam • Tedrickson Malender

Materials	1.Safety 2.Basic principle, basics symbols, features, composition of DG 3.1 Main Equipment of Diesel Generation (Mechanical) 3.2 Main Equipment of Diesel Generation (Electrical) 5.2 Maintenance of diesel generators (mechanical)

【1st Online training (RE)】

Purpose	To hold online trainings to supplement for RE trainings that cannot be held on-site due to travel restrictions
Training date	2020/7/1
Participants from JICA side (Senior Advisor/ Expert Team)	■ JICA Senior Advisor • Tadayuki Ogawa • Shingo Takeda ■ Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Masanori Shimabuku (Deputy chief/ Hybrid power generation system human resource development/A) • Hideyasu Hokama (DG economic operation/C) • Tomohiro Shiohama (RE integration plan/A) • Tasuku Taira (RE integration plan/B) • Hirokazu Nakamura (RE O&M/A) • Manatsu Yonashiro (RE O&M/C)
Participants from Pohnpei	■ Pohnpei Utilities Corporation (PUC) • Sidney Kilmete • Selestino Santiago
Training content	• Basic Hybrid Power Generation System (HPGS) technology • Status of performance ratio measurement • Basic knowledge for Hybrid Power Generation planning manual drafting and review • Basic knowledge in preparation for RE O&M manual drafting and revision • Q&A on PV maintenance

【2nd Online training (RE)】

Purpose	To hold online trainings to supplement for RE trainings that cannot be held on-site due to travel restrictions
Training date	2020/8/5
Participants from JICA side (Senior Advisor/ Expert Team)	■ JICA Senior Advisor • Tadayuki Ogawa • Shingo Takeda • Trishfarrah Billen ■ Expert Team • Masanori Shimabuku (Deputy chief/ Hybrid power generation system human resource development/A) • Tomohiro Shiohama (RE integration plan/A) • Tasuku Taira (RE integration plan/B) • Yuma Uezu (RE integration plan/C) • Hirokazu Nakamura (RE O&M/A) • Manatsu Yonashiro (RE O&M/C) • Takahisa Watanabe (Work coordination/ monitoring/A)
Participants from Pohnpei	■ Pohnpei Utilities Corporation (PUC) • Sidney Kilmete • Julian Pelep • McCaffrey Gilmete

	• Richard Lohn,
Training content	• Basic knowledge in preparation for RE O&M manual drafting and revision - System configuration and explanation on O&M - Patrol, daily inspection, periodic inspection - Inspection check sheet preparation and recording (method, frequency, etc.) • Basic knowledge for Hybrid Power Generation planning manual drafting and review - Frequency fluctuation (system constant, algebraic method) • Performance ratio (overview and summary of measurement method, status assessment, evaluation, verification) • Manual revision

【3rd Online training (RE)】

Purpose	To hold online trainings to supplement for RE trainings that cannot be held on-site due to travel restrictions
Training date	2020/9/24
Participants from JICA side (Senior Advisor/ Expert Team)	■ JICA Senior Advisor • Tadayuki Ogawa • Trishfarrah Billen ■ Expert Team • Masanori Shimabuku (Deputy chief/ Hybrid power generation system human resource development/A) • Tomohiro Shiohama (RE integration plan/A) • Tasuku Taira (RE integration plan/B) • Hirokazu Nakamura (RE O&M/A) • Kaoru Ikehara (RE O&M/B) • Takahisa Watanabe (Work coordination/ monitoring/A)
Participants from Pohnpei	■ Pohnpei Utilities Corporation (PUC) • Sidney Kilmeter • Julian Pelep
Training content	• O&M manual revision • Basic knowledge for Hybrid Power Generation planning manual drafting and review - Review exercise • Basic knowledge in preparation for RE O&M manual drafting and revision - Review exercise - Discussion on measurement result (I-V graph) • Performance ratio - Status assessment and evaluation • PV facility inspection - Generation cost calculation exercise

【4th Online training (RE)】

Purpose	To hold online trainings to supplement for RE trainings that cannot be held on-site due to travel restrictions
Training date	2020/11/10
Participants from JICA side (Senior Advisor/	■ JICA Senior Advisor • Shingo Takeda ■ Expert Team • Masanori Shimabuku (Deputy chief/ Hybrid power generation system

Expert Team)	- human resource development/A) • Tomohiro Shiohama (RE integration plan/A) • Tasuku Taira (RE integration plan/B) • Hirokazu Nakamura (RE O&M/A) • Manatsu Yonashiro (RE O&M/C) • Takahisa Watanabe (Work coordination/ monitoring/A)
Participants from Pohnpei	■ Pohnpei Utilities Corporation (PUC) • Sidney Kilmete • Julian Pelep • Johnny Cantero • McCaffrey Gilmete
Training content	• RE O&M manual revision • Performance ratio • Case example of RE expansion in Okinawa Hybrid Power Generation System in Yonaguni Island • Interconnection and operation of RE grid (grid stabilization method) Output fluctuation mitigation control (ΔP control) Frequency fluctuation mitigation control (ΔF control) • Explanation on Plan of Operation (PO) • Future maintenance system and budget

【5th Online training (RE)】

Purpose	To hold online trainings to supplement for RE trainings that cannot be held on-site due to travel restrictions
Training date	2021/2/16
Participants from JICA side (Senior Advisor/ Expert Team)	■ JICA Senior Advisor • Trishfarrah Billen ■ Expert Team • Masanori Shimabuku (Deputy chief/ Hybrid power generation system human resource development/A) • Tomohiro Shiohama (RE integration plan/A) • Tasuku Taira (RE integration plan/B) • Hirokazu Nakamura (RE O&M/A) • Manatsu Yonashiro (RE O&M/C) • Takahisa Watanabe (Work coordination/ monitoring/A)
Participants from Pohnpei	■ Pohnpei Utilities Corporation (PUC) • Sidney Kilmete • Julian Pelep
Training content	• Discussion on manual revision • Performance ratio How to obtain solar irradiation data (utilizing NASA data) • RE grid interconnection and operation Grid code (grid interconnection rules) Grid interconnection procedure Operation (output curtailment) *case example • MG set introduction • Future maintenance system and maintenance budget Maintenance system Maintenance budget Support details by other donors

【6th Online training (RE)】

Purpose	To hold online trainings to supplement for RE trainings that cannot be held on-site due to travel restrictions
Training date	2021/6/8
Participants from JICA side (Senior Advisor/ Expert Team)	■ JICA Senior Advisor • Tadayuki Ogawa ■ Expert Team • Masanori Shimabuku (Deputy chief/ Hybrid power generation system human resource development/A) • Tomohiro Shiohama (RE integration plan/A) • Tasuku Taira (RE integration plan/B) • Hirokazu Nakamura (RE O&M/A) • Manatsu Yonashiro (RE O&M/C) • Takahisa Watanabe (Work coordination/ monitoring/A)
Participants from Pohnpei	■ Pohnpei Utilities Corporation (PUC) • Sidney Kilmete • Julian Pelep
Training content	• Performance ratio, periodic inspection • (RE integration plan) RE integration case examples in Okinawa - Abu Mega solar demonstration research - Ogimi Wind Power Generation Demonstration Research Facility - Output fluctuation control (ΔP control and ΔF control) • (RE O&M) Future maintenance system and budget - Setting up maintenance system, human resource planning (collaborative work) - O&M schedule planning for 2021 (collaborative work)

【7th Online training (RE)】

Purpose	To hold online trainings to supplement for RE trainings that cannot be held on-site due to travel restrictions
Training date	2021/9/21
Participants from JICA side (Senior Advisor/ Expert Team)	■ Expert Team • Masanori Shimabuku (Deputy chief/ Hybrid power generation system human resource development/A) • Tomohiro Shiohama (RE integration plan/A) • Tasuku Taira (RE integration plan/B) • Hirokazu Nakamura (RE O&M/A) • Kaoru Ikehara (RE O&M/B) • Manatsu Yonashiro (RE O&M/C) • Takahisa Watanabe (Work coordination/ monitoring/A)
Participants from Pohnpei	■ Pohnpei Utilities Corporation (PUC) • Sidney Kilmete
Training content	• Performance ratio • Discussion on facility inspection - PV facility inspection record - Advice and discussion on inspection work - PV facility inspection method • Future maintenance system - Setting up maintenance system, human resource planning

	• RE manual revision training (Chapter 1)

【8th Online training (RE)】

Purpose	To hold online trainings to supplement for RE trainings that cannot be held on-site due to travel restrictions
Training date	2022/7/5
Participants from JICA side (Senior Advisor/ Expert Team)	■Expert Team • Masanori Shimabuku (Deputy chief/ Hybrid power generation system human resource development/A) • Tomohiro Shiohama (RE integration plan/A) • Tasuku Taira (RE integration plan/B) • Hirokazu Nakamura (RE O&M/A) • Kaoru Ikehara (RE O&M/B)
Participants from Pohnpei	■Pohnpei Utilities Corporation (PUC) • Sidney Kilmete • Julian Pelep
Training content	• Performance ratio • RE integration plan RE manual revision (Chapter 1) Lecture: Regional micro-grid construction project in Kurima Island • RE O&M RE manual revision (Chapter 2)

【1st RE manual revision meeting】

Purpose	Progress assessment and giving advice on RE manual revision
Date	2021/5/31、 2021/6/21 (supplementary lecture)
Participants from JICA side (Senior Advisor/ Expert Team)	■Expert Team • Masanori Shimabuku (Deputy chief/ Hybrid power generation system human resource development/A) • Tomohiro Shiohama (RE integration plan/A) • Hirokazu Nakamura (RE O&M/A) • Takahisa Watanabe (Work coordination/ monitoring/A)
Participants from Pohnpei	■Pohnpei Utilities Corporation (PUC) • Sidney Kilmete
Follow-up content	1. Give comments on the revised manual (Chapter 1) 2. Procedure for manual revision - Revising procedure (overview) - Revising procedure (step 1: organizing information on RE integration plan) - Revising procedure (step 2: make a table of contents) - Revising procedure (step 3: draft contents) Others

【2nd RE manual revision meeting】

Purpose	Progress assessment and giving advice on RE manual revision
Date	2021/7/28
Participants from JICA side	■Expert Team • Masanori Shimabuku (Deputy chief/ Hybrid power generation system

(Senior Advisor/ Expert Team)	human resource development/A) • Tomohiro Shiohama (RE integration plan/A) • Tasuku Taira (RE integration plan/B) • Hirokazu Nakamura (RE O&M/A) • Manatsu Yonashiro (RE O&M/C) • Takahisa Watanabe (Work coordination/ monitoring/A)
Participants from Pohnpei	■ Pohnpei Utilities Corporation (PUC) • Sidney Kilmete • Julian Pelep
Follow-up content	1. Advice on the revised RE manual (Chapter 1) draft

【3rd RE manual revision meeting】

Purpose	Progress assessment and giving advice on RE manual revision
Date	2022/3/29
Participants from JICA side (Senior Advisor/ Expert Team)	■ Expert Team • Masanori Shimabuku (Deputy chief/ Hybrid power generation system human resource development/A) • Tomohiro Shiohama (RE integration plan/A) • Tasuku Taira (RE integration plan/B) • Hirokazu Nakamura (RE O&M/A)
Participants from Pohnpei	■ Pohnpei Utilities Corporation (PUC) • Sidney Kilmete
Follow-up content	1. Status of RE manual (Chapter 1) revision work 2. Discussion on the revised content on RE manual (Chapter 1) 3. Other announcements and confirmation

【4th RE manual revision meeting】

Purpose	Progress assessment and giving advice on RE manual revision
Date	2022/5/19
Participants from JICA side (Senior Advisor/ Expert Team)	■ JICA Senior Advisor • Tadayuki Ogawa ■ Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Masanori Shimabuku (Deputy chief/ Hybrid power generation system human resource development/A) • Tomohiro Shiohama (RE integration plan/A) • Tasuku Taira (RE integration plan/B) • Hirokazu Nakamura (RE O&M/A) • Takahisa Watanabe (Work coordination/ monitoring/A)
Participants from Pohnpei	■ Pohnpei Utilities Corporation (PUC) • Sidney Kilmete • Julian Pelep
Follow-up content	1. Status of RE manual (Chapter 1) revision work, advice 2. Other announcements and confirmation

【5th RE manual revision meeting】

Purpose	Progress assessment and giving advice on RE manual revision
Date	2022/8/24
Participants from JICA side (Senior Advisor/ Expert Team)	■ JICA Senior Advisor • Tadayuki Ogawa ■ Expert Team • Tomohiro Shiohama (RE integration plan/A) • Tasuku Taira (RE integration plan/B) • Hirokazu Nakamura (RE O&M/A) • Kaoru Ikehara (RE O&M/B) • Takahisa Watanabe (Work coordination/ monitoring/A) • Gaku Hashimoto
Participants from Pohnpei	■ Pohnpei Utilities Corporation (PUC) • Sidney Kilmete • Julian Pelep
Follow-up content	1. Advice on the revised RE manual (Chapter 1: Integration) draft 2. Others

【6th RE manual revision meeting】

Purpose	Progress assessment and giving advice on RE manual revision
Date	2022/12/9
Participants from JICA side (Senior Advisor/ Expert Team)	■ Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Tomohiro Shiohama (RE integration plan/A) • Tasuku Taira (RE integration plan/B) • Hirokazu Nakamura (RE O&M/A) • Kaoru Ikehara (RE O&M/B) • Gaku Hashimoto
Participants from Pohnpei	■ Pohnpei Utilities Corporation (PUC) • Sidney Kilmete • Julian Pelep
Follow-up content	1. Status of RE manual revision by PUC (Pohnpei) 2. Follow-up on the revised RE manual (Chapter 1: Integration) draft 3. Follow-up on the revised RE manual draft (Chapter 2: RE O&M) 4. RE O&M work plan drafting

5) Chuuk (FSM)

Overviews of the online trainings for Chuuk are shown below.

【1st Online training (DG)】

Purpose	To hold online trainings to supplement for TOT trainings that cannot be held on-site due to travel restrictions
Training date	2020/6/22
Participants from JICA side (Senior Advisor/ Expert Team)	■ JICA Senior Advisor • Tadayuki Ogawa • Torahiko Osaki ■ Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Masaru Miyagi (Deputy chief/ Hybrid power generation system human resource development/B) • Hiroyuki Nakachi (DG economic operation/A)

	• Hisashi Shimabukuro (DG economic operation/B) • Hideyasu Hokama (DG economic operation/C) • Ken Miyagi (DG maintenance-mechanical/A) • Takahisa Watanabe (Work coordination/ monitoring/A) • Gaku Hashimoto (Work coordination/ monitoring/B)
Participants from Chuuk	■ Chuuk Public Utility Corporation (CPUC) • Dennis Triana • Jimmy Reyes • Basiente Kintin Jr.
Training content	• Explanation on online training schedule, greeting • Basic knowledge on DG (each system) • Explanation on DG daily inspection (Pmax adjustment, exhaust temperature measurement, FO rack adjustment) • How to read electrical diagrams (single line diagram, three-line diagram, sequence diagram) • Specific fuel consumption measurement method • Information on the next training

【2nd Online training (DG)】

Purpose	To hold online trainings to supplement for TOT trainings that cannot be held on-site due to travel restrictions
Training date	2020/7/27
Participants from JICA side (Senior Advisor/ Expert Team)	■ JICA Senior Advisor • Tadayuki Ogawa • Shingo Takeda ■ Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Masaru Miyagi (Deputy chief/ Hybrid power generation system human resource development/B) • Hiroyuki Nakachi (DG economic operation/A) • Hideyasu Hokama (DG economic operation/C) • Ken Miyagi (DG maintenance-mechanical/A) • Riki Oshiro (DG maintenance-electrical/A) • Takahisa Watanabe (Work coordination/ monitoring/A) • Gaku Hashimoto (Work coordination/ monitoring/B)
Participants from Chuuk	■ Chuuk Public Utility Corporation (CPUC) • Dennis Triana • Jimmy Reyes • Basiente Kintin Jr.
Training content	• Explanation on online training schedule, greeting • How to use measuring instruments (caliper, micrometer, dial gauge) • How to use digital measuring instruments (RTD, TC, pressure gauge) • Power plant operation • Status assessment of power plant improvement • O&M manual revision

【3rd Online training (DG)】

Purpose	To hold online trainings to supplement for TOT trainings that cannot be held on-site due to travel restrictions
Training date	2020/8/24

Participants from JICA side (Senior Advisor/ Expert Team)	■ JICA Senior Advisor • Tadayuki Ogawa • Shingo Takeda ■ Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Masaru Miyagi (Deputy chief/ Hybrid power generation system human resource development/B) • Hiroyuki Nakachi (DG economic operation/A) • Hideyasu Hokama (DG economic operation/C) • Riki Oshiro (DG maintenance-electrical/A) • Takahisa Watanabe (Work coordination/ monitoring/A) • Gaku Hashimoto (Work coordination/ monitoring/B)
Participants from Chuuk	■ Chuuk Public Utility Corporation (CPUC) • Dennis Triana • Jimmy Reyes • Minoru Stephen
Training content	• Orientation of online trainings • O&M manual revision • DG maintenance method (mechanical) • Fuel tank inspection • Progress on power plant improvement and specific fuel consumption measurement

【4th Online training (DG)】

Purpose	To hold online trainings to supplement for TOT trainings that cannot be held on-site due to travel restrictions
Training date	2020/10/19
Participants from JICA side (Senior Advisor/ Expert Team)	■ JICA Senior Advisor • Tadayuki Ogawa • Shingo Takeda ■ Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Masaru Miyagi (Deputy chief/ Hybrid power generation system human resource development/B) • Hiroyuki Nakachi (DG economic operation/A) • Hideyasu Hokama (DG economic operation/C) • Ken Miyagi (DG maintenance-mechanical/A) • Riki Oshiro (DG maintenance-electrical/A) • Takahisa Watanabe (Work coordination/ monitoring/A) • Gaku Hashimoto (Work coordination/ monitoring/B)
Participants from Chuuk	■ Chuuk Public Utility Corporation (CPUC) • Dennis Triana • Jimmy Reyes • Basiente Kintin Jr.
Training content	• O&M manual revision • DG maintenance method (mechanical) • DG turbocharger maintenance • Remote island power source development plan • Points to confirm (power plant improvement plan, specific fuel consumption, generator operation record)

【5th Online training (DG)】

Purpose	To hold online trainings to supplement for TOT trainings that cannot be held on-site due to travel restrictions
Training date	2021/1/25
Participants from JICA side (Senior Advisor/ Expert Team)	■ JICA Senior Advisor • Tadayuki Ogawa • Shingo Takeda ■ Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Masaru Miyagi (Deputy chief/ Hybrid power generation system human resource development/B) • Hiroyuki Nakachi (DG economic operation/A) • Hisashi Shimabukuro (DG economic operation/B) • Ken Miyagi (DG maintenance-mechanical/A) • Takahisa Watanabe (Work coordination/ monitoring/A) • Gaku Hashimoto (Work coordination/ monitoring/B)
Participants from Chuuk	■ Chuuk Public Utility Corporation (CPUC) • Dennis Triana • Jimmy Reyes • Basiente Kintin Jr. • Dexter Tom
Training content	• Orientation of online trainings • O&M manual revision • DG daily maintenance method (mechanical) • Generator inspection • Periodic inspection planning for small remote islands • Points to confirm (improvement plan, specific fuel consumption, OH schedule, power plant operational data)

【6th Online training (DG)】

Purpose	To hold online trainings to supplement for TOT trainings that cannot be held on-site due to travel restrictions
Training date	2021/5/24
Participants from JICA side (Senior Advisor/ Expert Team)	■ Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Masaru Miyagi (Deputy chief/ Hybrid power generation system human resource development/B) • Hiroyuki Nakachi (DG economic operation/A) • Hisashi Shimabukuro (DG economic operation/B) • Hideyasu Hokama (DG economic operation/C) • Ken Miyagi (DG maintenance-mechanical/A) • Riki Oshiro (DG maintenance-electrical/A) • Takahisa Watanabe (Work coordination/ monitoring/A) • Gaku Hashimoto (Work coordination/ monitoring/B)
Participants from Chuuk	■ Chuuk Public Utility Corporation (CPUC) • Dennis Triana • Jimmy Reyes • Basiente Kintin Jr. • Mellor Sirom

Training content	• Orientation of online trainings • Circuit breaker inspection • Non-destructive inspection (dye penetrant testing, magnetic particle testing) • Blackout recovery procedure • Heat exchanger • Points to confirm (power plant improvement plan, fuel flow meter installation, OH schedule, comprehension test)

【7th Online training (DG)】

Purpose	To hold online trainings to supplement for TOT trainings that cannot be held on-site due to travel restrictions
Training date	2021/9/6
Participants from JICA side (Senior Advisor/ Expert Team)	■ JICA Senior Advisor • Tadayuki Ogawa ■ Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Masaru Miyagi (Deputy chief/ Hybrid power generation system human resource development/B) • Hiroyuki Nakachi (DG economic operation/A) • Hideyasu Hokama (DG economic operation/C) • Ken Miyagi (DG maintenance-mechanical/A) • Riki Oshiro (DG maintenance-electrical/A) • Gaku Hashimoto (Work coordination/ monitoring/B)
Participants from Chuuk	■ Chuuk Public Utility Corporation (CPUC) • Dennis Triana • Jimmy Reyes • Basiente Kintin Jr. • Mellor Sirom • Augustine Hallers
Training content	• Orientation of online trainings • O&M manual revision • Governor control • Heat balance • Basics of relays • Basics of sequence control • Points to confirm (power plant improvement plan, specific fuel consumption, OH schedule, comprehension test)

【8th Online training (DG)】

Purpose	To hold online trainings to supplement for TOT trainings that cannot be held on-site due to travel restrictions
Training date	2022/5/26
Participants from JICA side (Senior Advisor/ Expert Team)	■ JICA Senior Advisor • Luis Kakefuku (Chief/ Hybrid power generation system human resource development) ■ Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development)

	• Hideyasu Hokama (DG economic operation/C) • Riki Oshiro (DG maintenance-electrical/A) • Gaku Hashimoto (Work coordination/ monitoring/B)
Participants from Chuuk	■ Chuuk Public Utility Corporation (CPUC) • Dennis Triana • Jimmy Reyes • Basiente Kintin Jr. • Mellor Sirom
Training content	• Orientation of online trainings • O&M manual revision • Specific fuel consumption • Power plant improvement plan/ overhaul • Troubleshooting case examples

【1st DG manual revision meeting】

Purpose	Progress assessment and advice on O&M manual revision
Training date	2021/5/14
Participants from JICA side (Senior Advisor/ Expert Team)	■ Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Masaru Miyagi (Deputy chief/ Hybrid power generation system human resource development/B) • Hideyasu Hokama (DG economic operation/C) • Takahisa Watanabe (Work coordination/ monitoring/A) • Gaku Hashimoto (Work coordination/ monitoring/B)
Participants from Chuuk	■ Chuuk Public Utility Corporation (CPUC) • Dennis Triana • Jimmy Reyes
Materials	• 5.2 Maintenance of diesel generators (mechanical)rev 4

【2nd DG manual revision meeting】

Purpose	Progress assessment and advice on O&M manual revision
Training date	2021/7/12
Participants from JICA side (Senior Advisor/ Expert Team)	■ JICA Senior Advisor • Tadayuki Ogawa • Shingo Takeda ■ Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Hideyasu Hokama (DG economic operation/C) • Takahisa Watanabe (Work coordination/ monitoring/A) • Gaku Hashimoto (Work coordination/ monitoring/B)
Participants from Chuuk	■ Chuuk Public Utility Corporation (CPUC) • Dennis Triana • Jimmy Reyes
Materials	• 5.2 Maintenance of diesel generators (mechanical)rev 4

【3rd DG manual revision meeting】

Purpose	Progress assessment and advice on O&M manual revision
Training date	2022/12/9
Participants from JICA side (Senior Advisor/ Expert Team)	■Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Hirokazu Nakamura (RE O&M/A) • Gaku Hashimoto (Work coordination/ monitoring/B)
Participants from Chuuk	■Chuuk Public Utility Corporation (CPUC) • Dennis Triana • Jimmy Reyes
Materials	• 5.2 Maintenance of diesel generators (mechanical)rev 4

【1st Online training (RE)】

Purpose	To hold online trainings to supplement for RE trainings that cannot be held on-site due to travel restrictions
Training date	2020/6/29
Participants from JICA side (Senior Advisor/ Expert Team)	■JICA Senior Advisor • Tadayuki Ogawa • Torahiko Osaki • Shingo Takeda ■Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Masanori Shimabuku (Deputy chief/ Hybrid power generation system human resource development/A) • Hirokazu Nakamura (RE O&M/A) • Manatsu Yonashiro (RE O&M/C) • Takahisa Watanabe (Work coordination/ monitoring/A)
Participants from Chuuk	■Chuuk Public Utility Corporation (CPUC) • Albert Francis • Limus Setik
Training content	• Basic Hybrid Power Generation System (HPGS) technology • Status of performance ratio measurement • Basic knowledge for Hybrid Power Generation planning manual drafting and review • Basic knowledge in preparation for RE O&M manual drafting and revision • Q&A on PV maintenance

【2nd Online training (RE)】

Purpose	To hold online trainings to supplement for RE trainings that cannot be held on-site due to travel restrictions
Training date	2020/8/3
Participants from JICA side (Senior Advisor/ Expert Team)	■JICA Senior Advisor • Tadayuki Ogawa ■Expert Team • Masanori Shimabuku (Deputy chief/ Hybrid power generation system human resource development/A) • Tomohiro Shiohama (RE integration plan/A) • Tasuku Taira (RE integration plan/B) • Yuma Uezu (RE integration plan/C) • Hirokazu Nakamura (RE O&M/A)

	• Manatsu Yonashiro (RE O&M/C) • Takahisa Watanabe (Work coordination/ monitoring/A)
Participants from Chuuk	■ Chuuk Public Utility Corporation (CPUC) • Chris Killion • Limus Setik • Jimmy Reyes
Training content	• Basic knowledge in preparation for RE O&M manual drafting and revision - System configuration and explanation on O&M - Patrol, daily inspection, periodic inspection - Inspection check sheet preparation and recording (method, frequency, etc.) • Basic knowledge for Hybrid Power Generation planning manual drafting and review - Frequency fluctuation (system constant, algebraic method) • Performance ratio (overview and summary of measurement method, status assessment, evaluation, verification) • Manual revision

【3rd Online training (RE)】

Purpose	To hold online trainings to supplement for RE trainings that cannot be held on-site due to travel restrictions
Training date	2020/8/31, 2020/9/7 (supplementary lecture)
Participants from JICA side (Senior Advisor/ Expert Team)	■ JICA Senior Advisor • Tadayuki Ogawa • Shingo Takeda ■ Expert Team • Masanori Shimabuku (Deputy chief/ Hybrid power generation system human resource development/A) • Tomohiro Shiohama (RE integration plan/A) • Tasuku Taira (RE integration plan/B) • Yuma Uezu (RE integration plan/C) • Hirokazu Nakamura (RE O&M/A) • Kaoru Ikehara (RE O&M/B) • Manatsu Yonashiro (RE O&M/C) • Takahisa Watanabe (Work coordination/ monitoring/A)
Participants from Chuuk	■ Chuuk Public Utility Corporation (CPUC) • Dennis Triana • Chris Killion • Limus Setik • Minoru Stephen • Jimmy Reyes • John Jun Aleonar • Dexter Tom
Training content	• O&M manual revision • Basic knowledge for Hybrid Power Generation planning manual drafting and review - Review exercise (long-term • short-term) • Basic knowledge in preparation for RE O&M manual drafting and revision - Review exercise - Discussion on measurement result (I-V graph) • Performance ratio - Status assessment and evaluation • PV facility inspection - Generation cost calculation exercise

【4th Online training (RE)】

Purpose	To hold online trainings to supplement for RE trainings that cannot be held on-site due to travel restrictions

Training date	2020/11/9
Participants from JICA side (Senior Advisor/ Expert Team)	■ JICA Senior Advisor • Tadayuki Ogawa • Shingo Takeda ■ Expert Team • Masanori Shimabuku (Deputy chief/ Hybrid power generation system human resource development/A) • Tomohiro Shiohama (RE integration plan/A) • Tasuku Taira (RE integration plan/B) • Hirokazu Nakamura (RE O&M/A) • Manatsu Yonashiro (RE O&M/C) • Takahisa Watanabe (Work coordination/ monitoring/A)
Participants from Chuuk	■ Chuuk Public Utility Corporation (CPUC) • Dennis Triana • Chris Killion • Limus Setik • Jimmy Reyes, • Basiente Kintin Jr. • John Jun Aleonar
Training content	• RE manual revision • Performance ratio • Interconnection and operation of RE grid (grid stabilization method) Output fluctuation mitigation control (ΔP control) Frequency fluctuation mitigation control (ΔF control) • Explanation on Plan of Operation (PO) • Future maintenance system and budget

【5th Online training (RE)】

Purpose	To hold online trainings to supplement for RE trainings that cannot be held on-site due to travel restrictions
Training date	2021/2/15
Participants from JICA side (Senior Advisor/ Expert Team)	■ Expert Team • Masanori Shimabuku (Deputy chief/ Hybrid power generation system human resource development/A) • Tomohiro Shiohama (RE integration plan/A) • Tasuku Taira (RE integration plan/B) • Hirokazu Nakamura (RE O&M/A) • Kaoru Ikehara (RE O&M/B) • Manatsu Yonashiro (RE O&M/C) • Takahisa Watanabe (Work coordination/ monitoring/A)
Participants from Chuuk	■ Chuuk Public Utility Corporation (CPUC) • Dennis Triana • Chris Killion • Limus Setik
Training content	• Discussion on manual revision • Performance ratio How to obtain solar irradiation data (utilizing NASA data) • RE grid interconnection and operation Grid code (grid interconnection rules) Grid interconnection procedure Operation (output curtailment) *case example • Future maintenance system and maintenance budget Maintenance system Maintenance budget Support details by other donors • Demonstration of string tracer measurement

【6th Online training (RE)】

Purpose	To hold online trainings to supplement for RE trainings that cannot be held on-site due to travel restrictions
Training date	2021/6/7
Participants from JICA side (Senior Advisor/ Expert Team)	■ JICA Senior Advisor • Tadayuki Ogawa ■ Expert Team • Masanori Shimabuku (Deputy chief/ Hybrid power generation system human resource development/A) • Tomohiro Shiohama (RE integration plan/A) • Tasuku Taira (RE integration plan/B) • Hirokazu Nakamura (RE O&M/A) • Manatsu Yonashiro (RE O&M/C) • Takahisa Watanabe (Work coordination/ monitoring/A)
Participants from Chuuk	■ Chuuk Public Utility Corporation (CPUC) • Dennis Triana
Training content	• Performance ratio • (RE integration plan) RE integration case examples in Okinawa Abu Mega solar demonstration research Ogimi Wind Power Generation Demonstration Research Facility Output fluctuation control (ΔP control and ΔF control) • (RE O&M) Future maintenance system and budget Setting up maintenance system, human resource planning (collaborative work) O&M schedule planning for 2021 (collaborative work)

【7th Online training (RE)】

Purpose	To hold online trainings to supplement for RE trainings that cannot be held on-site due to travel restrictions
Training date	2021/9/28、2021/10/6 (supplementary lecture)
Participants from JICA side (Senior Advisor/ Expert Team)	■ Expert Team • Masanori Shimabuku (Deputy chief/ Hybrid power generation system human resource development/A) • Tomohiro Shiohama (RE integration plan/A) • Tasuku Taira (RE integration plan/B) • Hirokazu Nakamura (RE O&M/A) • Kaoru Ikehara (RE O&M/B) • Manatsu Yonashiro (RE O&M/C) • Takahisa Watanabe (Work coordination/ monitoring/A)
Participants from Chuuk	■ Chuuk Public Utility Corporation (CPUC) • Dennis Triana • Albert Francis • Chris Killion • Limus Setik • Jimmy Reyes
Training content	• Performance ratio • Discussion on facility inspection PV facility inspection record Advice and discussion on inspection work

	PV facility inspection method • Future maintenance system Setting up maintenance system, human resource planning • RE manual revision training (Chapter 1)

【8th Online training (RE)】

Purpose	To hold online trainings to supplement for RE trainings that cannot be held on-site due to travel restrictions
Training date	2022/7/1
Participants from JICA side (Senior Advisor/ Expert Team)	■Expert Team • Masanori Shimabuku (Deputy chief/ Hybrid power generation system human resource development/A) • Tomohiro Shiohama (RE integration plan/A) • Tasuku Taira (RE integration plan/B) • Hirokazu Nakamura (RE O&M/A) • Kaoru Ikehara (RE O&M/B)
Participants from Chuuk	■Chuuk Public Utility Corporation (CPUC) • Dennis Triana
Training content	• Performance ratio • RE integration plan RE manual revision (Chapter 1) Lecture: Regional micro-grid construction project in Kurima Island • RE O&M RE manual revision (Chapter 2)

【1st RE manual revision meeting】

Purpose	Progress assessment and giving advice on RE manual revision
Date	2021/5/26、2021/6/21 (supplementary lecture)
Participants from JICA side (Senior Advisor/ Expert Team)	■Expert Team • Masanori Shimabuku (Deputy chief/ Hybrid power generation system human resource development/A) • Tomohiro Shiohama (RE integration plan/A) • Hirokazu Nakamura (RE O&M/A) • Takahisa Watanabe (Work coordination/ monitoring/A)
Participants from Chuuk	■Chuuk Public Utility Corporation (CPUC) • Dennis Triana • Albert Francis • Chris Killion • Limus Setik • Dexter Tom
Follow-up content	1. Give comments on the revised manual (Chapter 1) 2. Procedure for manual revision Works related to RE integration plan Drafting a table of contents for the manual Others

【2nd RE manual revision meeting】

Purpose	Progress assessment and giving advice on RE manual revision
Date	2021/7/27

Participants from JICA side (Senior Advisor/ Expert Team)	■Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Masanori Shimabuku (Deputy chief/ Hybrid power generation system human resource development/A) • Tomohiro Shiohama (RE integration plan/A) • Tasuku Taira (RE integration plan/B) • Hirokazu Nakamura (RE O&M/A) • Manatsu Yonashiro (RE O&M/C) • Takahisa Watanabe (Work coordination/ monitoring/A)
Participants from Chuuk	■Chuuk Public Utility Corporation (CPUC) • Albert Francis • Chris Killion • Limus Setik • Harry Gouland
Follow-up content	1. Advice on the revised RE manual (Chapter 1) draft

【3rd RE manual revision meeting】

Purpose	Progress assessment and giving advice on RE manual revision
Date	2022/3/31
Participants from JICA side (Senior Advisor/ Expert Team)	■Expert Team • Tomohiro Shiohama (RE integration plan/A) • Tasuku Taira (RE integration plan/B) • Hirokazu Nakamura (RE O&M/A)
Participants from Chuuk	■Chuuk Public Utility Corporation (CPUC) • Dennis Triana • Chris Killion
Follow-up content	1. Status of RE manual (Chapter 1) revision work 2. Advice on the revised content of RE manual (Chapter 1) 3. Other announcements and confirmation

【4th RE manual revision meeting】

Purpose	Progress assessment and giving advice on RE manual revision
Date	2022/5/17
Participants from JICA side (Senior Advisor/ Expert Team)	■JICA Senior Advisor • Tadayuki Ogawa ■Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Masanori Shimabuku (Deputy chief/ Hybrid power generation system human resource development/A) • Tomohiro Shiohama (RE integration plan/A) • Tasuku Taira (RE integration plan/B) • Hirokazu Nakamura (RE O&M/A) • Takahisa Watanabe (Work coordination/ monitoring/A)
Participants from Chuuk	■Chuuk Public Utility Corporation (CPUC) • Dennis Triana • Limus Setik • Jimmy Reyes
Follow-up content	1. Status of RE manual (Chapter 1) revision work, advice 2. Other announcements and confirmation

【5th RE manual revision meeting】

Purpose	Progress assessment and giving advice on RE manual revision
Date	2022/8/17
Participants from JICA side (Senior Advisor/ Expert Team)	■ JICA Senior Advisor • Tadayuki Ogawa ■ Expert Team • Masanori Shimabuku (Deputy chief/ Hybrid power generation system human resource development/A) • Tomohiro Shiohama (RE integration plan/A) • Tasuku Taira (RE integration plan/B) • Hirokazu Nakamura (RE O&M/A) • Kaoru Ikehara (RE O&M/B) • Takahisa Watanabe (Work coordination/ monitoring/A)
Participants from Chuuk	■ Chuuk Public Utility Corporation (CPUC) • Dennis Triana • Albert Francis • Chris Killion • Limus Setik
Follow-up content	1. Status of RE manual (Chapter 1) revision work, advice

【6th RE manual revision meeting】

Purpose	Progress assessment and giving advice on RE manual revision
Date	2022/12/9
Participants from JICA side (Senior Advisor/ Expert Team)	■ JICA Senior Advisor • Tadayuki Ogawa ■ Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Tomohiro Shiohama (RE integration plan/A) • Tasuku Taira (RE integration plan/B) • Hirokazu Nakamura (RE O&M/A) • Kaoru Ikehara (RE O&M/B)
Participants from Chuuk	■ Chuuk Public Utility Corporation (CPUC) • Dennis Triana • Albert Francis • Chris Killion • Limus Setik
Follow-up content	1. Status of RE manual revision by CPUC (Chuuk) 2. Follow-up on the revised RE manual (Chapter 1: Integration) draft 3. Follow-up on the revised RE manual draft (Chapter 2: RE O&M) 4. RE O&M work plan drafting

(6) Yap (FSM)

Overviews of the online trainings for Yap are shown below.

【1st Online training (DG)】

Purpose	To hold online trainings to supplement for TOT trainings that cannot be held on-site due to travel restrictions
Training Date	2020/6/22
Participants from JICA side (Senior Advisor/	■ JICA Senior Advisor • Tadayuki Ogawa • Torahiko Osaki ■ Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource

Expert Team)	development) • Masaru Miyagi (Deputy chief/ Hybrid power generation system human resource development/B) • Hiroyuki Nakachi (DG economic operation/A) • Hisashi Shimabukuro (DG economic operation/B) • Hideyasu Hokama (DG economic operation/C) • Ken Miyagi (DG maintenance-mechanical/A) • Takahisa Watanabe (Work coordination/ monitoring/A) • Gaku Hashimoto (Work coordination/ monitoring/B)
Participants from Yap	■ Yap State Public Services Corporation (YSPSC) • Victor Nabeyan • Christopher Igem • Rowino Yarofaliut • Ricky Igelmai
Training content	• Explanation on online training schedule, greeting • Basic knowledge on DG (each system) • Explanation on DG daily inspection (Pmax adjustment, exhaust temperature measurement, FO rack adjustment) • How to read electrical diagrams (single line diagram, three-line diagram, sequence diagram) • Specific fuel consumption measurement method • Information on the next training

【2nd Online training (DG)】

Purpose	To hold online trainings to supplement for TOT trainings that cannot be held on-site due to travel restrictions
Training Date	2020/7/27
Participants from JICA side (Senior Advisor/ Expert Team)	■ JICA Senior Advisor • Tadayuki Ogawa • Shingo Takeda ■ Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Masaru Miyagi (Deputy chief/ Hybrid power generation system human resource development/B) • Hiroyuki Nakachi (DG economic operation/A) • Hideyasu Hokama (DG economic operation/C) • Ken Miyagi (DG maintenance-mechanical/A) • Riki Oshiro (DG maintenance-electrical/A) • Takahisa Watanabe (Work coordination/ monitoring/A) • Gaku Hashimoto (Work coordination/ monitoring/B)
Participants from YSPSC	■ Yap State Public Services Corporation (YSPSC) • Christopher Igem • Rowino Yarofaliut • Casmero Yithemang • John Chieng • Benneth Sermaeling • Ricky Igelmai • Sylvester Maiwemai
Training content	• Explanation on online training schedule, greeting • How to use measuring instruments (caliper, micrometer, dial gauge) • How to use digital measuring instruments (RTD, TC, pressure gauge) • Power plant operation • Status assessment of power plant improvement • O&M manual revision

【3rd Online training (DG)】

Purpose	To hold online trainings to supplement for TOT trainings that cannot be held on-site due to travel restrictions
Training Date	2020/8/24
Participants from JICA side (Senior Advisor/ Expert Team)	■ JICA Senior Advisor • Tadayuki Ogawa • Shingo Takeda ■ Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Masaru Miyagi (Deputy chief/ Hybrid power generation system human resource development/B) • Hiroyuki Nakachi (DG economic operation/A) • Hideyasu Hokama (DG economic operation/C) • Riki Oshiro (DG maintenance-electrical/A) • Takahisa Watanabe (Work coordination/ monitoring/A) • Gaku Hashimoto (Work coordination/ monitoring/B)
Participants from YSPSC	■ Yap State Public Services Corporation (YSPSC) • John Chieng • Alphonsus Ruwema • Christopher Igem • Rowino Yarofaliut • Casmero Yithemang • Benneth Sermaeiling • Ricky Igelmai • Sylvester Maiwemai • Roscoe Tamag
Training content	• Orientation of online trainings • O&M manual revision • DG maintenance method (mechanical) • Fuel tank inspection • Progress on power plant improvement and specific fuel consumption measurement

【4th Online training (DG)】

Purpose	To hold online trainings to supplement for TOT trainings that cannot be held on-site due to travel restrictions
Training Date	2020/10/19
Participants from JICA side (Senior Advisor/ Expert Team)	■ JICA Senior Advisor • Tadayuki Ogawa • Shingo Takeda ■ Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Masaru Miyagi (Deputy chief/ Hybrid power generation system human resource development/B) • Hiroyuki Nakachi (DG economic operation/A) • Hideyasu Hokama (DG economic operation/C) • Ken Miyagi (DG maintenance-mechanical/A) • Riki Oshiro (DG maintenance-electrical/A) • Takahisa Watanabe (Work coordination/ monitoring/A) • Gaku Hashimoto (Work coordination/ monitoring/B)
Participants from Yap	■ Yap State Public Services Corporation (YSPSC) • John Chieng • Alphonsus Ruwema • Christopher Igem • Rowino Yarofaliut • Casmero Yithemang • Benneth Sermaeiling • Ricky Igelmai • Sylvester Maiwemai • Roscoe Tamag
Training content	• Orientation of online trainings • O&M manual revision

	• DG maintenance method (mechanical) • DG turbocharger maintenance method • Remote island power source development plan • Points to confirm (improvement plan, specific fuel consumption, OH schedule, power plant operational data)

【5th Online training (DG)】

Purpose	To hold online trainings to supplement for TOT trainings that cannot be held on-site due to travel restrictions
Training Date	2021/1/25
Participants from JICA side (Senior Advisor/ Expert Team)	■ JICA Senior Advisor • Tadayuki Ogawa • Shingo Takeda ■ Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Masaru Miyagi (Deputy chief/ Hybrid power generation system human resource development/B) • Hiroyuki Nakachi (DG economic operation/A) • Hisashi Shimabukuro (DG economic operation/B) • Ken Miyagi (DG maintenance-mechanical/A) • Takahisa Watanabe (Work coordination/ monitoring/A) • Gaku Hashimoto (Work coordination/ monitoring/B)
Participants from Yap	■ Yap State Public Services Corporation (YSPSC) • Alphonsus Ruwema • Christopher Igem • Rowino Yarofaliut • Benneth Sermaeiling • Ricky Igelmai • Sylvester Maiwemai • Roscoe Tamag
Training content	• Orientation of online trainings • O&M manual revision • DG daily maintenance method (mechanical) • Generator inspection • Periodic inspection planning for small remote islands • Points to confirm (improvement plan, specific fuel consumption, OH schedule, power plant operational data)

【6th Online training (DG)】

Purpose	To hold online trainings to supplement for TOT trainings that cannot be held on-site due to travel restrictions
Training Date	2021/5/24
Participants from JICA side (Senior Advisor/ Expert Team)	■ JICA Senior Advisor • Tadayuki Ogawa • Shingo Takeda ■ Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Masaru Miyagi (Deputy chief/ Hybrid power generation system human resource development/B) • Hiroyuki Nakachi (DG economic operation/A) • Hisashi Shimabukuro (DG economic operation/B) • Hideyasu Hokama (DG economic operation/C) • Ken Miyagi (DG maintenance-mechanical/A) • Riki Oshiro (DG maintenance-electrical/A)

	• Takahisa Watanabe (Work coordination/ monitoring/A) • Gaku Hashimoto (Work coordination/ monitoring/B)
Participants from Yap	■ Yap State Public Services Corporation (YSPSC) • Alphonsus Ruwema • Christopher Igem • Rowino Yarofaliut • Casmero Yithemang • Benneth Sermaeiling • Ricky Igelmai • Sylvester Maiwemai • Roscoe Tamag
Training content	• Orientation of online trainings • Circuit breaker inspection • Non-destructive inspection (dye penetrant testing, magnetic particle testing) • Blackout recovery procedure • Heat exchanger • O&M manual revision • Points to confirm (power plant improvement plan, specific fuel consumption, OH schedule, comprehension test)

【7th Online training (DG)】

Purpose	To hold online trainings to supplement for TOT trainings that cannot be held on-site due to travel restrictions
Training Date	2021/9/30
Participants from JICA side (Senior Advisor/ Expert Team)	■ Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Masaru Miyagi (Deputy chief/ Hybrid power generation system human resource development/B) • Hisashi Shimabukuro (DG economic operation/B) • Hideyasu Hokama (DG economic operation/C) • Ken Miyagi (DG maintenance-mechanical/A) • Riki Oshiro (DG maintenance-electrical/A) • Gaku Hashimoto (Work coordination/ monitoring/B)
Participants from Yap	■ Yap State Public Services Corporation (YSPSC) • Alphonsus Ruwema • Christopher Igem • Rowino Yarofaliut • Benneth Sermaeiling • Ricky Igelmai • Sylvester Maiwemai
Training content	• Orientation of online trainings • Governor control • Heat balance • Basics of relays • Basics of sequence control • O&M manual revision • Points to confirm (Power plant improvement plan, specific fuel consumption)

【8th Online training (DG)】

Purpose	To hold online trainings to supplement for TOT trainings that cannot be held on-site due to travel restrictions
Training Date	2022/5/25
Participants from JICA side (Senior Advisor/	■ Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Hideyasu Hokama (DG economic operation/C)

Expert Team)	• Riki Oshiro (DG maintenance-electrical/A) • Gaku Hashimoto (Work coordination/ monitoring/B)
Participants from Yap	■ Yap State Public Services Corporation (YSPSC) • Alphonsus Ruwema • Rowino Yarofaliut • Casmiro Yithemang • Ricky Igelmai • Roscoe Tamag
Training content	• Orientation of online trainings • O&M manual revision • Specific fuel consumption • Power plant improvement plan • Troubleshooting case examples

【9th Online training (DG)】

Purpose	To hold online trainings to supplement for TOT trainings that cannot be held on-site due to travel restrictions
Training Date	2022/9/21
Participants from JICA side (Senior Advisor/ Expert Team)	■ Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Hideyasu Hokama (DG economic operation/C) • Riki Oshiro (DG maintenance-electrical/A)
Participants from Yap	■ Yap State Public Services Corporation (YSPSC) • Alphonsus Ruwema • Christopher Igem • Rowino Yarofaliut • Casmiro Yithemang • Ricky Igelmai • Roscoe Tamag • Benneth Sarmailug
Training content	• Orientation of online trainings • O&M manual revision • Specific fuel consumption • Power plant improvement plan • DG maintenance schedule • Troubleshooting case examples

【1st DG manual revision meeting】

Purpose	Progress assessment of O&M manual revision
Training Date	2021/5/13
Participants from JICA side (Senior Advisor/ Expert Team)	■ JICA Senior Advisor • Tadayuki Ogawa ■ Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Masaru Miyagi (Deputy chief/ Hybrid power generation system human resource development/B) • Hideyasu Hokama (DG economic operation/C) • Takahisa Watanabe (Work coordination/ monitoring/A) • Gaku Hashimoto (Work coordination/ monitoring/B)

Participants from Yap	■ Yap State Public Services Corporation (YSPSC) • Christopher Igem • Rowino Yarofaliut • Roscoe Tamag
Materials	• 5.2 Maintenance of diesel generators (mechanical)rev 4 • 5.3 Maintenance of diesel generators (Electrical)

【2nd DG manual revision meeting】

Purpose	Progress assessment of O&M manual revision
Training Date	2021/7/8
Participants from JICA side (Senior Advisor/ Expert Team)	■ Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Takahisa Watanabe (Work coordination/ monitoring/A) • Gaku Hashimoto (Work coordination/ monitoring/B)
Participants from Yap	■ Yap State Public Services Corporation (YSPSC) • Christopher Igem • Rowino Yarofaliut • Roscoe Tamag
Materials	• 1.Safety rev.1 • 2.Basic principle, basics symbols, features, composition of DG(201901) • 3.1 Main Equipment of Diesel Engine Generator (Mechanical) • 3.2 Main Equipment of Diesel Engine Generator (Electrical)

【3rd DG manual revision meeting】

Purpose	Progress assessment of O&M manual revision
Training Date	2022/11/18
Participants from JICA side (Senior Advisor/ Expert Team)	■ JICA Senior Advisor ■ Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Hideyasu Hokama (DG economic operation/C)
Participants from Yap	■ Yap State Public Services Corporation (YSPSC) • Christopher Igem • Rowino Yarofaliut • Roscoe Tamag • Casmiro Yithemang • Benneth Sarmailug • Spencer Sarmalur
Materials	• 5.2 Maintenance of diesel generators (mechanical)rev 4 • 5.3 Maintenance of diesel generators (Electrical)

【1st Online training (RE)】

Purpose	To hold online trainings to supplement for RE trainings that cannot be held on-site due to travel restrictions
Training Date	2020/6/29
Participants from JICA side	■ JICA Senior Advisor • Tadayuki Ogawa • Torahiko Osaki • Shingo Takeda

(Senior Advisor/ Expert Team)	■ Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Masanori Shimabuku (Deputy chief/ Hybrid power generation system human resource development/A) • Hirokazu Nakamura (RE O&M/A) • Manatsu Yonashiro (RE O&M/C) • Takahisa Watanabe (Work coordination/ monitoring/A)
Participants from Yap	■ Yap State Public Service Corporation (YSPSC) • John A. Chieng • Jacob J. Choay • Mario Sukulbech, • Sebastian S.Marleyang
Training content	• Basic Hybrid Power Generation System (HPGS) technology • Status of performance ratio measurement • Basic knowledge for Hybrid Power Generation planning manual drafting and review • Basic knowledge in preparation for RE O&M manual drafting and revision • Q&A on PV maintenance

【2nd Online training (RE)】

Purpose	To hold online trainings to supplement for RE trainings that cannot be held on-site due to travel restrictions
Training Date	2020/8/3
Participants from JICA side (Senior Advisor/ Expert Team)	■ JICA Senior Advisor • Tadayuki Ogawa • Shingo Takeda ■ Expert Team • Masanori Shimabuku (Deputy chief/ Hybrid power generation system human resource development/A) • Tomohiro Shiohama (RE integration plan/A) • Tasuku Taira (RE integration plan/B) • Yuma Uezu (RE integration plan/C) • Hirokazu Nakamura (RE O&M/A) • Manatsu Yonashiro (RE O&M/C) • Takahisa Watanabe (Work coordination/ monitoring/A)
Participants from Yap	■ Yap State Public Service Corporation (YSPSC) • John Chieng • Jacob J. Choay • Steven Ken • Charles Laman
Training content	• Basic knowledge in preparation for RE O&M manual drafting and revision - System configuration and explanation on O&M - Patrol, daily inspection, periodic inspection - Inspection check sheet preparation and recording (method, frequency, etc.) • Basic knowledge for Hybrid Power Generation planning manual drafting and review - Frequency fluctuation (system constant, algebraic method) • Performance ratio (overview and summary of measurement method, status assessment, evaluation, verification) • Manual revision

【3rd Online training (RE)】

Purpose	To hold online trainings to supplement for RE trainings that cannot be held on-site due to travel restrictions
Training Date	2020/8/31、2020/9/7 (supplementary lecture)
Participants from JICA side (Senior Advisor/ Expert Team)	■ JICA Senior Advisor • Tadayuki Ogawa • Shingo Takeda ■ Expert Team • Masanori Shimabuku (Deputy chief/ Hybrid power generation system human resource development/A) • Tomohiro Shiohama (RE integration plan/A) • Tasuku Taira (RE integration plan/B) • Yuma Uezu (RE integration plan/C) • Hirokazu Nakamura (RE O&M/A) • Kaoru Ikehara (RE O&M/B) • Manatsu Yonashiro (RE O&M/C) • Takahisa Watanabe (Work coordination/ monitoring/A)
Participants from Yap	■ Yap State Public Service Corporation (YSPSC) • John Chieng • Jacob J. Choay • Steven Ken
Training content	• O&M manual revision • Basic knowledge for Hybrid Power Generation planning manual drafting and review Review exercise (long-term • short-term) • Basic knowledge in preparation for RE O&M manual drafting and revision Review exercise Discussion on measurement result (I-V graph) • Performance ratio Status assessment and evaluation • PV facility inspection Generation cost calculation exercise

【4th Online training (RE)】

Purpose	To hold online trainings to supplement for RE trainings that cannot be held on-site due to travel restrictions
Training Date	2020/11/9
Participants from JICA side (Senior Advisor/ Expert Team)	■ JICA Senior Advisor • Tadayuki Ogawa ■ Expert Team • Masanori Shimabuku (Deputy chief/ Hybrid power generation system human resource development/A) • Tomohiro Shiohama (RE integration plan/A) • Tasuku Taira (RE integration plan/B) • Hirokazu Nakamura (RE O&M/A) • Manatsu Yonashiro (RE O&M/C) • Takahisa Watanabe (Work coordination/ monitoring/A)
Participants from Yap	■ Yap State Public Service Corporation (YSPSC) • John Chieng • Jacob J. Choay • Steven Ken • Charles Laman
Training content	• RE manual revision • Performance ratio • Interconnection and operation of RE grid (grid stabilization method) Output fluctuation mitigation control (ΔP control)

	Frequency fluctuation mitigation control (ΔF control) • Explanation on Plan of Operation (PO) - Future maintenance system and budget

【5th Online training (RE)】

Purpose	To hold online trainings to supplement for RE trainings that cannot be held on-site due to travel restrictions
Training Date	2021/2/15
Participants from JICA side (Senior Advisor/ Expert Team)	■Expert Team • Masanori Shimabuku (Deputy chief/ Hybrid power generation system human resource development/A) • Tomohiro Shiohama (RE integration plan/A) • Tasuku Taira (RE integration plan/B) • Hirokazu Nakamura (RE O&M/A) • Kaoru Ikehara (RE O&M/B) • Manatsu Yonashiro (RE O&M/C) • Takahisa Watanabe (Work coordination/ monitoring/A)
Participants from Yap	■Yap State Public Service Corporation (YSPSC) • John Chieng • Jacob J. Choay • Steven Ken • Charles Laman • Jeremiah Bugun • Marvin Tamangrow
Training content	• Discussion on manual revision • Performance ratio How to obtain solar irradiation data (utilizing NASA data) • RE grid interconnection and operation Grid code (grid interconnection rules) Grid interconnection procedure Operation (output curtailment) *case example • Future maintenance system and maintenance budget Maintenance system Maintenance budget Support details by other donors • Demonstration of string tracer measurement

【6th Online training (RE)】

Purpose	To hold online trainings to supplement for RE trainings that cannot be held on-site due to travel restrictions
Training Date	2021/6/7
Participants from JICA side (Senior Advisor/ Expert Team)	■JICA Senior Advisor • Tadayuki Ogawa ■Expert Team • Masanori Shimabuku (Deputy chief/ Hybrid power generation system human resource development/A) • Tomohiro Shiohama (RE integration plan/A) • Tasuku Taira (RE integration plan/B) • Hirokazu Nakamura (RE O&M/A) • Manatsu Yonashiro (RE O&M/C) • Takahisa Watanabe (Work coordination/ monitoring/A)

Participants from Yap	■ Yap State Public Service Corporation (YSPSC) • John Chieng • Jacob J. Choay • Steven Ken • Charles Laman
Training content	• Performance ratio • (RE integration plan) RE integration case examples in Okinawa - Abu Mega solar demonstration research - Ogimi Wind Power Generation Demonstration Research Facility - Output fluctuation control (ΔP control and ΔF control) • (RE O&M) Future maintenance system and budget - Setting up maintenance system, human resource planning (collaborative work) - O&M schedule planning for 2021 (collaborative work)

【7th Online training (RE)】

Purpose	To hold online trainings to supplement for RE trainings that cannot be held on-site due to travel restrictions
Training Date	2021/9/28
Participants from JICA side (Senior Advisor/ Expert Team)	■ Expert Team • Masanori Shimabuku (Deputy chief/ Hybrid power generation system human resource development/A) • Tomohiro Shiohama (RE integration plan/A) • Tasuku Taira (RE integration plan/B) • Hirokazu Nakamura (RE O&M/A) • Kaoru Ikehara (RE O&M/B) • Manatsu Yonashiro (RE O&M/C) • Takahisa Watanabe (Work coordination/ monitoring/A)
Participants from Yap	■ Yap State Public Service Corporation (YSPSC) • John Chieng • Jacob J. Choay • Steven Ken • Charles Laman
Training content	• Performance ratio • Discussion on facility inspection - PV facility inspection record - Advice and discussion on inspection work • Future maintenance system - Setting up maintenance system, human resource planning • RE manual revision training (Chapter 1)

【8th Online training (RE)】

Purpose	To hold online trainings to supplement for RE trainings that cannot be held on-site due to travel restrictions
Training Date	2022/6/30
Participants from JICA side (Senior Advisor/ Expert Team)	■ Expert Team • Masanori Shimabuku (Deputy chief/ Hybrid power generation system human resource development/A)

Expert Team)	• Tomohiro Shiohama (RE integration plan/A) • Tasuku Taira (RE integration plan/B) • Hirokazu Nakamura (RE O&M/A) • Kaoru Ikehara (RE O&M/B)
Participants from Yap	■ Yap State Public Service Corporation (YSPSC) • John Chieng • Jacob J. Choay • Steven Ken
Training content	• Performance ratio • RE integration plan RE manual revision (Chapter 1) Lecture: Regional micro-grid construction project in Kurima Island • RE O&M RE manual revision (Chapter 2)

【1st RE manual revision meeting】

Purpose	Progress assessment and giving advice on RE manual revision
Date	2021/5/25、2021/6/21 (supplementary lecture)
Participants from JICA side (Senior Advisor/ Expert Team)	■ JICA Senior Advisor • Tadayuki Ogawa ■ Expert Team • Masanori Shimabuku (Deputy chief/ Hybrid power generation system human resource development/A) • Tasuku Taira (RE integration plan/B) • Hirokazu Nakamura (RE O&M/A) • Takahisa Watanabe (Work coordination/ monitoring/A)
Participants from Yap	■ Yap State Public Service Corporation (YSPSC) • John Chieng
Follow-up content	1. Give comments on the revised manual (Chapter 1) 2. Procedure for manual revision Works related to RE integration plan Drafting a table of contents for the manual Others

【2nd RE manual revision meeting】

Purpose	Progress assessment and giving advice on RE manual revision
Date	2021/8/4
Participants from JICA side (Senior Advisor/ Expert Team)	■ Expert Team • Masanori Shimabuku (Deputy chief/ Hybrid power generation system human resource development/A) • Tasuku Taira (RE integration plan/B) • Hirokazu Nakamura (RE O&M/A) • Manatsu Yonashiro (RE O&M/C) • Takahisa Watanabe (Work coordination/ monitoring/A)
Participants from Yap	■ Yap State Public Service Corporation (YSPSC) • John Chieng
Follow-up content	1. Discussion on RE manual (Chapter 1) revising work Status of information collection

	Demand curve SCADA and hybrid wizard System diagram Generation facilities System constant

【3rd RE manual revision meeting】

Purpose	Progress assessment and giving advice on RE manual revision
Date	2022/3/31
Participants from JICA side (Senior Advisor/ Expert Team)	■Expert Team • Tomohiro Shiohama (RE integration plan/A) • Tasuku Taira (RE integration plan/B) • Hirokazu Nakamura (RE O&M/A)
Participants from Yap	■Yap State Public Service Corporation (YSPSC) • John Chieng
Follow-up content	1. Status of RE manual (Chapter 1) revision work 2. Discussion on the revised RE manual (Chapter 1) content 2. Other announcements and confirmation

【4th RE manual revision meeting】

Purpose	Progress assessment and giving advice on RE manual revision
Date	2022/5/17
Participants from JICA side (Senior Advisor/ Expert Team)	■JICA Senior Advisor • Tadayuki Ogawa ■Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Masanori Shimabuku (Deputy chief/ Hybrid power generation system human resource development/A) • Tomohiro Shiohama (RE integration plan/A) • Tasuku Taira (RE integration plan/B) • Hirokazu Nakamura (RE O&M/A) • Takahisa Watanabe (Work coordination/ monitoring/A)
Participants from Yap	■Yap State Public Service Corporation (YSPSC) • John Chieng
Follow-up content	1. Status of RE manual (Chapter 1) revision work, advice, discussion 2. Other announcements and confirmation

【5th RE manual revision meeting】

Purpose	Progress assessment and giving advice on RE manual revision
Date	2022/9/21
Participants from JICA side	■JICA Senior Advisor • Tadayuki Ogawa

(Senior Advisor/ Expert Team)	■ Expert Team • Tomohiro Shiohama (RE integration plan/A) • Tasuku Taira (RE integration plan/B) • Hirokazu Nakamura (RE O&M/A) • Kaoru Ikehara (RE O&M/B) • Takahisa Watanabe (Work coordination/ monitoring/A)
Participants from Yap	■ Yap State Public Service Corporation (YSPSC) • John Chieng
Follow-up content	1. Status of RE manual revision by YSPSC (Yap) 2. Follow-up on the revised RE manual (Chapter 1) draft 3. Revised RE manual draft (Chapter 2: RE O&M) 4. Others

【6th RE manual revision meeting】

Purpose	Progress assessment and giving advice on RE manual revision
Date	2022/11/29
Participants from JICA side (Senior Advisor/ Expert Team)	■ Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Masanori Shimabuku (Deputy chief/ Hybrid power generation system human resource development/A) • Tomohiro Shiohama (RE integration plan/A) • Tasuku Taira (RE integration plan/B) • Hirokazu Nakamura (RE O&M/A) • Kaoru Ikehara (RE O&M/B)
Participants from Yap	■ Yap State Public Service Corporation (YSPSC) • John Chieng
Follow-up content	1. Status of RE manual revision by YSPSC (Yap) 2. Follow-up on the revised RE manual (Chapter 1: Integration) draft 3. Follow-up on the revised RE manual draft (Chapter 2: RE O&M) 4. RE O&M work plan drafting

(7) Kosrae (FSM)

Overviews of the online trainings for Kosrae are shown below.

【1st Online training (DG)】

Purpose	To hold online trainings to supplement for TOT trainings that cannot be held on-site due to travel restrictions
Training Date	2020/6/24
Participants from JICA side (Senior Advisor/ Expert Team)	■ JICA Senior Advisor • Tadayuki Ogawa • Torahiko Osaki • Shingo Takeda ■ Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Masaru Miyagi (Deputy chief/ Hybrid power generation system human resource development/B) • Hiroyuki Nakachi (DG economic operation/A) • Hisashi Shimabukuro (DG economic operation/B) • Hideyasu Hokama (DG economic operation/C)

	• Ken Miyagi (DG maintenance-mechanical/A) • Riki Oshiro (DG maintenance-electrical/A) • Takahisa Watanabe (Work coordination/ monitoring/A)
Participants from Kosrae	■ Kosrae Utilities Authority (KUA) • Ronald Albert • 2 other participants
Training content	• Explanation on online training schedule, greeting • Basic knowledge on DG (each system) • Explanation on DG daily inspection (Pmax adjustment, exhaust temperature measurement, FO rack adjustment) • How to read electrical diagrams (single line diagram, three-line diagram, sequence diagram) • Specific fuel consumption measurement method • Specific fuel consumption calculation exercise • Information on the next training

【2nd Online training (DG)】

Purpose	To hold online trainings to supplement for TOT trainings that cannot be held on-site due to travel restrictions
Training Date	2020/7/28
Participants from JICA side (Senior Advisor/ Expert Team)	■ JICA Senior Advisor • Shingo Takeda ■ Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Masaru Miyagi (Deputy chief/ Hybrid power generation system human resource development/B) • Hisashi Shimabukuro (DG economic operation/B) • Hideyasu Hokama (DG economic operation/C) • Ken Miyagi (DG maintenance-mechanical/A) • Riki Oshiro (DG maintenance-electrical/A) • Takahisa Watanabe (Work coordination/ monitoring/A) • Gaku Hashimoto (Work coordination/ monitoring/B)
Participants from Kosrae	■ Kosrae Utilities Authority (KUA) • Robert Taulupe • Ronald Albert • Careston Aloka
Training content	• Explanation of online training schedule, greeting • How to use measuring instruments (caliper, micrometer, dial gauge) • How to use digital measuring instruments (RTD, TC, pressure gauge) • Power plant operation • Status assessment of power plant improvement • Others

【3rd Online training (DG)】

Purpose	To hold online trainings to supplement for TOT trainings that cannot be held on-site due to travel restrictions
Training Date	2020/8/25
Participants from JICA side	■ JICA Senior Advisor • Tadayuki Ogawa • Shingo Takeda

(Senior Advisor/ Expert Team)	■ Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Masaru Miyagi (Deputy chief/ Hybrid power generation system human resource development/B) • Hisashi Shimabukuro (DG economic operation/B) • Hideyasu Hokama (DG economic operation/C) • Ken Miyagi (DG maintenance-mechanical/A) • Gaku Hashimoto (Work coordination/ monitoring/B)
Participants from Kosrae	■ Kosrae Utilities Authority (KUA) • Robert Taulupe • Ronald Albert
Training content	• Orientation OF online trainings • O&M manual revision • DG maintenance method (mechanical) • Fuel tank inspection • Progress on power plant improvement and specific fuel consumption measurement

【4th Online training (DG)】

Purpose	To hold online trainings to supplement for TOT trainings that cannot be held on-site due to travel restrictions
Training Date	2020/10/20
Participants from JICA side (Senior Advisor/ Expert Team)	■ JICA Senior Advisor • Tadayuki Ogawa • Shingo Takeda ■ Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Masaru Miyagi (Deputy chief/ Hybrid power generation system human resource development/B) • Hisashi Shimabukuro (DG economic operation/B) • Hideyasu Hokama (DG economic operation/C) • Ken Miyagi (DG maintenance-mechanical/A) • Riki Oshiro (DG maintenance-electrical/A) • Takahisa Watanabe (Work coordination/ monitoring/A) • Gaku Hashimoto (Work coordination/ monitoring/B)
Participants from Kosrae	■ Kosrae Utilities Authority (KUA) • Robert Taulupe / • Ronald Albert • Careston Aloka
Training content	• Orientation of online trainings • O&M manual revision • DG maintenance method (mechanical) • DG turbocharger maintenance method • Remote island power source development plan • Points to confirm (improvement plan, specific fuel consumption, OH schedule, power plant operational data)

【5th Online training (DG)】

Purpose	To hold online trainings to supplement for TOT trainings that cannot be held on-site due to travel restrictions

Training Date	2021/1/26
Participants from JICA side (Senior Advisor/ Expert Team)	■ JICA Senior Advisor • Tadayuki Ogawa • Shingo Takeda ■ Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Masaru Miyagi (Deputy chief/ Hybrid power generation system human resource development/B) • Hisashi Shimabukuro (DG economic operation/B) • Ken Miyagi (DG maintenance-mechanical/A) • Takahisa Watanabe (Work coordination/ monitoring/A)
Participants from Kosrae	■ Kosrae Utilities Authority (KUA) • Ronald Albert
Training content	• Orientation of online trainings • O&M manual revision • DG daily maintenance method (mechanical) • Generator inspection • Periodic inspection planning for small remote islands • Points to confirm (improvement plan, specific fuel consumption, OH schedule, power plant operational data)

【6th Online training (DG)】

Purpose	To hold online trainings to supplement for TOT trainings that cannot be held on-site due to travel restrictions
Training Date	2021/5/25
Participants from JICA side (Senior Advisor/ Expert Team)	■ JICA Senior Advisor • Trish Billen (JICA/FSM) ■ Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Masaru Miyagi (Deputy chief/ Hybrid power generation system human resource development/B) • Hisashi Shimabukuro (DG economic operation/B) • Hideyasu Hokama (DG economic operation/C) • Ken Miyagi (DG maintenance-mechanical/A) • Riki Oshiro (DG maintenance-electrical/A) • Takahisa Watanabe (Work coordination/ monitoring/A) • Gaku Hashimoto (Work coordination/ monitoring/B)
Participants from Kosrae	■ Kosrae Utilities Authority (KUA) • Robert Taualupe • Ronald Albert • Careston Aloka
Training content	• Orientation of online trainings • Circuit breaker inspection • Non-destructive inspection (dye penetrant testing, magnetic particle testing) • Blackout recovery procedure • Heat exchanger • O&M manual revision • Points to confirm (Power plant improvement plan, specific fuel consumption, OH schedule, comprehension test)

【7th Online training (DG)】

Purpose	To hold online trainings to supplement for TOT trainings that cannot be held on-site due to travel restrictions
Training Date	2021/9/30
Participants from JICA side (Senior Advisor/ Expert Team)	■ JICA Senior Advisor ■ Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Masaru Miyagi (Deputy chief/ Hybrid power generation system human resource development/B) • Hisashi Shimabukuro (DG economic operation/B) • Hideyasu Hokama (DG economic operation/C) • Ken Miyagi (DG maintenance-mechanical/A) • Riki Oshiro (DG maintenance-electrical/A) • Takahisa Watanabe (Work coordination/ monitoring/A) • Gaku Hashimoto (Work coordination/ monitoring/B)
Participants from Kosrae	■ Kosrae Utilities Authority (KUA) • Robert Taualupe • Tedrick Joseph
Training content	• Orientation of online trainings • Governor control • Heat balance • Basics of relays • Basics of sequence control • O&M manual revision • Points to confirm (power plant improvement plan, specific fuel consumption, fuel flow meter)

【8th Online training (DG)】

Purpose	To hold online trainings to supplement for TOT trainings that cannot be held on-site due to travel restrictions
Training Date	2022/5/30
Participants from JICA side (Senior Advisor/ Expert Team)	■ JICA Senior Advisor • Tadayuki Ogawa ■ Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Hideyasu Hokama (DG economic operation/C) • Riki Oshiro (DG maintenance-electrical/A) • Gaku Hashimoto (Work coordination/ monitoring/B)
Participants from Kosrae	■ Kosrae Utilities Authority (KUA) • Robert Taualupe • Ronald Albert • Tedrick Joseph
Training content	• Orientation of online trainings • O&M manual revision • Specific fuel consumption/ fuel flow meter installation

	• Power plant improvement plan • Troubleshooting case examples

【9th Online training (DG)】

Purpose	To hold online trainings to supplement for TOT trainings that cannot be held on-site due to travel restrictions
Training Date	2022/9/13
Participants from JICA side (Senior Advisor/ Expert Team)	■ JICA Senior Advisor • Tadayuki Ogawa ■ Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Hideyasu Hokama (DG economic operation/C) • Riki Oshiro (DG maintenance-electrical/A) • Takahisa Watanabe (Work coordination/ monitoring/A)
Participants from Kosrae	■ Kosrae Utilities Authority (KUA) • Robert Taulupe • Ronald Albert • Tedrick Joseph
Training content	• Orientation of online trainings • O&M manual revision • Specific fuel consumption • Power plant improvement plan • DG maintenance schedule • Troubleshooting case examples

2nd DG manual revision meeting】

Purpose	Progress assessment of O&M manual revision
Training Date	2021/7/15
Participants from JICA side (Senior Advisor/ Expert Team)	■ JICA Senior Advisor • Tadayuki Ogawa ■ Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Hideyasu Hokama (DG economic operation/C) • Takahisa Watanabe (Work coordination/ monitoring/A) • Gaku Hashimoto (Work coordination/ monitoring/B)
Participants from Kosrae	■ Kosrae Utilities Authority (KUA) • Robert Taulupe
Materials	• 1.Safety rev.1 • 2.Basic principle, basics symbols, features, composition of DG(201901) • 3.1 Main Equipment of Diesel Engine Generator (Mechanical) • 3.2 Main Equipment of Diesel Engine Generator (Electrical)

【3rd DG manual revision meeting】

Purpose	Progress assessment of O&M manual revision

Training Date	2022/12/1
Participants from JICA side (Senior Advisor/ Expert Team)	■ Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Hideyasu Hokama (DG economic operation/C) • Gaku Hashimoto (Work coordination/ monitoring/B)
Participants from Kosrae	■ Kosrae Utilities Authority (KUA) • Robert Taulupe • Ronald Albert • Tedrick Joseph
Materials	1.Safety 2.Basic principle, basics symbols, features, composition of DG 5.2 Maintenance of diesel generators (mechanical)

【1st Online training (RE)】

Purpose	To hold online trainings to supplement for RE trainings that cannot be held on-site due to travel restrictions
Training Date	2020/7/1
Participants from JICA side (Senior Advisor/ Expert Team)	■ JICA Senior Advisor • Tadayuki Ogawa • Shingo Takeda ■ Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Masanori Shimabuku (Deputy chief/ Hybrid power generation system human resource development/A) • Hideyasu Hokama (DG economic operation/C) • Tomohiro Shiohama (RE integration plan/A) • Tasuku Taira (RE integration plan/B) • Hirokazu Nakamura (RE O&M/A) • Manatsu Yonashiro (RE O&M/C)
Participants from Kosrae	■ Kosrae Utilities Authority (KUA) • Robert Taulupe
Training content	• Basic Hybrid Power Generation System (HPGS) technology • Status of performance ratio measurement • Basic knowledge for Hybrid Power Generation planning manual drafting and review • Basic knowledge in preparation for RE O&M manual drafting and revision • Q&A on PV maintenance

【2nd Online training (RE)】

Purpose	To hold online trainings to supplement for RE trainings that cannot be held on-site due to travel restrictions
Training Date	2020/8/5、2020/8/6
Participants from JICA side (Senior Advisor/ Expert Team)	■ JICA Senior Advisor • Tadayuki Ogawa • Shingo Takeda • Trishfarrah Billen ■ Expert Team • Masanori Shimabuku (Deputy chief/ Hybrid power generation system human resource development/A) • Tomohiro Shiohama (RE integration plan/A) • Tasuku Taira (RE integration plan/B)

	• Yuma Uezu (RE integration plan/C) • Hirokazu Nakamura (RE O&M/A) • Manatsu Yonashiro (RE O&M/C) • Takahisa Watanabe (Work coordination/ monitoring/A)
Participants from Kosrae	■ Kosrae Utilities Authority (KUA) • Robert Tualupe • Ronnie George • Careston Alokoa
Training content	• Basic knowledge in preparation for RE O&M manual drafting and revision - System configuration and explanation on O&M - Patrol, daily inspection, periodic inspection - Inspection check sheet preparation and recording (method, frequency, etc.) • Basic knowledge for Hybrid Power Generation planning manual drafting and review - Frequency fluctuation (system constant, algebraic method) • Performance ratio (overview and summary of measurement method, status assessment, evaluation, verification) • Manual revision

【3rd Online training (RE)】

Purpose	To hold online trainings to supplement for RE trainings that cannot be held on-site due to travel restrictions
Training Date	2020/9/24
Participants from JICA side (Senior Advisor/ Expert Team)	■ JICA Senior Advisor • Tadayuki Ogawa • Trishfarrah Billen ■ Expert Team • Masanori Shimabuku (Deputy chief/ Hybrid power generation system human resource development/A) • Tomohiro Shiohama (RE integration plan/A) • Tasuku Taira (RE integration plan/B) • Hirokazu Nakamura (RE O&M/A) • Kaoru Ikehara (RE O&M/B) • Takahisa Watanabe (Work coordination/ monitoring/A)
Participants from Kosrae	■ Kosrae Utilities Authority (KUA) • Robert Tualupe • Gerardo Protacio • Ronnie George • Greg Ribauw • Casey Freddy
Training content	• O&M manual revision • Basic knowledge for Hybrid Power Generation planning manual drafting and review - Review exercise • Basic knowledge in preparation for RE O&M manual drafting and revision - Review exercise - Discussion on measurement result (I-V graph) • Performance ratio - Status assessment and evaluation • PV facility inspection - Generation cost calculation exercise

【4th Online training (RE)】

Purpose	To hold online trainings to supplement for RE trainings that cannot be held on-site due to travel restrictions

Training Date	2020/11/10
Participants from JICA side (Senior Advisor/ Expert Team)	■ JICA Senior Advisor • Shingo Takeda ■ Expert Team • Masanori Shimabuku (Deputy chief/ Hybrid power generation system human resource development/A) • Tomohiro Shiohama (RE integration plan/A) • Tasuku Taira (RE integration plan/B) • Hirokazu Nakamura (RE O&M/A) • Manatsu Yonashiro (RE O&M/C) • Takahisa Watanabe (Work coordination/ monitoring/A)
Participants from Kosrae	■ Kosrae Utilities Authority (KUA) • Robert Tualupe • Gerardo Protacio • Ronnie George • Casey Freddy
Training content	• RE O&M manual revision • Performance ratio • Case example of RE expansion in Okinawa Hybrid Power Generation System in Yonaguni Island • Interconnection and operation of RE grid (grid stabilization method) Output fluctuation mitigation control (ΔP control) Frequency fluctuation mitigation control (ΔF control) • Explanation on Plan of Operation (PO) • Future maintenance system and budget

【5th Online training (RE)】

Purpose	To hold online trainings to supplement for RE trainings that cannot be held on-site due to travel restrictions
Training Date	2021/2/16
Participants from JICA side (Senior Advisor/ Expert Team)	■ JICA Senior Advisor • Trishfarrah Billen ■ Expert Team • Masanori Shimabuku (Deputy chief/ Hybrid power generation system human resource development/A) • Tomohiro Shiohama (RE integration plan/A) • Tasuku Taira (RE integration plan/B) • Hirokazu Nakamura (RE O&M/A) • Manatsu Yonashiro (RE O&M/C) • Takahisa Watanabe (Work coordination/ monitoring/A)
Participants from Kosrae	■ Kosrae Utilities Authority (KUA) • Gerardo Protacio • Ronnie George
Training content	• Discussion on manual revision • Performance ratio How to obtain solar irradiation data (utilizing NASA data) • RE grid interconnection and operation Grid code (grid interconnection rules) Grid interconnection procedure Operation (output curtailment) *case example • MG set introduction • Future maintenance system and maintenance budget • Maintenance system

	Maintenance budget Support details by other donors

【6th Online training (RE)】

Purpose	To hold online trainings to supplement for RE trainings that cannot be held on-site due to travel restrictions
Training Date	2021/6/8
Participants from JICA side (Senior Advisor/ Expert Team)	■ JICA Senior Advisor • Tadayuki Ogawa ■ Expert Team • Masanori Shimabuku (Deputy chief/ Hybrid power generation system human resource development/A) • Tomohiro Shiohama (RE integration plan/A) • Tasuku Taira (RE integration plan/B) • Hirokazu Nakamura (RE O&M/A) • Manatsu Yonashiro (RE O&M/C) • Takahisa Watanabe (Work coordination/ monitoring/A)
Participants from Kosrae	■ Kosrae Utilities Authority (KUA) • Robert Tualupe • Gerardo Protacio • Ronnie George • Casey Freddy
Training content	• Performance ratio, periodic inspection • (RE integration plan) RE integration case examples in Okinawa Abu Mega solar demonstration research Ogimi Wind Power Generation Demonstration Research Facility Output fluctuation control (ΔP control and ΔF control) • (RE O&M) Future maintenance system and budget Setting up maintenance system, human resource planning (collaborative work) O&M schedule planning for 2021 (collaborative work)

【7th Online training (RE)】

Purpose	To hold online trainings to supplement for RE trainings that cannot be held on-site due to travel restrictions
Training Date	2021/9/21
Participants from JICA side (Senior Advisor/ Expert Team)	■ Expert Team • Masanori Shimabuku (Deputy chief/ Hybrid power generation system human resource development/A) • Tomohiro Shiohama (RE integration plan/A) • Tasuku Taira (RE integration plan/B) • Hirokazu Nakamura (RE O&M/A) • Kaoru Ikehara (RE O&M/B) • Manatsu Yonashiro (RE O&M/C) • Takahisa Watanabe (Work coordination/ monitoring/A)
Participants from Kosrae	■ Kosrae Utilities Authority (KUA) • Robert Tualupe • Gerardo Protacio • Casey Freddy

Training content	• Performance ratio • Discussion on facility inspection - PV facility inspection record - Advice and discussion on inspection work - PV facility inspection method • Future maintenance system - Setting up maintenance system, human resource planning • RE manual revision training (Chapter 1)

【8th Online training (RE)】

Purpose	To hold online trainings to supplement for RE trainings that cannot be held on-site due to travel restrictions
Training Date	2022/7/5
Participants from JICA side (Senior Advisor/ Expert Team)	■Expert Team • Masanori Shimabuku (Deputy chief/ Hybrid power generation system human resource development/A) • Tomohiro Shiohama (RE integration plan/A) • Tasuku Taira (RE integration plan/B) • Hirokazu Nakamura (RE O&M/A) • Kaoru Ikehara (RE O&M/B)
Participants from Kosrae	■Kosrae Utilities Authority (KUA) • Robert (Atelea) Taulupe • Gerardo Protacio • Casey Freddy • Livingston James
Training content	• Performance ratio • RE integration plan - RE manual revision (Chapter 1) - Lecture: Regional micro-grid construction project in Kurima Island • RE O&M - RE manual revision (Chapter 2)

【1st RE manual revision meeting】

Purpose	Progress assessment and giving advice on RE manual revision
Date	2021/5/28、2021/6/21 (supplementary lecture)
Participants from JICA side (Senior Advisor/ Expert Team)	■JICA Senior Advisor • Tadayuki Ogawa ■Expert Team • Masanori Shimabuku (Deputy chief/ Hybrid power generation system human resource development/A) • Tasuku Taira (RE integration plan/B) • Hirokazu Nakamura (RE O&M/A) • Manatsu Yonashiro (RE O&M/C) • Takahisa Watanabe (Work coordination/ monitoring/A) • Gaku Hashimoto (Work coordination/ monitoring/B)
Participants from Kosrae	■Kosrae Utilities Authority (KUA) • Gerardo Protacio • Greg Ribauw
Follow-up content	1. Advice on manual (Chapter 1) revision work

	2. Procedure for manual revision Revising procedure (overview) Revising procedure (step 1: organizing information on RE integration plan) Revising procedure (step 2: make a table of contents) Revising procedure (step 3: draft contents)

【2nd RE manual revision meeting】

Purpose	Progress assessment and giving advice on RE manual revision
Date	2021/8/23
Participants from JICA side (Senior Advisor/ Expert Team)	■Expert Team • Masanori Shimabuku (Deputy chief/ Hybrid power generation system human resource development/A) • Tomohiro Shiohama (RE integration plan/A) • Tasuku Taira (RE integration plan/B) • Hirokazu Nakamura (RE O&M/A)
Participants from Kosrae	■Kosrae Utilities Authority (KUA) • Robert Taualupe (KUA Operation Manager)
Follow-up content	1 .RE manual (Chapter 1) revising work Status of information collection Overview of reference material in Kiribati Generation facilities Frequency / voltage fluctuation System constant

【3rd RE manual revision meeting】

Purpose	Progress assessment and giving advice on RE manual revision
Date	2022/4/1
Participants from JICA side (Senior Advisor/ Expert Team)	■Expert Team • Masanori Shimabuku (Deputy chief/ Hybrid power generation system human resource development/A) • Tomohiro Shiohama (RE integration plan/A) • Tasuku Taira (RE integration plan/B) • Hirokazu Nakamura (RE O&M/A)
Participants from Kosrae	■Kosrae Utilities Authority (KUA) • Gerardo Protacio
Follow-up content	1. Status of RE manual (Chapter 1) revision work 2. Discussion on the revised RE manual (Chapter 1) 3. Other announcements and confirmation

【4th RE manual revision meeting】

Purpose	Progress assessment and giving advice on RE manual revision
Date	2022/5/16
Participants from	■JICA Senior Advisor

JICA side (Senior Advisor/ Expert Team)	• Tadayuki Ogawa ■Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Tasuku Taira (RE integration plan/B) • Hirokazu Nakamura (RE O&M/A) • Takahisa Watanabe (Work coordination/ monitoring/A)
Participants from Kosrae	■Kosrae Utilities Authority (KUA) • Gerardo Protacio (KUA Electrical Engineer)
Follow-up content	1. Status of RE manual (Chapter 1) revision work, advice, discussion 2. Other announcements and confirmation

【5th RE manual revision meeting】

Purpose	Progress assessment and giving advice on RE manual revision
Date	2022/9/12
Participants from JICA side (Senior Advisor/ Expert Team)	■JICA Senior Advisor • Tadayuki Ogawa ■Expert Team • Tomohiro Shiohama (RE integration plan/A) • Tasuku Taira (RE integration plan/B) • Hirokazu Nakamura (RE O&M/A) • Kaoru Ikehara (RE O&M/B) • Takahisa Watanabe (Work coordination/ monitoring/A)
Participants from Kosrae	■Kosrae Utilities Authority (KUA) • Gerardo Protacio (KUA Electrical Engineer)
Follow-up content	1. Status of RE manual revision by KUA (Kosrae) 2. Follow-up on the revised RE manual (Chapter 1: Integration) draft 3. Follow-up on the revised RE manual draft (Chapter 2: RE O&M) 4. Others

【6th RE manual revision meeting】

Purpose	Progress assessment and giving advice on RE manual revision
Date	2022/12/2
Participants from JICA side (Senior Advisor/ Expert Team)	■Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Masanori Shimabuku (Deputy chief/ Hybrid power generation system human resource development/A) • Tomohiro Shiohama (RE integration plan/A) • Tasuku Taira (RE integration plan/B) • Hirokazu Nakamura (RE O&M/A)
Participants from Kosrae	■Kosrae Utilities Authority (KUA) • Robert Taulupe (KUA Operation Manager) • Gerardo Protacio (KUA Electrical Engineer)
Follow-up content	1. Status of RE manual revision by KUA (Kosrae) 2. Follow-up on the revised RE manual (Chapter 1: Integration) draft 3. Follow-up on the revised RE manual draft (Chapter 2: RE O&M)

	4. RE O&M work plan drafting

(8) RMI

Overviews of the online trainings for RMI are shown below.

【1st Online training (DG)】

Purpose	To hold online trainings to supplement for TOT trainings that cannot be held on-site due to travel restrictions
Training Date	2020/6/25
Participants from JICA side (Senior Advisor/ Expert Team)	■ JICA Senior Advisor • Shingo Takeda ■ Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Masaru Miyagi (Deputy chief/ Hybrid power generation system human resource development/B) • Hiroyuki Nakachi (DG economic operation/A) • Hisashi Shimabukuro (DG economic operation/B) • Hideyasu Hokama (DG economic operation/C) • Ken Miyagi (DG maintenance-mechanical/A) • Riki Oshiro (DG maintenance-electrical/A) • Takahisa Watanabe (Work coordination/ monitoring/A)
Participants from RMI	■ Marshalls Energy Company (MEC) • Raul Paul • Richard Reimers • Paulson Laiden ■ Kajur • Sheldon Jacob • Lomona Thomas
Training content	• Explanation on online training schedule, greeting • Basic knowledge on DG (each system) • Explanation on DG daily inspection (Pmax adjustment, exhaust temperature measurement, FO rack adjustment) • How to read electrical diagrams (single line diagram, three-line diagram, sequence diagram) • Specific fuel consumption measurement method, calculation exercise • Information on the next training

【2nd Online training (DG)】

Purpose	To hold online trainings to supplement for TOT trainings that cannot be held on-site due to travel restrictions
Training Date	2020/7/29
Participants from JICA side (Senior Advisor/ Expert Team)	■ JICA Senior Advisor • Shingo Takeda ■ Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Masaru Miyagi (Deputy chief/ Hybrid power generation system human resource development/B) • Hisashi Shimabukuro (DG economic operation/B) • Hideyasu Hokama (DG economic operation/C) • Ken Miyagi (DG maintenance-mechanical/A) • Riki Oshiro (DG maintenance-electrical/A)

	• Gaku Hashimoto (Work coordination/ monitoring/B)
Participants from RMI	■ Marshalls Energy Company (MEC) • Steve Wakefield • Raul Paul • Richard Reimers • Paulson Laiden ■ Kajur • Joseph T. Pedro • Lomona Thomas
Training content	• Explanation on online training schedule, greeting • How to use measuring instruments (caliper, micrometer, dial gauge) • How to use digital measuring instruments (RTD, TC, pressure gauge) • Power plant operation • Status assessment of power plant improvement • O&M manual revision

【3rd Online training (DG)】

Purpose	To hold online trainings to supplement for TOT trainings that cannot be held on-site due to travel restrictions
Training Date	2020/9/23
Participants from JICA side (Senior Advisor/ Expert Team)	■ JICA Senior Advisor • Tadayuki Ogawa ■ Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Masaru Miyagi (Deputy chief/ Hybrid power generation system human resource development/B) • Hiroyuki Nakachi (DG economic operation/A) • Hideyasu Hokama (DG economic operation/C) • Ken Miyagi (DG maintenance-mechanical/A) • Takahisa Watanabe (Work coordination/ monitoring/A) • Gaku Hashimoto (Work coordination/ monitoring/B)
Participants from RMI	■ Marshalls Energy Company (MEC) • Raul Paul • Richard Reimers • Paulson Laiden ■ Kajur • Sheldon Jacob
Training content	• Orientation of online trainings • O&M manual revision • DG maintenance method (mechanical) • Fuel tank inspection • Progress on power plant improvement and specific fuel consumption measurement

【4th Online training (DG)】

Purpose	To hold online trainings to supplement for TOT trainings that cannot be held on-site due to travel restrictions
Training Date	2020/10/21
Participants from JICA side (Senior Advisor/ Expert Team)	■ JICA Senior Advisor • Tadayuki Ogawa ■ Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Masaru Miyagi (Deputy chief/ Hybrid power generation system human resource development/B)

	• Hisashi Shimabukuro (DG economic operation/B) • Hideyasu Hokama (DG economic operation/C) • Ken Miyagi (DG maintenance-mechanical/A) • Takahisa Watanabe (Work coordination/ monitoring/A) • Gaku Hashimoto (Work coordination/ monitoring/B)
Participants from RMI	■ Marshalls Energy Company (MEC) • Steve Wakefield • Raul Paul • Richard Reimers • Paulson Laiden ■ Kajur • Sheldon Jacob • Lomona Thomas
Training content	• Orientation of online trainings • O&M manual revision • DG maintenance method (mechanical) • DG turbocharger maintenance method • Remote island power source development plan • Points to confirm (improvement plan, specific fuel consumption, OH schedule, power plant operational data)

【5th Online training (DG)】

Purpose	To hold online trainings to supplement for TOT trainings that cannot be held on-site due to travel restrictions
Training Date	2021/1/27
Participants from JICA side (Senior Advisor/ Expert Team)	■ JICA Senior Advisor • Tadayuki Ogawa • Shingo Takeda ■ Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Masaru Miyagi (Deputy chief/ Hybrid power generation system human resource development/B) • Hiroyuki Nakachi (DG economic operation/A) • Hisashi Shimabukuro (DG economic operation/B) • Ken Miyagi (DG maintenance-mechanical/A) • Takahisa Watanabe (Work coordination/ monitoring/A) • Gaku Hashimoto (Work coordination/ monitoring/B)
Participants from RMI	■ Marshalls Energy Company (MEC) • Steve Wakefield • Raul Paul • Richard Reimers • Paulson Laiden • Johnson Ketwen ■ Kajur • Sheldon Jacob
Training content	• Orientation of online trainings • O&M manual revision • DG daily maintenance method (mechanical) • Generator inspection • Periodic inspection planning for small remote islands • Points to confirm (improvement plan, specific fuel consumption, OH schedule, power plant operational data)

【6th Online training (DG)】

Purpose	To hold online trainings to supplement for TOT trainings that cannot be held on-site due to travel restrictions
Training Date	2021/5/26
Participants from JICA	■ JICA Senior Advisor

side (Senior Advisor/ Expert Team)	• Tadayuki Ogawa ■ Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Masaru Miyagi (Deputy chief/ Hybrid power generation system human resource development/B) • Hisashi Shimabukuro (DG economic operation/B) • Hideyasu Hokama (DG economic operation/C) • Ken Miyagi (DG maintenance-mechanical/A) • Riki Oshiro (DG maintenance-electrical/A) • Takahisa Watanabe (Work coordination/ monitoring/A) • Gaku Hashimoto (Work coordination/ monitoring/B)
Participants from RMI	■ Marshalls Energy Company (MEC) • Vilive Lasaga • Paulson Laiden ■ Kajur • Sheldon Jacob
Training content	• Orientation of online trainings • Circuit breaker inspection • Non-destructive inspection (dye penetrant testing, magnetic particle testing) • Blackout recovery procedure • Heat exchanger • O&M manual revision • Points to confirm (power plant improvement plan, specific fuel consumption, OH schedule, comprehension test)

【7th Online training (DG)】

Purpose	To hold online trainings to supplement for TOT trainings that cannot be held on-site due to travel restrictions
Training Date	2021/9/8
Participants from JICA side (Senior Advisor/ Expert Team)	■ JICA Senior Advisor • Tadayuki Ogawa ■ Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Masaru Miyagi (Deputy chief/ Hybrid power generation system human resource development/B) • Hiroyuki Nakachi (DG economic operation/A) • Hideyasu Hokama (DG economic operation/C) • Ken Miyagi (DG maintenance-mechanical/A) • Riki Oshiro (DG maintenance-electrical/A) • Gaku Hashimoto (Work coordination/ monitoring/B)
Participants from RMI	■ Marshalls Energy Company (MEC) • Vilive Lasaga • Raul Paul • Richard Reimers • Paulson Laiden ■ Kajur • Sheldon Jacob
Training content	• Orientation of online trainings • Governor control • Heat balance • Basics of relays • Basics of sequence control

	• O&M manual revision • Points to confirm (power plant improvement plan, specific fuel consumption, OH schedule, WB project)

【8th Online training (DG)】

Purpose	To hold online trainings to supplement for TOT trainings that cannot be held on-site due to travel restrictions
Training Date	2022/5/31
Participants from JICA side (Senior Advisor/ Expert Team)	■ JICA Senior Advisor • Tadayuki Ogawa ■ Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Hideyasu Hokama (DG economic operation/C) • Riki Oshiro (DG maintenance-electrical/A) • Gaku Hashimoto (Work coordination/ monitoring/B)
Participants from RMI	■ Marshalls Energy Company (MEC) • Vilive Lasaga • Raul Paul • Richard Reimers • Paulson Laiden
Training content	• Orientation of online trainings • O&M manual revision • Specific fuel consumption • Power plant improvement plan • Troubleshooting case examples

【2nd DG manual revision meeting】

Purpose	Progress assessment of O&M manual revision
Training Date	2021/7/16
Participants from JICA side (Senior Advisor/ Expert Team)	■ JICA Senior Advisor • Tadayuki Ogawa ■ Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Hideyasu Hokama (DG economic operation/C) • Takahisa Watanabe (Work coordination/ monitoring/A) • Gaku Hashimoto (Work coordination/ monitoring/B)
Participants from RMI	■ Marshalls Energy Company (MEC) • Vilive Lasaga • Raul Paul • Paulson Laiden
Materials	• 5.2 Maintenance of diesel generators (mechanical) rev 4 • 5.3 Maintenance of diesel generators (Electrical)

【1st Online training (RE)】

Purpose	To hold online trainings to supplement for RE trainings that cannot be held on-site due to travel restrictions
Training Date	2020/7/1
Participants from	■ JICA Senior Advisor

JICA side (Senior Advisor/ Expert Team)	• Tadayuki Ogawa ■ Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Masanori Shimabuku (Deputy chief/ Hybrid power generation system human resource development/A) • Hideyasu Hokama (DG economic operation/C) • Tomohiro Shiohama (RE integration plan/A) • Tasuku Taira (RE integration plan/B) • Hirokazu Nakamura (RE O&M/A) • Manatsu Yonashiro (RE O&M/C)
Participants from RMI	■ Marshall Energy Company (MEC) • Damian Milne • Billy Schutz • Francis Takatsuki ■ Kwajalein Atoll Joint Utility Resources (KAJUR) • Joe Jorlanin • Noel Patrick ■ National Energy Office (NEO) • Benjamin Wakefield
Training content	• Basic Hybrid Power Generation System (HPGS) technology • Status of performance ratio measurement • Basic knowledge for Hybrid Power Generation planning manual drafting and review • Basic knowledge in preparation for RE O&M manual drafting and revision - Q&A on PV maintenance

【2nd Online training (RE)】

Purpose	To hold online trainings to supplement for RE trainings that cannot be held on-site due to travel restrictions
Training Date	2020/8/6
Participants from JICA side (Senior Advisor/ Expert Team)	■ JICA Senior Advisor • Tadayuki Ogawa ■ Expert Team • Masanori Shimabuku (Deputy chief/ Hybrid power generation system human resource development/A) • Tomohiro Shiohama (RE integration plan/A) • Tasuku Taira (RE integration plan/B) • Yuma Uezu (RE integration plan/C) • Hirokazu Nakamura (RE O&M/A) • Manatsu Yonashiro (RE O&M/C)
Participants from RMI	■ Marshall Energy Company (MEC) • Damian Milne • Billy Schutz • Francis Takatsuki • John Aikuj, • Carthney Laukon Jr ■ Kwajalein Atoll Joint Utility Resources (KAJUR) • Joe Jorlanin
Training content	• Basic knowledge in preparation for RE O&M manual drafting and revision - System configuration and explanation on O&M - Patrol, daily inspection, periodic inspection - Inspection check sheet preparation and recording (method, frequency, etc.) • Basic knowledge for Hybrid Power Generation planning manual drafting and review - Frequency fluctuation (system constant, algebraic method) • Performance ratio (overview and summary of measurement method, status)

	assessment, evaluation, verification)

【3rd Online training (RE)】

Purpose	To hold online trainings to supplement for RE trainings that cannot be held on-site due to travel restrictions
Training Date	2020/9/3
Participants from JICA side (Senior Advisor/ Expert Team)	■ JICA Senior Advisor • Tadayuki Ogawa ■ Expert Team • Masanori Shimabuku (Deputy chief/ Hybrid power generation system human resource development/A) • Tomohiro Shiohama (RE integration plan/A) • Hirokazu Nakamura (RE O&M/A) • Kaoru Ikehara (RE O&M/B) • Takahisa Watanabe (Work coordination/ monitoring/A)
Participants from RMI	■ Marshall Energy Company (MEC) • Billy Schutz • Francis Takatsuki • Meton Aikuj ■ Kwajalein Atoll Joint Utility Resources (KAJUR) • Joe Jorlanin • Noel Patrick ■ National Energy Office (NEO) • Benjamin Wakefield
Training content	• O&M manual revision • Basic knowledge for Hybrid Power Generation planning manual drafting and review Review exercise (long-term • short-term) • Basic knowledge in preparation for RE O&M manual drafting and revision Review exercise (RE O&M) • Performance ratio Assessment of current status, evaluation and verification • PV facility inspection Maintenance, inspection, and operation status of existing PV facility

【4th Online training (RE)】

Purpose	To hold online trainings to supplement for RE trainings that cannot be held on-site due to travel restrictions
Training Date	2020/11/11
Participants from JICA side (Senior Advisor/ Expert Team)	■ JICA Senior Advisor • Tadayuki Ogawa ■ Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Masanori Shimabuku (Deputy chief/ Hybrid power generation system human resource development/A) • Tomohiro Shiohama (RE integration plan/A) • Tasuku Taira (RE integration plan/B) • Hirokazu Nakamura (RE O&M/A) • Manatsu Yonashiro (RE O&M/C) • Takahisa Watanabe (Work coordination/ monitoring/A)
Participants from RMI	■ Marshall Energy Company (MEC) • Steve Wakefield • Billy Schutz • Francis Takatsuki ■ Kwajalein Atoll Joint Utility Resources (KAJUR)

	• Joe Jorlanin • Noel Patrick ■National Energy Office (NEO) • Rupeni Mario
Training content	• RE O&M manual revision • Updating performance ratio data • Interconnection and operation of RE grid (grid stabilization method) - Output fluctuation mitigation control (ΔP control) - Frequency fluctuation mitigation control (ΔF control) • Explanation on Plan of Operation (PO) • Future maintenance system and budget

【5th Online training (RE)】

Purpose	To hold online trainings to supplement for RE trainings that cannot be held on-site due to travel restrictions
Training Date	2021/2/18
Participants from JICA side (Senior Advisor/ Expert Team)	■Expert Team • Masanori Shimabuku (Deputy chief/ Hybrid power generation system human resource development/A) • Tasuku Taira (RE integration plan/B) • Hirokazu Nakamura (RE O&M/A) • Manatsu Yonashiro (RE O&M/C) • Takahisa Watanabe (Work coordination/ monitoring/A)
Participants from RMI	■Marshall Energy Company (MEC) • Steve Wakefield • Damien Milne • Billy Schutz • Francis Takatsuki ■Kwajalein Atoll Joint Utility Resources (KAJUR) • Joe Jorlanin • Noel Patrick ■National Energy Office (NEO) • Benjamin Wakefield
Training content	• Discussion on manual revision • Performance ratio - How to obtain solar irradiation data (utilizing NASA data) • RE grid interconnection and operation - Grid code (grid interconnection rules) - Grid interconnection procedure - Operation (output curtailment) *case example • MG set introduction • Future maintenance system and maintenance budget - Maintenance system - Maintenance budget - Support details by other donors

【6th Online training (RE)】

Purpose	To hold online trainings to supplement for RE trainings that cannot be held on-site due to travel restrictions
Training Date	2021/6/11
Participants from JICA side (Senior Advisor/ Expert Team)	■JICA Senior Advisor • Tadayuki Ogawa ■Expert Team • Masanori Shimabuku (Deputy chief/ Hybrid power generation system human resource development/A) • Tomohiro Shiohama (RE integration plan/A)

	• Tasuku Taira (RE integration plan/B) • Hirokazu Nakamura (RE O&M/A) • Manatsu Yonashiro (RE O&M/C) • Takahisa Watanabe (Work coordination/ monitoring/A)
Participants from RMI	■Marshall Energy Company (MEC) • Billy Schutz • Francis Takatsuki ■Kwajalein Atoll Joint Utility Resources (KAJUR) • Noel Patrick (Electrical Engineer)
Training content	• (RE integration plan) RE integration case examples in Okinawa - Abu Mega solar demonstration research - Ogimi Wind Power Generation Demonstration Research Facility - Output fluctuation control (ΔP control and ΔF control) • (RE O&M) Future maintenance system and budget - Review of the previous training - Setting up maintenance system, human resource planning (collaborative work) - O&M schedule planning for 2021 (collaborative work) • Performance ratio, inspection record

【7th Online training (RE)】

Purpose	To hold online trainings to supplement for RE trainings that cannot be held on-site due to travel restrictions
Training Date	2021/9/29
Participants from JICA side (Senior Advisor/ Expert Team)	■Expert Team • Masanori Shimabuku (Deputy chief/ Hybrid power generation system human resource development/A) • Tomohiro Shiohama (RE integration plan/A) • Tasuku Taira (RE integration plan/B) • Hirokazu Nakamura (RE O&M/A) • Kaoru Ikehara (RE O&M/B) • Manatsu Yonashiro (RE O&M/C) • Takahisa Watanabe (Work coordination/ monitoring/A)
Participants from RMI	■Marshall Energy Company (MEC) • Steve Wakefield • Billy Schutz • Francis Takatsuki • Carthney Laukon ■Kwajalein Atoll Joint Utility Resources (KAJUR) • Joe Jorlanin • Noel Patrick ■National Energy Office (NEO) • Benjamin Wakefield
Training content	• RE manual revision training (Chapter 1) • Performance ratio • Discussion on facility inspection - PV facility inspection record - Advice and discussion on inspection work - PV facility inspection method • Future maintenance system - Setting up maintenance system, human resource planning

【8th Online training (RE)】

Purpose	To hold online trainings to supplement for RE trainings that cannot be held on-site due to travel restrictions

Training Date	2022/7/6
Participants from JICA side (Senior Advisor/ Expert Team)	■Expert Team • Masanori Shimabuku (Deputy chief/ Hybrid power generation system human resource development/A) • Tomohiro Shiohama (RE integration plan/A) • Tasuku Taira (RE integration plan/B) • Hirokazu Nakamura (RE O&M/A) • Kaoru Ikehara (RE O&M/B)
Participants from RMI	■Marshall Energy Company (MEC) • Damien Milne • Francis Takatsuki ■National Energy Office (NEO) • Wesley Lokeijak
Training content	• Performance ratio • RE integration plan RE manual revision (Chapter 1) Lecture: Regional micro-grid construction project in Kurima Island • RE O&M RE manual revision (Chapter 2)

【1st RE manual revision meeting】

Purpose	Progress assessment and giving advice on RE manual revision
Date	2021/5/24
Participants from JICA side (Senior Advisor/ Expert Team)	■JICA Senior Advisor • Tadayuki Ogawa ■Expert Team • Masanori Shimabuku (Deputy chief/ Hybrid power generation system human resource development/A) • Tomohiro Shiohama (RE integration plan/A) • Hirokazu Nakamura (RE O&M/A) • Manatsu Yonashiro (RE O&M/C) • Takahisa Watanabe (Work coordination/ monitoring/A)
Participants from RMI	■Marshall Energy Company (MEC) • Damien Milne • Francis Takatsuki • Billy Schutz • Nine Bill ■National Energy Office (NEO) • Benjamin Wakefield
Follow-up content	1. Give comments on the revised manual (Chapter 1) 2. Procedure for manual revision Works related to RE integration plan. Drafting a table of contents for the manual Others

【2nd RE manual revision meeting】

Purpose	Progress assessment and giving advice on RE manual revision
Date	2021/7/27

Participants from JICA side (Senior Advisor/ Expert Team)	■ JICA Senior Advisor • Tadayuki Ogawa ■ Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Masanori Shimabuku (Deputy chief/ Hybrid power generation system human resource development/A) • Tomohiro Shiohama (RE integration plan/A) • Tasuku Taira (RE integration plan/B) • Hirokazu Nakamura (RE O&M/A) • Kaoru Ikehara (RE O&M/B) • Manatsu Yonashiro (RE O&M/C) • Takahisa Watanabe (Work coordination/ monitoring/A)
Participants from RMI	■ Marshall Energy Company (MEC) • Damien Milne • Francis Takatsuki • Billy Schutz ■ National Energy Office (NEO) • Benjamin Wakefield
Follow-up content	1. RE manual (Chapter 1) revision 2. Other points to confirm

【3rd RE manual revision meeting】

Purpose	Progress assessment and giving advice on RE manual revision
Date	2022/3/29
Participants from JICA side (Senior Advisor/ Expert Team)	■ Expert Team • Masanori Shimabuku (Deputy chief/ Hybrid power generation system human resource development/A) • Tomohiro Shiohama (RE integration plan/A) • Tasuku Taira (RE integration plan/B) • Hirokazu Nakamura (RE O&M/A)
Participants from RMI	■ Marshall Energy Company (MEC) • Francis Takatsuki (RE Supervisor/Administrator)
Follow-up content	1. Status of RE manual (Chapter 1) revision work 2. Discussion on the revised RE manual (Chapter 1) draft 3. Other announcements and confirmation

【4th RE manual revision meeting】

Purpose	Progress assessment and giving advice on RE manual revision
Date	2022/5/20
Participants from JICA side (Senior Advisor/ Expert Team)	■ JICA Senior Advisor • Tadayuki Ogawa ■ Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Masanori Shimabuku (Deputy chief/ Hybrid power generation system human resource development/A)

	• Tomohiro Shiohama (RE integration plan/A) • Tasuku Taira (RE integration plan/B) • Hirokazu Nakamura (RE O&M/A) • Takahisa Watanabe (Work coordination/ monitoring/A)
Participants from RMI	■ Marshall Energy Company (MEC) • Steve Wakefield • Billy Schutz • Francis Takatsuki ■ National Energy Office (NEO) • Benjamin Wakefield
Follow-up content	1. Status of RE manual (Chapter 1) revision work, advice 2. Other announcements and confirmation

【5th RE manual revision meeting】

Purpose	Progress assessment and giving advice on RE manual revision
Date	2022/10/3
Participants from JICA side (Senior Advisor/ Expert Team)	■ JICA Senior Advisor • Tadayuki Ogawa ■ Expert Team • Masanori Shimabuku (Deputy chief/ Hybrid power generation system human resource development/A) • Tasuku Taira (RE integration plan/B) • Hirokazu Nakamura (RE O&M/A) • Kaoru Ikehara (RE O&M/B)
Participants from RMI	■ Marshall Energy Company (MEC) • Francis Takatsuki ■ Kwajalein Atoll Joint Utility Resources (KAJUR) • Joe Jorlanin ■ National Energy Office (NEO) • Benjamin Wakefield
Follow-up content	1. Status of RE manual revision (RMI) 2. Follow-up on the revised RE manual (Chapter 1: Integration) draft 3. Follow-up on the revised RE manual draft (Chapter 2: RE O&M) 4. Others

【6th RE manual revision meeting】

Purpose	Progress assessment and giving advice on RE manual revision
Date	2022/12/9
Participants from JICA side (Senior Advisor/ Expert Team)	■ Expert Team • Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Tomohiro Shiohama (RE integration plan/A) • Tasuku Taira (RE integration plan/B) • Hirokazu Nakamura (RE O&M/A) • Kaoru Ikehara (RE O&M/B)
Participants from RMI	■ Marshall Energy Company (MEC) • Francis Takatsuki ■ Kwajalein Atoll Joint Utility Resources (KAJUR) • Joe Jorlanin • Noel Patrick ■ National Energy Office (NEO) • Wesley Lokeijak

Follow-up content	1. Status of RE manual revision by MEC, NEO (RMI) 2. Follow-up on the revised RE manual (Chapter 1: Integration) draft 3. Follow-up on the revised RE manual draft (Chapter 2: RE O&M) 4. RE O&M work plan drafting

Table 7.1.3 List of procured (donated) equipment

(1) Fiji

No.	Equipment name	Quantity	Purpose/necessity	Note
DG-related procured equipment				
1	Digital Pressure Calibrator Baker Hughes DPI800S	1	Maintenance of DG instrumentation equipment	
2	Digital multimeter YOKOKAWA TY710	1	Maintenance of DG instrumentation equipment	
3	Digital thermometer TOKOKAWA TX1001	1	Maintenance of DG instrumentation equipment	
4	Instrumentation signal measurement / Generator YOKOKAWA CA150	1	Maintenance of DG instrumentation equipment	
5	Ohm meter YOKOKAWA MY600	1	Maintenance of DG instrumentation equipment	
6	Air compressor kit Baker Hughes PV211	1	Maintenance of DG instrumentation equipment	
7	Air hose 1 m × 2 1.5 m × 1	1	Maintenance of DG instrumentation equipment	
8	Various types of fittings (1/8, 1/4, 3/8, 1/2, 3/4, 1)	1	Maintenance of DG instrumentation equipment	
9	Inside micrometer Mitutoyo IMZ-300W	1	Maintenance of DG machinery	
10	Outside micrometer Mitutoyo MDC-75MX	1	Maintenance of DG machinery	
11	Dial gauge Mitutoyo DG2046SB	1	Maintenance of DG machinery	
12	Magnetic stand Mitutoyo 701010	1	Maintenance of DG machinery	

13	Crankshaft deflection Gauge Mitutoyo CG160AX	1	Maintenance of DG machinery	
14	Digital Vernier caliper Mitutoyo CD67S15PM	1	Maintenance of DG machinery	
15	Vernier caliper Mitutoyo N15	1	Maintenance of DG machinery	
16	Torque wrench TONE T4MN300 12.7mm(1/2") 40~300N • m	1	Maintenance of DG machinery	
17	Feeler gauge set BESTOMZ 4N476G2108E58NE8L	1	Maintenance of DG machinery	
RE-related procured equipment				
18	Training PV equipment (3.5kW)	1	Training equipment for the training center PV panel and mounting frame	
19	Pyranometer & thermometer Togami Electric Mfg SPST-A-F2	1	Diagnosis of PV facility operating conditions	
20	String Tracer (I -V curve tracer) Togami Electric Mfg SPST-A2A-Y1	1	Diagnosis of PV facility operating conditions/ detect string issues	
21	PV-Analyzer Nippon Kernal Mfg Epsilon1000	1 / DOE	Diagnosis of PV facility operating conditions	
22	Cell Line Checker Togami Electric Mfg SPLC-A-Y1	1	Diagnosis of PV facility operating conditions/ detect faulty PV modules	
23	HOMER PRO HOMER Software	2	Effective RE integration planning/ Simulation software	
24	Insulation Tester HIOKI IR4053-11	1	Diagnosis of PV facility operating conditions	
25	Thermographic Camera Fluke TiS55	1	Diagnosis of PV facility operating conditions/ temperature monitoring	

(2) Tuvalu

No.	Equipment name	Quantity	Purpose/necessity	Note
DG-related procured equipment				
1	Fuel flow meter Nitto Seiko RC25CFFM2	3	Accurate specific fuel consumption measurement	
2	Digital Pressure Calibrator Baker Hughes DP705E	1	Maintenance of DG instrumentation equipment	
3	Digital multimeter YOKOKAWA TY710	1	Maintenance of DG instrumentation equipment	
4	Digital thermometer TOKOKAWA TX1001	1	Maintenance of DG instrumentation equipment	
5	Instrumentation signal measurement / Generator YOKOKAWA CA500	1	Maintenance of DG instrumentation equipment	
6	Ohm meter YOKOKAWA MY600	1	Maintenance of DG instrumentation equipment	
7	Air compressor kit Baker Hughes PV211	1	Maintenance of DG instrumentation equipment	
8	Air hose 1 m × 2 1.5 m × 1	1	Maintenance of DG instrumentation equipment	
9	Various types of fittings (1/8, 1/4, 3/8, 1/2, 3/4, 1)	1	Maintenance of DG instrumentation equipment	
10	Battery HiTester HIOKI BT3554	1	Diagnosis of storage battery operating conditions	
11	Clamp on AC/DC HiTester HIOKI 3285	1	Diagnosis of storage battery operating conditions	
12	Radiation thermometer HIOKI FT3701	1	Diagnosis of storage battery operating conditions	
13	Battery hydrometer	1	Diagnosis of storage battery operating conditions	

14	Vibration measuring instrument TASCO TA415EB	1	Diagnosis of DG facility operating conditions	
15	Digital panel meter OMRON K3MA-J DC24V	6	Mitigation of DG facility deterioration/ Digital display	
16	Digital panel meter OMRON K3HB-RNB-A DC24V	1	Mitigation of DG facility deterioration/ Rotary pulse meter	
17	Power Supply OMRON S8FS-G10024CD	1	Mitigation of DG facility deterioration/ DC Power Supply	
18	VILEDON air filter (W1.6m×30m×8mm) JAPAN VILENE COMPANY, LTD PS/150N	1	Mitigation of generator deterioration/ Intake filter	
19	Control Air Unit (Valve, Filter, Strainer, regulator)	1set	Mitigation of control air system deterioration	
20	Machine general tools 151 items	1set	Maintenance of DG machinery	
21	Mechanical measuring equipment 26 items	1set	Maintenance of DG machinery	
22	INSULTEX Tape	1	Safety measure for generation facility/ Heat resistant tape to apply on exhaust pipe	
RE-related procured equipment				
23	Pyranometer & thermometer Togami Electric Mfg SPST-A-F2	1	Diagnosis of PV facility operating conditions	
24	String Tracer(I -V curve tracer) Togami Electric Mfg SPST-A2A- Y1	1	Diagnosis of PV facility operating conditions/ detect string issues	
25	Cell Line Checker Togami Electric Mfg SPLC-A-Y1	1	Diagnosis of PV facility operating conditions/ detect faulty PV modules	
26	HOMER PRO HOMER Software	1	Effective RE integration planning/ Simulation software	

27	Insulation Tester HIOKI IR4053-11	1	Diagnosis of PV facility operating conditions	
28	Thermographic Camera Fluke TiS55	1	Diagnosis of PV facility operating conditions/ temperature monitoring	
29	Digital Multimeter HIOKI DT4254	1	Diagnosis of PV facility operating conditions	
30	Mower Makita MEM428	1	PV facility maintenance	
31	High pressure washer KOSHIN JCE-1408UDX	1	PV facility maintenance/ Solar panel cleaning	

(3) Kiribati

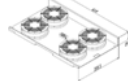
No.	Equipment name	Quantity	Purpose/necessity	Note
DG-related procured equipment				
1	Fuel flow meter Nitto Seiko RC25CFFM2	4	Accurate specific fuel consumption measurement	
2	Digital Pressure Calibrator Baker Hughes DPI800S	1	Maintenance of DG instrumentation equipment	
3	Digital multimeter YOKOKAWA TY710	1	Maintenance of DG instrumentation equipment	
4	Digital thermometer TOKOKAWA TX1001	1	Maintenance of DG instrumentation equipment	
5	Instrumentation signal measurement / Generator YOKOKAWA CA150	1	Maintenance of DG instrumentation equipment	
6	Ohm meter YOKOKAWA MY600	1	Maintenance of DG instrumentation equipment	
7	Air compressor kit Baker Hughes PV211	1	Maintenance of DG instrumentation equipment	
8	Air hose 1 m × 2 1.5 m × 1	1	Maintenance of DG instrumentation equipment	

9	Various types of fittings (1/8, 1/4, 3/8, 1/2, 3/4, 1)	1	Maintenance of DG instrumentation equipment	
10	Battery HiTester HIOKI BT3554	1	Diagnosis of storage battery operating conditions	
11	Clamp on AC/DC HiTester HIOKI 3285	1	Diagnosis of storage battery operating conditions	
12	Radiation thermometer HIOKI FT3701	1	Diagnosis of storage battery operating conditions	
13	Battery hydrometer	1	Diagnosis of storage battery operating conditions	
14	Vibration measuring instrument TASCO TA415EB	1	Diagnosis of DG facility operating conditions	
15	Digital panel meter OMRON K3MA-J DC24V	6	Mitigation of DG facility deterioration/ Digital display	
16	DC input converter M-SYSTEM WVS-AAA-P DC110V	6	Mitigation of DG facility deterioration	
17	VILEDON air filter (W1.6m×30m×8mm) JAPAN VILENE COMPANY, LTD PS/150N	1	Mitigation of generator deterioration/ Intake filter	
18	INSULTEX Tape	1	Safety measure for generation facility/ Heat resistant tape to apply on exhaust pipe	
RE-related procured equipment				
19	Pyranometer & thermometer Togami Electric Mfg SPST-A-F2	1	Diagnosis of PV facility operating conditions	
20	String Tracer(I -V curve tracer) Togami Electric Mfg SPST-A2A-Y1	1	Diagnosis of PV facility operating conditions/ detect string issues	
21	Cell Line Checker Togami Electric Mfg SPLC-A-Y1	1	Diagnosis of PV facility operating conditions/ detect faulty PV modules	
22	HOMER PRO HOMER Software	2	Effective RE integration planning/ Simulation software	
23	Insulation Tester HIOKI IR4053-11	1	Diagnosis of PV facility operating conditions	

24	Thermographic Camera Fluke TiS55	1	Diagnosis of PV facility operating conditions/ temperature monitoring	
25	Digital Multimeter HIOKI DT4254	1	Diagnosis of PV facility operating conditions	
26	Mower Makita MEM428	1	PV facility maintenance	
27	High pressure washer KOSHIN JCE-1408UDX	1	PV facility maintenance/ Solar panel cleaning	

(4) FSM (Pohnpei, Chuuk, Yap, Kosrae)**① Pohnpei**

No.	Equipment name	Quantity	Purpose/necessity	Note
DG-related procured equipment				
1	Fuel flow meter Nitto Seiko BRC20-2-P4	10	Accurate specific fuel consumption measurement	
2	Battery HiTester HIOKI BT3554	1	Diagnosis of storage battery operating conditions	
3	Clamp on AC/DC HiTester HIOKI 3285	1	Diagnosis of storage battery operating conditions	
4	Radiation thermometer HIOKI FT3701	1	Diagnosis of storage battery operating conditions	
5	Battery hydrometer	1	Diagnosis of storage battery operating conditions	
6	Vibration measuring instrument TASCO TA415EB	1	Diagnosis of DG facility operating conditions	
RE-related procured equipment				
7	Pyranometer & thermometer Togami Electric Mfg SPST-A-F2	1	Diagnosis of PV facility operating conditions	
8	String Tracer(I -V curve tracer) Togami Electric Mfg SPST-A2A-Y1	1	Diagnosis of PV facility operating conditions/ detect string issues	
9	Cell Line Checker Togami Electric Mfg SPLC-A-Y1	1	Diagnosis of PV facility operating conditions/ detect faulty PV modules	
10	HOMER PRO HOMER Software	1	Effective RE integration planning/	

			Simulation software	
11	Insulation Tester HIOKI IR4053-11	1	Diagnosis of PV facility operating conditions	
12	Fan Unit (For Power Conditioner) KYOUUSERA P83B FANUNIT FM4	3set	Improving the Japan- donated PV facility PCS internal fan	
13	Thermographic Camera Fluke TiS55	1	Diagnosis of PV facility operating conditions/ temperature monitoring	
14	Digital Multimeter HIOKI DT4254	1	Diagnosis of PV facility operating conditions	
15	Mower Makita MEM428	1	PV facility maintenance	
16	High pressure washer KOSHIN JCE-1408UDX	1	PV facility maintenance/ Solar panel cleaning	

② Chuuk

No.	Equipment name	Quantity	Purpose/necessity	Note
DG-related procured equipment				
1	Battery HiTester HIOKI BT3554	1	Diagnosis of storage battery operating conditions	
2	Clamp on AC/DC HiTester HIOKI 3285	1	Diagnosis of storage battery operating conditions	
3	Radiation thermometer HIOKI FT3701	1	Diagnosis of storage battery operating conditions	
4	Battery hydrometer	1	Diagnosis of storage battery operating conditions	
5	Vibration measuring instrument TASCO TA415EB	1	Diagnosis of DG facility operating conditions	
RE-related procured equipment				
6	Pyranometer & thermometer Togami Electric Mfg SPST-A-F2	1	Diagnosis of PV facility operating conditions	
7	String Tracer(I -V curve tracer) Togami Electric Mfg SPST-A2A- Y1	1	Diagnosis of PV facility operating conditions/ detect string issues	
8	Cell Line Checker Togami Electric Mfg SPLC-A-Y1	1	Diagnosis of PV facility operating conditions/ detect faulty PV modules	

9	HOMER PRO HOMER Software	1	Effective RE integration planning/ Simulation software	
10	Insulation Tester HIOKI IR4053-11	1	Diagnosis of PV facility operating conditions	
11	Thermographic Camera Fluke TiS55	1	Diagnosis of PV facility operating conditions/ temperature monitoring	
12	Digital Multimeter HIOKI DT4254	1	Diagnosis of PV facility operating conditions	
13	Mower Makita MEM428	1	PV facility maintenance	
14	High pressure washer KOSHIN JCE-1408UDX	1	PV facility maintenance/ Solar panel cleaning	

③ Yap

No.	Equipment name	Quantity	Purpose/necessity	Note
DG-related procured equipment				
1	Battery HiTester HIOKI BT3554	1	Diagnosis of storage battery operating conditions	
2	Clamp on AC/DC HiTester HIOKI 3285	1	Diagnosis of storage battery operating conditions	
3	Radiation thermometer HIOKI FT3701	1	Diagnosis of storage battery operating conditions	
4	Battery hydrometer	1	Diagnosis of storage battery operating conditions	
5	Vibration measuring instrument TASCO TA415EB	1	Diagnosis of DG facility operating conditions	
RE-related procured equipment				
6	Pyranometer & thermometer Togami Electric Mfg SPST-A-F2	1	Diagnosis of PV facility operating conditions	
7	String Tracer(I -V curve tracer) Togami Electric Mfg SPST-A2A-Y1	1	Diagnosis of PV facility operating conditions/ detect string issues	
8	Cell Line Checker Togami Electric Mfg SPLC-A-Y1	1	Diagnosis of PV facility operating conditions/ detect faulty PV modules	

9	HOMER PRO HOMER Software	1	Effective RE integration planning/ Simulation software	
10	Insulation Tester HIOKI IR4053-11	1	Diagnosis of PV facility operating conditions	
11	Thermographic Camera Fluke TiS55	1	Diagnosis of PV facility operating conditions/ temperature monitoring	
12	Digital Multimeter HIOKI DT4254	1	Diagnosis of PV facility operating conditions	
13	Mower Makita MEM428	1	PV facility maintenance	
14	High pressure washer KOSHIN JCE-1408UDX	1	PV facility maintenance/ Solar panel cleaning	

④ **Kosrae**

No.	Equipment name	Quantity	Purpose/necessity	Note
DG-related procured equipment				
1	Fuel flow meter Nitto Seiko BRC20-2-P4	4	Accurate specific fuel consumption measurement	
2	Digital Pressure Calibrator Baker Hughes DPI800S	1	Maintenance of DG instrumentation equipment	
3	Digital multimeter YOKOKAWA TY710	1	Maintenance of DG instrumentation equipment	
4	Digital thermometer TOKOKAWA TX1001	1	Maintenance of DG instrumentation equipment	
5	Instrumentation signal measurement / Generator YOKOKAWA CA150	1	Maintenance of DG instrumentation equipment	
6	Ohm meter YOKOKAWA MY600	1	Maintenance of DG instrumentation equipment	
7	Air compressor kit Baker Hughes PV211	1	Maintenance of DG instrumentation equipment	
8	Air hose 1 m × 2 1.5 m × 1	1	Maintenance of DG instrumentation equipment	

9	Various types of fittings (1/8, 1/4, 3/8, 1/2, 3/4, 1)	1	Maintenance of DG instrumentation equipment	
10	Battery HiTester HIOKI BT3554	1	Diagnosis of storage battery operating conditions	
11	Clamp on AC/DC HiTester HIOKI 3285	1	Diagnosis of storage battery operating conditions	
12	Radiation thermometer HIOKI FT3701	1	Diagnosis of storage battery operating conditions	
13	Battery hydrometer	1	Diagnosis of storage battery operating conditions	
14	Vibration measuring instrument TASCO TA415EB	1	Diagnosis of DG facility operating conditions	
RE-related procured equipment				
15	Pyranometer & thermometer Togami Electric Mfg SPST-A-F2	1	Diagnosis of PV facility operating conditions	
16	String Tracer(I -V curve tracer) Togami Electric Mfg SPST-A2A-Y1	1	Diagnosis of PV facility operating conditions/ detect string issues	
17	Cell Line Checker Togami Electric Mfg SPLC-A-Y1	1	Diagnosis of PV facility operating conditions/ detect faulty PV modules	
18	HOMER PRO HOMER Software	1	Effective RE integration planning/ Simulation software	
19	Insulation Tester HIOKI IR4053-11	1	Diagnosis of PV facility operating conditions	
20	Thermographic Camera Fluke TiS55	1	Diagnosis of PV facility operating conditions/ temperature monitoring	
21	Digital Multimeter HIOKI DT4254	1	Diagnosis of PV facility operating conditions	

(5) RMI

No.	Equipment name	Quantity	Purpose/necessity	Note
DG-related procured equipment				
1	Digital Pressure Calibrator Baker Hughes DPI800S	1	Maintenance of DG instrumentation equipment	

2	Digital multimeter YOKOKAWA TY710	1	Maintenance of DG instrumentation equipment	
3	Digital thermometer TOKOKAWA TX1001	1	Maintenance of DG instrumentation equipment	
4	Instrumentation signal measurement / Generator YOKOKAWA CA150	1	Maintenance of DG instrumentation equipment	
5	Ohm meter YOKOKAWA MY600	1	Maintenance of DG instrumentation equipment	
6	Air compressor kit Baker Hughes PV211	1	Maintenance of DG instrumentation equipment	
7	Air hose 1 m × 2 1.5 m × 1	1	Maintenance of DG instrumentation equipment	
8	Various types of fittings (1/8, 1/4, 3/8, 1/2, 3/4, 1)	1	Maintenance of DG instrumentation equipment	
9	Battery HiTester HIOKI BT3554	1	Diagnosis of storage battery operating conditions	
10	Clamp on AC/DC HiTester HIOKI 3285	1	Diagnosis of storage battery operating conditions	
11	Radiation thermometer HIOKI FT3701	1	Diagnosis of storage battery operating conditions	
12	Battery hydrometer	1	Diagnosis of storage battery operating conditions	
13	Vibration measuring instrument TASCO TA415EB	1	Diagnosis of DG facility operating conditions	
RE-related procured equipment				
14	Pyranometer & thermometer Togami Electric Mfg SPST-A-F2	2 MEC / Kajur	Diagnosis of PV facility operating conditions	
15	String Tracer(I -V curve tracer) Togami Electric Mfg SPST-A2A-Y1	2 MEC / Kajur	Diagnosis of PV facility operating conditions/ detect string issues	

16	Cell Line Checker Togami Electric Mfg SPLC-A-Y1	2 MEC / Kajur	Diagnosis of PV facility operating conditions/ detect faulty PV modules	
17	HOMER PRO HOMER Software	2 MEC / Kajur	Effective RE integration planning/ Simulation software	
18	Insulation Tester HIOKI IR4053-11	2 MEC / Kajur	Diagnosis of PV facility operating conditions	
19	Stainless Empty Junction Box (Majuro Hospital) NITTO KOGYO SOR20-55	22	Proper PV facility maintenance/Cable junction box	
20	Stainless Empty Collector Box (Majuro Hospital) NITTO KOGYO SOR20-68	5	Proper PV facility maintenance/Cable collector box	
21	Thermographic Camera Fluke TiS55	1	Diagnosis of PV facility operating conditions/ temperature monitoring	
22	Digital Multimeter HIOKI DT4254	1	Diagnosis of PV facility operating conditions	
23	Mower Makita MEM428	1	PV facility maintenance	
24	High pressure washer KOSHIN JCE-1408UDX	1	PV facility maintenance/ Solar panel cleaning	

Oceania

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

Final Report

September 2023

Japan International Cooperation Agency (JICA)

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

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Abbreviations

Abbreviation	Formal name
ADB	Asian Development Bank
AFC	Automatic Frequency Control
AVR	Automatic Voltage Regulator
C/P	Counterpart
DG	Diesel Generator
EDC	Economic Load Dispatching Control
IPP	Independent Power Producer
IRENA	International Renewable Energy Agency
JCC	Joint Coordination Committee
JICA	Japan International Cooperation Agency
JOCV	Japan Overseas Cooperation Volunteers
MOU	Minutes of Understanding
ODA	Official Development Assistance
OJT	On the Job Training
O&M	Operation & Maintenance
PALM	Pacific Islands Leaders Meeting
PCS	Power Conditioning System
PDM	Project Design Matrix
PO	Plan of Operation
PV	Photovoltaic
RE	Renewable Energy
R/D	Record of Discussions
SDGs	Sustainable Development Goals
UAE	United Arab Emirates
UNDP	United Nations Development Programme
WB	World Bank
Fiji	
MPWTMS	Ministry of Public Works, Transport and Meteorological Services
DOE	Department of Energy
PPA	Pacific Power Association
EFL	Energy Fiji Limited
FEA	Fiji Electricity Authority
FNU	Fiji National University
USP	University of the South Pacific
Tuvalu	
MTET	Ministry of Transport Energy and Tourism

TEC	Tuvalu Electricity Corporation
Kiribati	
MISE	Ministry of Infrastructure and Sustainable Energy
PUB	Public Utilities Board
KIT	Kiribati Institute of Technology
Micronesia	
DRD	Department of Resources and Development
Yap	
YSPSC	Yap State Public Service Corporation
Chuuk	
CPUC	Chuuk Public Utility Corporation
Pohnpei	
PUC	Pohnpei Utilities Corporation
Kosrae	
KUA	Kosrae Utilities Authority
Marshall	
NEO	National Energy Office
MEC	Marshalls Energy Company
KAJUR	Kwajalein Atoll Joint Utilities Resources
Related to Regional Training for Additional countries	
EPC	Electric Power corporation (Samoa)
TPL	Tonga Power Ltd.
SP	Solomon Power
PPL	PNG Power Ltd.
PPUC	Palau Public Utilities Corporation
TAU	Te Aponga Uira O Tumu-Te-Varovaro
NPC	Niue Power Corporation

8. Project activity results

The activities of this project are aimed to contribute for the achievement of the overall goal in the target countries, and to promote baseline improvement and sustainability of activities through technical support activities. Figure 8 shows a conceptual diagram of the effects from the project activities.

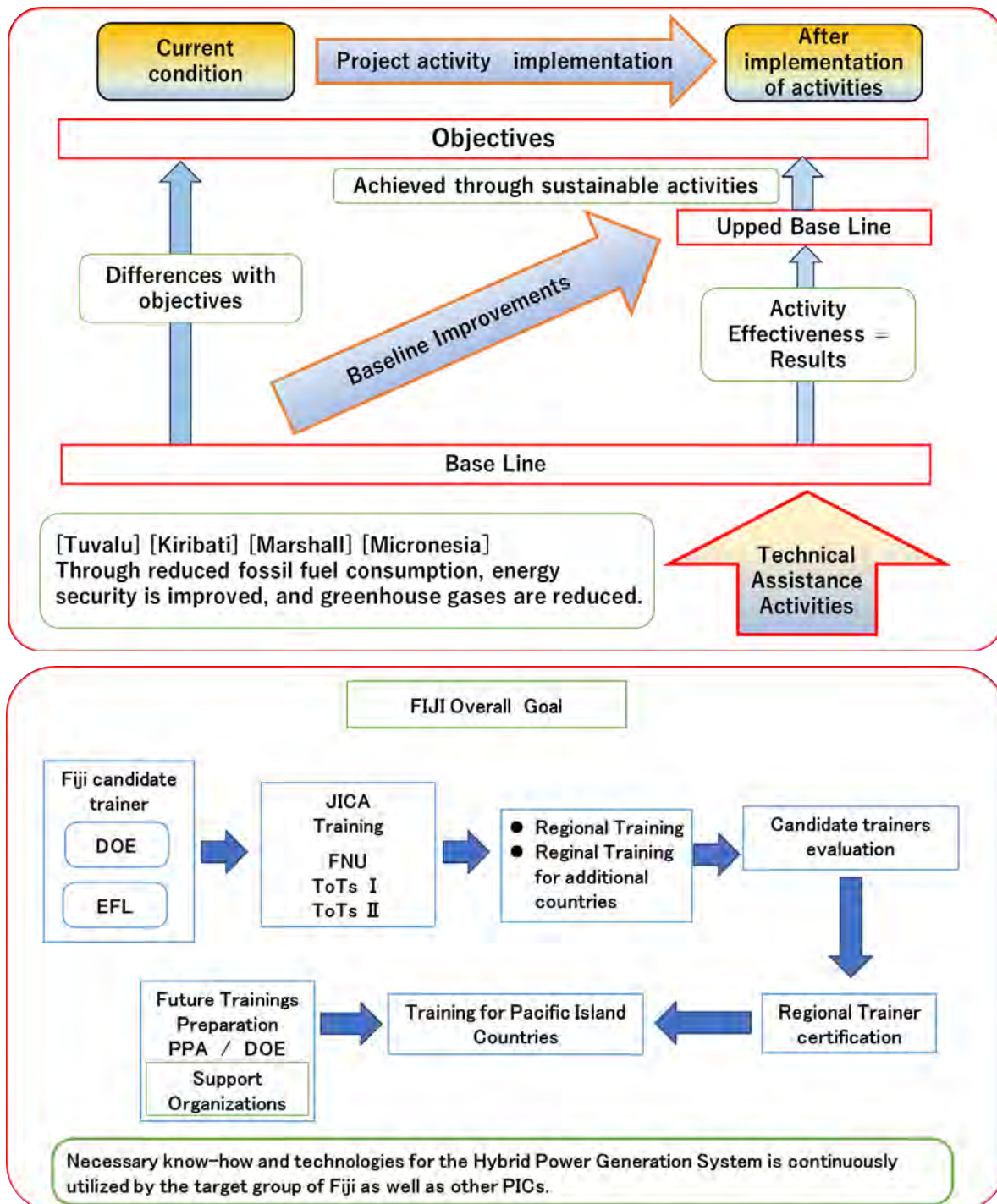


Figure 8 Conceptual diagram of the effects from the project activities

8.1 Project activity results

Project activities are specified in the Project Design Matrix (PDM) for each target country, and the “plan” and the “result” for each activity were managed in the Plan of Operation (PO).

The results of the technical assistance activities for Fiji, Tuvalu, Kiribati, FSM, and RMI are organized by country.

Other general project activities such as the Joint Coordination Committee (JCC), training in third countries (initial and additional target countries), training in Japan, and outreach activities are organized by activity.

8.2 Fiji-related activity results

8.2.1 Overall goal and indicators of the project

(1) Overall goal and indicators

Overall goal: Necessary know-how and technologies for the Hybrid Power Generation System is continuously utilized by the target group of Fiji as well as other PICs.

Indicator①: Number* of training programs, trainers, participants and their countries, in training program related to Hybrid Power Generation System in Fiji after the project.

Indicator②: Utilization ratio* of training materials (equipment, textbook, reference material, etc.) provided by the Project

Indicator③: Number* of training participants who utilize the learnings from the training programs and seminars in Fiji.

*At the time of Project completion, specific target numbers are to be determined.

(2) Project purpose and indicators

Project purpose: Regional training system on the introduction of Hybrid Power Generation System is strengthened in Fiji.

Indicator①: Number* of qualified trainers for regional training program

Indicator②: Number* of foreign training participants in the region

Indicator③: More than 80% of training participants assess the training program (trainers, training curriculum, textbook) are good.

Indicator④: More than 80 % of training participants understand the training content.

Indicator⑤: More than 80% of training participants consider the training content is useful.

*Based on the review on progress of Project activities, specific target numbers are to be determined. Indicators ③-⑤ are to be verified with the training participants' answers to questionnaire, and evaluation by C/P agencies and Japanese experts on training participants.

(3) Outputs (expected effect)

Output 1): Training programs for appropriate and economical system of O&M for Diesel Generators (DGs) is prepared.

Output 2): Training programs on methodology for appropriate planning and O&M of renewable energy (RE) is prepared.

Indicator①: Number* of new/revised training programs

Indicator②: Number* of prepared/revised training materials

Indicator③: Number* of trainings for trainers

*Based on the review on result of project activities, specific target numbers are to be determined.

8.2.2 Content of activities

(1) Activities related to output 1)

Technical support was provided through TOT trainings for the candidate trainers from DOE and EFL, who are the counterparts (C/P) of this project. Instruction on basic knowledge required for the activities of regional trainers, presentation material drafting method, and presentation skills was provided.

Regional trainings (for the four target countries) and regional trainings for seven additional countries were conducted for a total of three times for each, as occasion to confirm the result of the abovementioned technical support. In general, the regional trainings were provided for the same participants for all training sessions and were structured to enable introduction of advanced content with the progress of the training. Due to COVID-19 pandemic, the lecture materials were prepared through online discussions with the Fijian candidate trainers.

After the regional trainings, candidate trainers were evaluated based on the answers to the questionnaire from the training participants. 14 out of the 22 candidate trainers originally selected passed the evaluation. As some of the candidate trainers left EFL, or passed away, the certified trainers include some trainers who were additionally nominated during the training process.

(2) Activities related to output 2)

Technical support was provided through TOT trainings for the candidate trainers from DOE and EFL, who are the counterparts (C/P) of this project. Regional trainings (for each of the remaining four target countries) and additional countries regional trainings (seven countries) were conducted for a total of three times for each, as occasion to confirm the result of the abovementioned technical support. In general, the regional trainings were provided for the same participants for all training sessions and were structured to enable introduction of advanced content with the progress of the training. Due to COVID-19 pandemic, the lecture materials were prepared through online discussions with the Fijian trainers.

Project activity results that pertain to output 1 and 2 specified in the PDM are shown in the table below.

Project activity results (Fiji)

【Fiji】 Output 1): Training programs for appropriate and economical system of O&M for Diesel Generators (DGs) is prepared. Output 2) : Training programs on methodology for appropriate planning and O&M of renewable energy (RE) is prepared.	
Activities	Activity results
1)-1. Operational conditions of the existing DGs in the target area of Fiji are reviewed to identify training needs.	• Information on the operational condition of EFL's DG power plants were collected in the first field survey (August 2017), and their similarities with Okinawa Electric Power Company's power plants on remote islands were confirmed. • Related information was collected based on the questionnaire from JICA Expert Team to EFL. • Candidate trainers' knowledge and skills were evaluated with the self-evaluation sheet, and training needs assessment report (TNA report) was prepared. • Current conditions of Lautoka Training Center, the center of project activities in Fiji, were assessed to use it as the training site for this project.
	< Related material > • Training needs assessment report (TNA): Attachment A-5.1 • Survey Questionnaire: Attachment A-5.2
1)-2. Capacity assessment of candidate trainers is conducted.	• The TNA report was prepared based on the self-assessment sheet on the knowledge and skills of the trainer candidates. • The capacity of each trainer candidate was evaluated in the capacity assessment report conducted once a year. • After the regional training, participants were asked to complete a questionnaire to evaluate the trainer candidates. • The content of the DG O&M didactic material was confirmed with the candidate trainers during the 1st phase of the project. The material was used from the 2nd phase to prepare presentation materials for the regional trainings. • JICA Expert Team provided individual trainings for preparing presentation materials, and conducted individual evaluation based on the result. • Tests for the candidate trainers were conducted regularly and were used for capacity assessment.
	< Related material > • Capacity assessment: Attachment A-7
1)-3. Current related training activities and implementation	• Based on a questionnaire from JICA Expert Team to DOE and EFL, relevant information was collected.

structure are reviewed, including confirmation on objectively verifiable indicators.	• The information collected was used to formulate the structure and program for the implementation of the 1st regional training program. < Related material > • Training needs assessment report (TNA): Attachment A-5.1 • Survey Questionnaire: Attachment A-5.2 • Training Records: Attachment A-6																						
1)-4. Training for trainers is implemented.	• Trainings on basic knowledge were conducted for four times during the 1st phase of the project. • Trainer skill trainings were conducted during the 2nd phase.(Mock presentation, preparing material, etc.) • Online trainings were conducted for 11 times due to COVID-19 pandemic. < Related material > • Record of activity(on-site, online): Attachment A-6 • DG training schedule (result): Attachment A-6.1 • 1st-11th Trainer interview report: Attachment A-6.2																						
1)-5. Training guideline, curriculums, schedule, and textbooks for new/revised training program are prepared.	• The content of guideline, curriculums, and schedule were revised in the regional trainings held for three times. • 1st time was on basic knowledge, 2nd time was for conducting maintenance, and 3rd time was on skills required for maintenance (how to use measuring instruments, maintenance management, safety, etc.) • Presentation materials were revised at each regional training. < Related material > • Training curriculum: Attachment A-5.3 / 5.4 • Record of activity(on-site, online): Attachment A-6 • DG training text: Attachment F-1.1 / 1.2																						
1)-6. Necessary training equipment is identified and prepared (If necessary).	• Spare parts needed for OH were prepared by EFL, and measuring instruments and general tools, etc. were provided by JICA Expert team. The equipment provided are as follows. <table border="1"> <thead> <tr> <th>No.</th><th>Equipment provided</th></tr> </thead> <tbody> <tr> <td>1</td><td>Digital Pressure Calibrator</td></tr> <tr> <td>2</td><td>Digital multimeter</td></tr> <tr> <td>3</td><td>Digital thermometer</td></tr> <tr> <td>4</td><td>Instrumentation signal measurement/Generator</td></tr> <tr> <td>5</td><td>Ohm meter</td></tr> <tr> <td>6</td><td>Air compressor kit</td></tr> <tr> <td>7</td><td>Air hose</td></tr> <tr> <td>8</td><td>Various types of fittings</td></tr> <tr> <td>9</td><td>Inside micrometer</td></tr> <tr> <td>10</td><td>Outside micrometer</td></tr> </tbody> </table>	No.	Equipment provided	1	Digital Pressure Calibrator	2	Digital multimeter	3	Digital thermometer	4	Instrumentation signal measurement/Generator	5	Ohm meter	6	Air compressor kit	7	Air hose	8	Various types of fittings	9	Inside micrometer	10	Outside micrometer
No.	Equipment provided																						
1	Digital Pressure Calibrator																						
2	Digital multimeter																						
3	Digital thermometer																						
4	Instrumentation signal measurement/Generator																						
5	Ohm meter																						
6	Air compressor kit																						
7	Air hose																						
8	Various types of fittings																						
9	Inside micrometer																						
10	Outside micrometer																						

		11	Dial gauge				
		12	Magnetic stand				
		13	Crankshaft deflection Gauge				
		14	Digital Vernier caliper				
		15	Vernier caliper				
		16	Torque wrench				
		17	Feeler gauge set				
		18	PV panel and mounting frame				
		19	Pyranometer & thermometer				
		20	String Tracer (I -V curve tracer)				
		21	PV-Analyzer				
		22	Cell Line Checker				
		23	HOMER PRO software				
		24	Insulation Tester				
		25	Thermographic Camera				
		*Including equipment provided for RE training					
		• Education on how to use the measuring instruments was provided on-site and online					
		< Related material >					
		• Educational material: Attachment F-1.1 / 1.2 How to use Measuring Instruments How to read Micrometer (video) How to read Vernier Caliper (video)					
		• Provision of equipment: Attachment A-8					
		1)-7.	New/revised training programs are conducted.		• Consultations with candidate trainers were made during each regional training and expanded regional training, and determined the training contents. • Program content was determined to be suitable for EFL. • Questionnaire on the program content was conducted with the participants following each regional training, and the result was reflected to the next regional training.		
					< Related material >		
					• Record of activity(on-site, online): Attachment A-6.3		
		1)-8.	The result of new training programs is evaluated, and lessons learned from evaluation are reflected to revised program.		• After each regional training (total 6 times), the participants were asked to fill out a questionnaire to evaluate the training program. The answers were shared with the candidate trainers and reflected to the following training.		
					< Related material >		
		• Record of activity(on-site, online): Attachment A-6 • Capacity assessment: Attachment A-7					
1)-9.	Future training programs including necessary budget after project completion are prepared.	• Training contents necessary for the power utilities in PICs were surveyed. • The survey results were summarized and analyzed to determine the trainings to be prioritized. • Necessary system and operating budget for the future					

	training programs were planned and summarized in a report. < Related material > • Future work plan: Attachment A-9 • Training need Assessment: Attachment A-9.2 • Future Expansion plan: Attachment A-9.3 • Questionnaire for PPA Member Utilities : Attachment A-9.5
1)-10. Knowledge on appropriate and economical system for O&M of DGs is disseminated among stakeholders through seminar.	• 1st seminar was conducted on-site on June 27, 2019. • 2nd seminar was canceled due to COVID-19 pandemic. • 3rd seminar was planned on the day of closing ceremony on July 14, 2023, but was canceled due to request from Fiji side to shorten the program. < Related material > • 1st seminar report and presentation material: Attachment A-6.2.1
2)-1. Current situation and future development plan of RE in the target area of Fiji is reviewed to identify training needs.	• Request for information on the RE facilities of EFL and DOE was made during the 1st on-site survey (August 2017), and the information was reviewed. • Relevant information was collected based on a questionnaire from JICA Expert Team to DOE and EFL. • Training needs assessment report (TNA report) was prepared. • TNA report was assessed and training needs on related area were identified. • Knowledge and skills of candidate trainers were assessed with self-evaluation sheet, and training needs assessment report (TNA report) was made. • Current situation of Lautoka Training Center was reviewed, and confirmed to be used for the training site of this project. < Related material > • Training needs assessment report (TNA): Attachment A-5.1 • Survey Questionnaire: Attachment A-5.2
2)-2. Operational conditions of the existing RE facilities are reviewed to identify training needs.	Same activities as 2)-1 • The following were found with the information collected: 1.No EFL-owned PV facility at the moment, but future plan exists. 2.There are rooftop PVs on hotels and factories on Viti Levu, and EFL inspects them. 3.DOE in in charge of managing the PV facilities on remote islands. 4.Knowledge and skill on operation and maintenance, and grid interconnection are needed. 5.Measuring instruments necessary for PV facility

	inspections are not owned. < Related material > • Training needs assessment report (TNA): Attachment A-5.1 • Survey Questionnaire: Attachment A-5.2
2)-3. Capacity assessment of candidate trainers is conducted.	• DOE and EFL staff recommended candidate trainers. • Knowledge and skills of candidate trainers were assessed with self-evaluation sheet, and training needs assessment report (TNA report) was made. • Evaluation sheet to assess the candidate trainers was made. • Capacity assessment of each candidate trainer was made with annual capacity assessment reports. • Questionnaire was conducted with training participants following each regional training to evaluate the candidate trainers. • The content of DG O&M educational material was reviewed with the candidate trainers during the 1st phase, and the material was used from the 2nd phase to prepare for the presentation materials for regional trainings. • JICA Expert Team provided individual training for preparing presentation material, and made individual assessment based on the result. • Candidate trainers were tested periodically to use for capacity assessment. • Candidate trainers were determined at the end of the project from among the recommended candidates based on the conditions set by the JCC meeting. < Related material > • Capacity assessment: Attachment A-7
2)-4. Current related training activities and implementation structure are reviewed, including confirmation on objectively verifiable indicators.	• Related information was collected based on the questionnaire from JICA Expert Team to DOE and EFL. • The structure and draft program of the 1st regional trainings were developed utilizing the collected information. < Related material > • Training needs assessment report (TNA): Attachment A-5.1 • Survey Questionnaire: Attachment A-5.2 • JCC Meeting records: Attachment A-4
2)-5. Training for trainers is implemented.	• Education and training for the candidate trainers were conducted during the visits to Fiji (see Chapter 7 for reference). • Trainings on basic knowledge were conducted for four times during the 1st phase. • Trainer skill trainings were conducted during the 2nd

	phase.(Mock presentation, preparing material, etc.) • Online trainings were conducted for 11 times due to COVID-19 pandemic.
	< Related material > • Record of activity(on-site, online): Attachment A-6 • RE Training schedule (result): Attachment A-6.1 • 1st-11th Trainer interview report: Attachment A-6.2
2)-6. Training guideline, curriculums, schedule, and textbooks for new/revised training program are prepared.	• Material necessary for conducting regional trainings was prepared, such as training program, schedule, and list of lecturers. • The content of guideline, curriculums, and schedule were revised in the regional trainings held for three times. • 1st time was on basic knowledge, 2nd time was for conducting maintenance, and 3rd time was on skills required for maintenance (how to use measuring instruments, maintenance management, safety, etc.) • Presentation materials were revised at each regional training.
	< Related material > • Training curriculum: Attachment A-5.3 /5.4 • Record of activity(on-site, online): Attachment A-6 • RE training text: Attachment F-1.2
2)-7. Necessary training equipment is identified and prepared (If necessary).	• Measuring instruments necessary for PV facility inspection were selected, purchased and donated by the Expert team. Instruction on how to use them was provided to candidate trainers during onsite trainings. • Equipment needed for regional trainings were donated. Main items are as follows: ➢ PV facility (3.5kW) ➢ String Tracer (I -V curve tracer) ➢ Cell Line Checker ➢ Ohm meter ➢ Thermographic Camera
	< Related material > • Record of provided equipment: Attachment A-8
2)-8. New/revised training programs are conducted.	• Regional trainings (total 3 times) and expanded regional trainings (total 3 times) were conducted as follows: ➢ 1st Regional training (On-site, November 2019) ➢ 2nd Regional training (Online, November 2021) ➢ 3rd Regional training (On-site, February 2023) ➢ 1st Expanded regional training (Online, March 2021) ➢ 2nd Expanded regional training (Online, April 2022) ➢ 3rd Expanded regional training (On-site, April 2023) • Consultations with candidate trainers were made during each regional training and expanded regional training, and determined the training contents.

	• Program content was determined to be suitable for EFL. • Questionnaire on the program content was conducted with the participants following each regional training, and the result was reflected to the next regional training.
	< Related material > • Record of activity(on-site, online): Attachment A-6 • Fiji Trainers Presentation Documents: Attachment A-6.3
2)-9. The result of new training programs is evaluated, and lessons learned from evaluation are reflected to next revised program.	• After the regional (and expanded regional) trainings, questionnaire with the participants were conducted to evaluate each of the Fijian trainers (lecturers). • After the regional (and expanded regional) trainings, questionnaire with the participants were conducted to evaluate the training. • The results of the two questionnaires above were evaluated and were reflected to the next regional training. • After each regional training (total 6 times), the participants were asked to fill out a questionnaire to evaluate the training program. The answers were shared with the candidate trainers and reflected to the following training.
	< Related material > • Record of activity(on-site, online): Attachment A-6 • Capacity assessment: Attachment A-7
2)-10. Future training programs including necessary budget after project completion are prepared.	• Future Expansion Plan for Regional Training Program was developed with PPA, DOE, and EFL. • Training contents necessary for the power utilities in PICs were surveyed. • The survey results were summarized and analyzed to determine the trainings to be prioritized. • Necessary system and operating budget for the future training programs were planned and summarized in a report.
	< Related material > • Future work plan: Attachment A-9 • Training need Assessment.: Attachment A-9.2 • Future Expansion plan.: Attachment A-9.3 • Questionnaire for PPA Member Utilities : Attachment A-9.5
2)-11. Knowledge on methodology for appropriate planning and O&M of renewable energy (RE) is disseminated among stakeholders through seminar.	• 1st seminar was conducted on-site on June 27, 2019. • 2nd seminar was canceled due to COVID-19 pandemic. • 3rd seminar was planned on the day of closing ceremony on July 14, 2023, but was canceled due to request from Fiji side to shorten the program.
	< Related material >

	• 1st seminar report and presentation material: Attachment A-6.2.1

8.2.3 Project purpose and indicators (result)

Project purpose: Regional training system on the introduction of Hybrid Power Generation System is strengthened in Fiji.		
Indicator ①	Number of qualified trainers for regional training program	• Regional trainer certification requirements were determined at JCC as follows: 1. Capacity assessment result by JICA Expert Team is 70% or higher. The assessment includes the following points: 1) Those scored 70% or higher at comprehensive test (DG, RE, etc.) to be conducted in FY2023 as well as questionnaires at each regional training. 2) Those who have enough skills to prepare presentation material for each regional training (scoring 70% or higher in the questionnaires by training participants and JICA Expert Team). 3) Those who have demonstrated enough presentation skills at each regional training (scoring 70% or higher in the questionnaires) 2. Attendance rate for the ToTs and regional trainings held in the previous year is 70% or higher. The candidate trainers who were qualified at the end are as follows: • DG O&M : 7 candidates • RE Integration, O&M : 9 candidates 16 candidates in total were qualified as regional trainers.
Indicator ②	Number of foreign training participants in the region	• A total of 6 regional trainings were held in this project. The number of participants for DG and RE were as follows: 1. 1st Regional training: DG 15 people, RE 19 people 2. 2nd Regional training: DG 30 people, RE 42 people 3. 3rd Regional training: DG 14 people, RE 18 people 4. 1st Expanded regional training: DG 27 people, RE 21 people 5. 2nd Expanded regional training: DG 18 people, RE 24 people 6. 3rd Expanded regional training: DG 16 people, RE 20 people The total number of participants were 264 (including observers), with 120 participants for DG and 144 people for RE.
Indicator ③	More than 80% of training participants assess the training program (trainers,	• A total of 6 regional trainings were held in this project. Evaluation by the participants were as follows: 1. 1st Regional training: DG 87%、RE 100%

	training curriculum, textbook) are good.	2. 2nd Regional training: DG 96%、RE 93% 3. 3rd Regional training: DG 100%、RE 96% 4. Expanded regional training :DG 100%、RE 87% 5. 2nd Expanded regional training: DG 97%、RE 84% 6. 3rd Expanded regional training: DG 96%、RE 95% Average score for the entire project was 94.3% for DG and 92.5% for RE.
Indicator ④	More than 80 % of training participants understand the training content.	• A total of 6 regional trainings were held in this project. Evaluation by the participants are as follows: 1. 1st Regional training: DG 94%、RE 94% 2. 2nd Regional training: DG 89%、RE 93% 3. 3rd Regional training: DG 100%、RE 100% 4. Expanded regional training: DG 87%、RE 76% 5. 2nd Expanded regional training: DG 91%、RE 69% 6. 3rd Expanded regional training: DG 82%、RE 95% Average score for the entire project was 90.5% for DG and 87.8% for RE.
Indicator ⑤	More than 80% of training participants consider the training content is useful.	• A total of 6 regional trainings were held in this project. Evaluation by the participants are as follows: 1. 1st Regional training: DG 100%、RE 89% 2. 2nd Regional training: DG 90%、RE 100% 3. 3rd Regional training: DG 100%、RE 100% 4. 1st Expanded regional training: DG 100%、RE 100% 5. 2nd Expanded regional training: DG 100%、RE 92% 6. 3rd Expanded regional training: DG 100%、RE 95% Average score for the entire project was 98.3% for DG and 96% for RE.
Based on the review on progress of Project activities, specific target numbers are to be determined. Indicators ③ - ⑤ are to be verified with the training participants' answers to questionnaire, and evaluation by C/P agencies and Japanese experts on training participants.		

8.2.4 Degree of achievement for project output

Output 1): Training programs for appropriate and economical system of O&M for Diesel Generators (DGs) is prepared.		Status of achievement: Achieved
Indicator ①	Number of new/revised training programs	• Training program was revised following each regional training (activity 2)-9.). • As revisions were made at the 2nd and 3rd regional trainings, the number of revised training programs are 2.
Indicator ②	Number of prepared/revised training materials	• The training materials prepared for the lecturers in DG regional trainings were 37 volumes in total. 1. 1st Regional training: 11 volumes

		2. 2nd Regional training: 11 volumes 3. 3rd Regional training: 15 volumes For the expanded regional trainings, the same training materials with the regional trainings were used.
Indicator ③	Number of trainings for trainers	- TOT trainings on DG were held 17 times in total, with total cumulative participants of 333 people. 1) On-site trainings:4 times 2) Online trainings:11 times 3) Training in Japan:2 times
Output 2): Training programs on methodology for appropriate planning and O&M of renewable energy (RE) is prepared.		Status of achievement: Achieved
Indicator ①	Number of new/revised training programs	- Training program was revised following each regional training (activity 2)-9.). - As revisions were made at the 2nd and 3rd regional trainings, the number of revised training programs are 2.
Indicator ②	Number of prepared/revised training materials	- The training materials prepared for the lecturers in RE regional trainings were 39 volumes in total. 1. 1st Regional training: 13 volumes 2. 2nd Regional training: 14 volumes 3. 3rd Regional training: 12 volumes For the expanded regional trainings, the same training materials with the regional trainings were used.
Indicator ③	Number of trainings for trainers	- TOT trainings on RE were held 16 times in total, with total cumulative participants of 305 people. 1) On-site trainings:4 times 2) Online trainings:11 times 3) Training in Japan:1 time

8.2.5 Capacity assessment

The following two items are important in order to achieve the objectives of this project in Fiji.

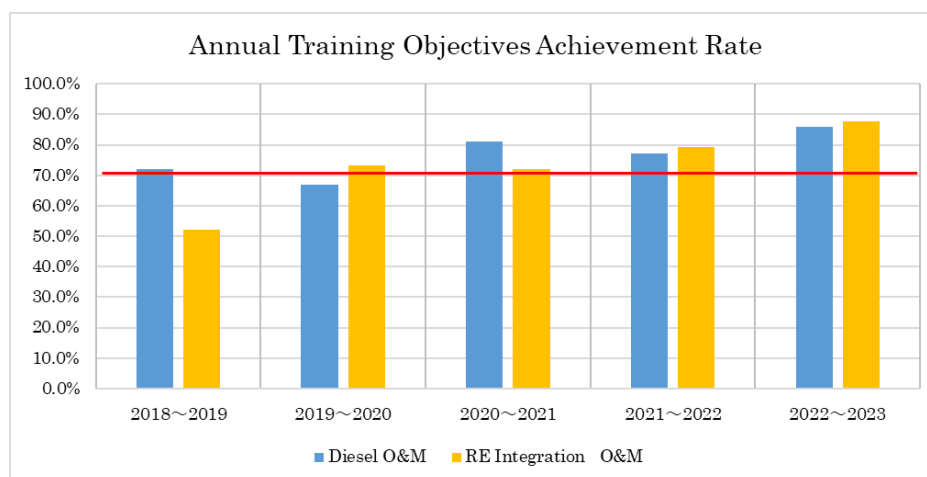
1. Preparation of training programs for appropriate and economical system of O&M for Diesel Generators (DGs)
2. Preparation of training programs on methodology for appropriate planning and O&M of renewable energy (RE)

In order to achieve the abovementioned outputs, the Expert Team selected candidate trainers from DOE and EFL, and collaboratively developed the training program. However, as on-site trainings became unfeasible due to COVID-19 pandemic, online support was provided to supplement them, for educational material development by candidate trainers and for improving their presentation skills by giving advice, etc.

In addition, annual capacity assessment was conducted to assess the degree of achievement in the candidate trainers' knowledge and skills. The assessment was made with test results, evaluations from the participants of regional trainings, evaluation by the Expert team, and training attendance rate as the indicators. See Capacity Assessment Reports for each period for details.

The results of the five-year project are shown in the following graph.

Year Output	2018~2019	2019~2020	2020~2021	2021~2022	2022~2023
Diesel O&M	72.0%	66.8%	81.1%	77.2%	86.0%
RE Integration / O&M	52.1%	73.2%	72.1%	79.4%	87.8%



A general increase in the knowledge and skills of candidate trainers can be observed from the graph above. Although the achievement rate on DG for 2021-2022 decreased slightly from the previous year due to influence from COVID-19 pandemic, the achievement rate for both DG and RE exceeded 80% in the final period of 2022-2023. This improvement seems to have resulted from the candidate trainers' participation in the training programs ToTs-1 and ToTs-2 provided by FNU. The candidate trainers seem to have demonstrated improved skills in the regional trainings as a result of taking these TOTs.

The average achievement rate of the entire project was 76.6% for DG, and 72.9% for RE.

1. Preparation of training programs for appropriate and economical system of O&M for Diesel Generators (DGs)

There were 10 candidate trainers assessed in the final assessment period, and eight of them passed by the requirements set in the JCC meeting. However, as one of them left EFL immediately before being certified as regional trainer, the number of certified DG trainers became seven.

DG Trainer evaluation sheet (July 2022 to June 2023)										
2023/6/16										
● DEG Training (Fiji)	Project Counterparts (Core trainers)									
	Sabitesh Ajay Pal	Waisea Tuamoto	Etika V. Rokobuli	Tobia W. Nayaqayaqa	Rusiate Jale Faivakibau	Isimeli Nabalarua	Maikeli L. Naciqa	Ravneel Karan Nair	Apenisa Drotini	Joseva Ravue ※2
Name	System Control Engineer (NCC)	RE mechanical technician	Generation mechanical technician	Generation mechanical technician	Team Leader Renewable	Team Leader Navutu Depot	Team Leader Nadarivatu	Training officer Mechanical	Electrical fitter	Electrician
Criteria										
1. The evaluation result of the capacity assessment by JICA Expert Team is 70% or more	OK	OK	OK	OK	OK	OK	OK	OK	NG	NG
1.1 Those who obtain a correct answer rate of 70% or more in the comprehensive test to be conducted in 2022 and questionnaire results at each regional training.	95.5%	77.3%	95.5%	77.3%	90.1%	90.1%	90.1%	100.0%	54.5%	77.3%
1.2 Those who are recognized to have enough skills in creating presentation materials used for each regional training (questionnaire results (total score of 70% or more) by the participants and JICA Expert Team).	87.4%	78.4%	78.5%	84.5%	82.7%	82.5%	84.0%	75.7%	78.4%	NG
1.3 Those who are recognized to have enough presentation skills for each regional training (questionnaire results of 70% or more)	85.95%	77.30%	83.15%	84.85%	85.05%	83.25%	84.45%	70.35%	77.10%	82.30%
2. Those who attend 70% or more of the ToT's and regional trainings conducted during the previous 1 year.	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
	100.0%	100%	100%	85%	100%	100%	85%	100%	85%	85%
Evaluation results	Cleared	Cleared	Cleared	Cleared	Cleared	Cleared	Cleared	Cleared	Not Cleared	Not Cleared
Comments										

The assessment of each candidate trainer for each period is shown in the table below.

DG Trainers		2018~2019	2019~2020	2020~2021	2021~2022	2022~2023
1	Anasa Wainimala Salobo ^{※1}	80.0%	0.0%	82.0%	75.1%	0.0%
2	Epeli Rokodrakiya ^{※1}	66.7%	75.0%	79.1%	76.7%	0.0%
3	Semesa Qalo ^{※1}	80.0%	72.0%	0.0%	0.0%	0.0%
4	Etika Veiqaravi Rokobuli	85.0%	0.0%	0.0%	58.7%	89.9%
5	Tobia W. Nayaqayaqa	60.0%	63.0%	0.0%	57.6%	83.2%
6	Waisea Tuamoto	62.5%	62.3%	83.4%	83.7%	83.4%
7	Sumendra Prasad ^{※1}	70.0%	0.0%	0.0%	0.0%	0.0%
8	Neipolione Gatanitubei ^{※1}	0.0%	68.0%	79.7%	0.0%	0.0%
9	Sabitesh Ajay Pal	0.0%	67.0%	0.0%	90.2%	91.7%
10	Rusiate Jale Faivakibau ^{※2}	0.0%	0.0%	0.0%	85.9%	89.7%
11	Mitili Beranadoi ^{※1}	0.0%	60.0%	0.0%	0.0%	0.0%
12	Isimeli Nabalarua ^{※3}	0.0%	0.0%	0.0%	84.3%	89.1%
13	Maikeli L. Naciqa ^{※3}	0.0%	0.0%	0.0%	82.9%	85.9%
14	Ravneel Karan Nair	0.0%	0.0%	0.0%	0.0%	86.1%
15	Apenisa Drotini ^{※3}	0.0%	0.0%	0.0%	0.0%	73.9%
16	Joseva Ravue ^{※3}	0.0%	0.0%	0.0%	0.0%	86.9%
Average of achievement of all DG trainers		72.0%	66.8%	81.1%	77.2%	86.0%

※1 Resigned as DG trainer

※2 Moved from RE to DG

※3 Nominated as DG trainer in 2022

2. Preparation of training programs on methodology for appropriate planning and O&M of renewable energy (RE)

There were 11 candidate trainers assessed in the final assessment period, and 10 of them passed by meeting the requirements set by JCC. However, as one of them who also participated as DG candidate trainer left EFL, the number of certified RE trainers became nine in the end (two of them were also

certified as DG trainer).

RE Trainer evaluation sheet (July 2022 to June 2023)											2023/6/16	
RE Training (Fiji)												
Name	Deepak Chand (DOE)	Waisale Vulagi (DOE)	Sabitesh Ajay Pal	Rusiata Jale Faivakibau	Maciu Waqaira	Maikeli L. Naciqa	Josese Atama	Filimoni Naigia (DOE)	Manoj Kumar	Mohammed Ahzaaz	Maikeli Drose	
	Deputy director	RE technician	System Control Engineer (NCC)	Team Leader Renewable	Team Leader Training Service	Manager System Control	Team Leader Renewable (Hydro)	RE technician	Manager System Control	Installation Inspection Coordinator	Training Officer	
Criteria												
1. The evaluation result of the capacity assessment by JICA Expert Team is 70% or more.	○	○	○	○	○	○	○	○	NG	○	○	
1.1 Those who obtain a correct answer rate of 70% or more in the comprehensive test to be conducted in 2022 and questionnaire results at each regional training.	85.0%	85.0%	95.0%	75.0%	90.0%	75.0%	85.0%	75.0%	N/A	85.0%	95.0%	
1.2 Those who are recognized to have enough skills in creating presentation materials used for each regional training (questionnaire results (total score of 70% or more) by the participants and JICA Expert Team).	89.5%	83.2%	87.6%	85.8%	86.3%	83.7%	89.3%	84.3%	86.2%	80.0%	85.4%	
1.3 Those who are recognized to have enough presentation skills for each regional training (questionnaire results of 70% or more)	90.5%	82.5%	86.9%	86.4%	85.5%	81.9%	88.3%	85.2%	86.4%	79.9%	82.5%	
2. Those who attend 70% or more of the ToT's and regional trainings conducted during the previous 1 year.	○	○	○	○	○	○	○	○	○	○	○	
	100.0%	100%	100%	100%	100%	100%	100%	100%	75%	100%	100%	
Evaluation result:	Cleared	Cleared	Cleared	Cleared	Cleared	Cleared	Cleared	Cleared	Not Cleared	Cleared	Cleared	
Comments												

The assessment of each candidate trainer for each period is shown in the table below.

RE Trainers		2018~2019	2019~2020	2020~2021	2021~2022	2022~2023
1	Deepak Chand (DOE)	50.0%	70.0%	74.9%	83.2%	90.0%
2	Waisale Vulagi (DOE)	60.0%	80.0%	71.1%	79.9%	88.0%
3	Sabitesh Ajay Pal	0.0%	74.0%	79.1%	88.4%	92.4%
4	Rusiata Jale Faivakibau	45.0%	80.0%	0.0%	0.0%	83.1%
5	Maciu Waqaira	40.0%	75.0%	0.0%	87.7%	90.2%
6	Maikeli Drose ^{※1}	0.0%	0.0%	0.0%	62.9%	91.1%
7	Maikeli L. Naciqa	0.0%	71.0%	0.0%	86.3%	85.0%
8	Josese Atama	50.0%	0.0%	75.7%	89.9%	87.0%
9	Filimoni Naigia (DOE)	60.0%	71.5%	70.6%	55.9%	86.4%
10	Manoj Kumar	0.0%	0.0%	0.0%	0.0%	86.4%
11	Mohammed Ahzaaz	0.0%	0.0%	0.0%	0.0%	86.1%
12	Krishneel Prasad	0.0%	77.0%	72.3%	92.5%	0.0%
13	Jese Dauti ^{※2}	60.0%	69.0%	0.0%	0.0%	0.0%
14	Mitieli Beranadoi ^{※2}	0.0%	64.0%	77.7%	67.2%	0.0%
15	Sitiveni Smith Tuisaravere ^{※2}	0.0%	0.0%	55.1%	0.0%	0.0%
Average of achievement of all RE trainers		52.1%	73.2%	72.1%	79.4%	87.8%

※1 Nominated as RE trainer in 2022

※2 Resigned as RE trainer

8.3 Tuvalu-related activity results

8.3.1 Overall goal and indicators of the project

(1) Overall goal and indicators

Overall goal: Energy security is improved and greenhouse gases are reduced through the reduction of fossil fuels consumption.

Indicator①: Reduced amount of CO₂ emission* of power utilities in the target area

Indicator②: Reduced amount of diesel fuel* of power utilities in the target area

Indicator③: Increased capacity (kW) and actual generated energy (kWh)* of renewable energy facilities of power utilities in the target area

*In comparison to the indicators at the time of baseline survey

(2) Project purpose and indicators

Project purpose: Hybrid Power Generation System is introduced.

Indicator①: Improvement of specific fuel consumption of pilot DG units (better than the baseline data set at the beginning of the Project)

Indicator②: Improvement of performance ratio for RE power generation systems (better than the baseline data set at the beginning of the Project)

Indicator③: Proper application of planning and O&M method of Hybrid Power Generation System

Note: Indicator② is to be evaluated with counterpart self-evaluation using check sheet that summarizes judgment criteria for “proper application”, etc., evaluation by Japanese experts, and stakeholder opinion.

(3) Outputs (expected effect)

Output 1): Appropriate and economical system for O&M of Diesel Generators (DGs) is enhanced.

Output 2): Methodology for appropriate planning and O&M of Hybrid Power Generation System is established.

Indicator①: Adequacy on the use of the work schedule, check sheets and manual for the maintenance work for the pilot DG units

Indicator②: Number of training participants who are conducting operation and maintenance of DG based on the learnings from the training program

Indicator③: Number of training participants who learned the planning method of the Hybrid Power Generation System

Indicator④: Number of training participants who are conducting O&M of RE facilities based on the learnings from the training program

Indicator⑤: Preparation of related manuals for Hybrid Power Generation System

Indicator⑥: Adequacy of the use of the related manuals for Hybrid Power Generation System

8.3.2 Content of activities

(1) Activities related to output 1)

1) **Appropriate and economical system for O&M of Diesel Generators (DGs) is enhanced.**

Hands-on trainings intended to improve basic knowledge of DG and skills were provided for the counterparts in order to improve DG operation and maintenance.

The following contents were instructed on basic knowledge of DG.

- Principle of DG
- DG parts (cylinder head, piston, crank shaft, etc.)
- Explanation on each utility (fuel, lubricating oil, cooling water, air, exhaust gas) and auxiliary equipment
- Governor function, importance of specific fuel consumption management, measurement method, etc.
- Power plant operation, economic load dispatch control (EDC), future expansion plan, etc.

The following contents were instructed on DG maintenance knowledge and skill.

- Safety
- Various kinds of maintenance (preventive maintenance, periodic maintenance, overhaul, etc.)
- Daily inspection check sheet preparation and recording
- Maintenance method of each engine part, disassembly, cleaning, inspection, testing, and assembling, etc.
- Recording and preparing report
- Troubleshooting
- Maintenance of electrical equipment (electrical board, circuit breaker, generator, etc.)
- Inspection method, adjustment, points to note, etc. were instructed on-site at hands-on trainings.
- DG O&M manual preparation
- DG future maintenance plan preparation

* See “Training curriculum (Attachment: F-0.1)” for details.

(2) Activities related to output 2)

1) **Methodology for appropriate planning of Hybrid Power Generation System is established.**

The following contents on necessary regulations (case example of Japan) and items to be studied for integrating and expanding RE were instructed on-site or via online.

- Overview of power system simulation
- Grid code
- Introduction of case example in Okinawa
- Introducing storage battery (concept of kW and kWh)
- HOMER

RE integration planning manual was prepared in collaboration with C/Ps based on the items above.

2) Methodology for O&M of Hybrid Power Generation System is established.

Lecture on RE inspection method in Japan was conducted and “inspection check sheet” and “inspection plan” were made in collaboration with C/Ps. In addition, necessary equipment for inspection were provided, and effective inspection method was established. During COVID-19 pandemic, result of periodic inspections and performance ratio (PR value) were reviewed via online, and advice was given.

The result of activities pertaining to output 1 and 2 specified in PDM are shown in the table below.

Project activity results (Tuvalu)

【Tuvalu】	
Output 1): Appropriate and economical system for O&M of Diesel Generators (DGs) is enhanced. Output 2): Methodology for appropriate planning and O&M of Hybrid Power Generation System is established.	
Activities	Activity results
1)-1. Operational conditions of the existing DGs are reviewed, including confirmation of objectively verifiable indicators for overall goal.	• Specific fuel consumption of pilot DG units was reviewed in the 1st on-site survey (August 2017). • As specific fuel consumption is an important indicator for this project, existing flow meter which had not been calibrated for approximately 20 years were replaced, and benchmark was set to SFC=0.260 L/kWh. • Questionnaire from JICA Expert Team was sent to TEC and related information was collected. • Technical knowledge and skills of C/P were assessed, and training needs assessment report (TNA report) was made.
	< Related material > • Training needs assessment report (TNA): Attachment B-5
1)-2. Specific fuel consumption of pilot DG units is measured.	• Instruction on the proper SFC measurement method was provided for several times either on-site or via online for DG C/P of TEC. SFC measurement record sheet was also made, and the C/P were instructed to use it. • Education on SFC monitoring, including assessing engine condition, economic efficiency, etc. was provided. • As it was time for periodic OH, instruction to measure SFC every month was given. In addition, the Expert Team requested to share the measured data every month via email. • Due to the issues on TEC side in terms of finance as well as installed capacity, OH has not been conducted as of June 2023, and no improvement has been made on SFC. Benchmark: SFC=0.260 L/kWh
	< Related material >

	• DG training text : Attachment F-1.1 • Training records : Attachment B-6.2 • Specific fuel consumption rate : Attachment B-9.1
1)-3. Improvement plan for the operation of pilot DG units is prepared.	• Power plant operation improvement plan was formulated in the 1st phase. In specific, 12 items that need to be improved, including building (2 items), electrical (6 items), mechanical (4 items), as well as 8 items on operation and maintenance were summarized and explained to C/P.
	< Related material > • Improvement plan: Attachment B-10
1)-4. Existing spare parts and maintenance tools of pilot DG units are confirmed.	The following were confirmed on-site during the 1st phase in 2019: • There were only a few spare parts available, and no spare for emergency purpose was prepared either. • General tools for maintenance and special tools and measuring instruments for OH were not enough (overseas OH service operators bring them in times of OH).
	< Related material > • Spare parts list (Daihatsu 6DK-20): Attachment B-11.1.5 • Tool and measuring instrument list: Attachment B-11.1.6 • Consumables list: Attachment B-11.1.7
1)-5. Improvement plan for the operation of pilot DG units is implemented.	• Explanation on the items that required improvement were explained to TEC staff and generation manager using the list made in activity 1)-3, and requested for implementation. • 9 items out of 12 have been implemented at the time of project completion. 1 item out of the 3 remaining items was not implemented due to insufficient budget, and the remaining 2 are to be implemented at OH. • 4 out of 8 items on O&M that require improvement were implemented.
	< Related material > • Improvement plan: Attachment B-10
1)-6. The result of implementation of the improvement plan is evaluated, and improvement plan is updated.	• The result of implementation of the improvement plan were confirmed at each visit and online training. • Implementation of the improvement plan seems to have contributed for power plant maintenance. • There was lack of knowledge on maintenance at the beginning of the project which was approx. 20 years after the start of power plant operation. Currently knowledge on maintenance among C/P seems to have improved through participation in the project activities. • After the validity of the improvement plan was confirmed, update of the plan was requested.

	• Maintenance staff of TEC make improvements as needed.																																										
1)-7. The concept of Economic Dispatch Control (EDC) is shared among operators and applied, If possible.	• Education on Economic load Dispatch Control (EDC) was conducted by on-site or online training. • TEC power plant is usually operated by load sharing with 2 generator units (the output of the two units are almost equivalent). • This operating condition does not make difference in SFC, therefore introducing EDC would not reduce fuel consumption. • EDC cannot be introduced as fuel saver device interferes generator output control. < Related material > • DG training text: Attachment F-1.1.2 /7																																										
1)-8. Necessary spare parts and maintenance tools for the pilot DG units are prepared.	• Spare parts needed for OH were prepared by TEC, and measuring instruments and general tools were provided by JICA Expert Team. The provided equipment is listed below. <table border="1"> <thead> <tr> <th>No.</th><th>Procured equipment</th></tr> </thead> <tbody> <tr><td>1</td><td>Fuel flow meter</td></tr> <tr><td>2</td><td>Digital Pressure Calibrator</td></tr> <tr><td>3</td><td>Digital multimeter</td></tr> <tr><td>4</td><td>Digital thermometer</td></tr> <tr><td>5</td><td>Instrumentation signal measurement/Generator</td></tr> <tr><td>6</td><td>Ohm meter</td></tr> <tr><td>7</td><td>Air compressor kit</td></tr> <tr><td>8</td><td>Air hose</td></tr> <tr><td>9</td><td>Various types of fittings</td></tr> <tr><td>10</td><td>Battery HI Tester</td></tr> <tr><td>11</td><td>Clamp on AC/DC HI Tester</td></tr> <tr><td>12</td><td>Radiation thermometer</td></tr> <tr><td>13</td><td>Battery hydrometer</td></tr> <tr><td>14</td><td>Vibration measuring instrument</td></tr> <tr><td>15</td><td>Digital panel meter</td></tr> <tr><td>16</td><td>Rotary pulse meter</td></tr> <tr><td>17</td><td>DC Power Supply</td></tr> <tr><td>18</td><td>Intake filter</td></tr> <tr><td>19</td><td>Control Air Unit</td></tr> <tr><td>20</td><td>Machine general tools (151 items)</td></tr> </tbody> </table>	No.	Procured equipment	1	Fuel flow meter	2	Digital Pressure Calibrator	3	Digital multimeter	4	Digital thermometer	5	Instrumentation signal measurement/Generator	6	Ohm meter	7	Air compressor kit	8	Air hose	9	Various types of fittings	10	Battery HI Tester	11	Clamp on AC/DC HI Tester	12	Radiation thermometer	13	Battery hydrometer	14	Vibration measuring instrument	15	Digital panel meter	16	Rotary pulse meter	17	DC Power Supply	18	Intake filter	19	Control Air Unit	20	Machine general tools (151 items)
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		21	Mechanical measuring equipment (26 items)
		22	INSULTEX Tape
		23	Pyranometer & thermometer
		24	String Tracer(I -V curve tracer)
		25	Cell Line Checker
		26	HOMER PRO software
		27	Insulation Tester
		28	Thermographic Camera
		29	Digital multimeter
		30	Mower
		31	High pressure washer
		*Including equipment provided for RE training	
• Education on how to use the measuring instruments was provided on-site and online			
< Related material >			
• Record of provided equipment: Attachment B-8			
1)-9.	Maintenance work schedule for the pilot DG units is prepared.	• JICA Expert Team prepared OH maintenance work schedule based on the OH record of OEPC’s power plants on remote islands, and explained it to C/P of TEC.	
< Related material >			
• DG future work plan (including budget): Attachment B-11.1.2			
1)-10.	Check sheets and maintenance manuals for maintenance works for pilot DG units are prepared.	The following materials were submitted to TEC, and a lecture on periodic maintenance and inspection was conducted to encourage it. • DG Inspection sheet • Daily patrol sheet • DG’s O&M Manual However, the check sheets which JICA Expert Team and TEC C/P made have not been used. < Reason > TEC already has its own DG Inspection sheet and Daily patrol sheet, and the operators are used to the existing ones, so using the sheets revised in this project is difficult. The operational data mainly of DG is recorded in PC, and generation manager prepares monthly reports.	
< Related material >			
• DG training text: Attachment B-1.1			
• DG inspection sheet: Attachment B-11.1.3			
• DG daily patrol sheet: Attachment B-11.1.4			
1)-11.	Maintenance works (daily/partial inspection/overhaul work) for pilot DG units are conducted in accordance with the	• OH is scheduled in 2023, but the date is undetermined due to insufficient reserve capacity. Spare parts for OH are prepared. • Daily patrol is conducted but not recorded. Staff members conduct it when they receive an instruction	

maintenance schedule.	to do it from generation manager. JICA Expert Team requested TEC to keep patrol records. • Hands-on training was conducted on-site (engine-related adjustments). • JICA Expert Team provided advice via online or necessary parts in response to troubles occurred at the power plant. The major ones are with the following: ① Short-circuited generator stator ② Control air trouble ③ Temperature adjustment of exhaust gas from each cylinder ④ Installing generator filter
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.	< Related material > • Record of activity(on-site, online) : Attachment B-6.2 • In accordance with the maintenance intervals set by the generator maintenance manual, future maintenance plan was made. • The future maintenance plan includes schedule, budget, and necessary spare parts. • The budget was made based on the information provided by TEC. • The result cannot be verified as OH has not yet been implemented. • The future O&M plan was finalized in collaboration with TEC. < Related material > • DG future work plan (including budget): Attachment B-11.1.2
1)-13. Specific fuel consumption of the pilot DG units is measured before and after implementation of the related project activities.	• As OH was not conducted during the project period, SFC improvement was not made. • The reasons for not conducting OH are as follows: ① OH support supervisor from overseas could not enter the country for a long time due to COVID-19 pandemic. ② Reserve capacity is insufficient. 3 units are operated to respond to increase in Funafuti system demand and stopping unit 8 for OH would result in insufficient supply capacity. • As of June 2023, TEC is working towards securing temporary power source. • JICA Expert Team advised TEC to secure power source during the 1st phase, but TEC did not follow through (probably due to inability to secure budget). < Related material > • Specific fuel consumption: Attachment B-9.1
1)-14. Related training programs for appropriate O&M system for DGs are implemented	• On-site trainings for technical support were conducted for 4 times in total. • Online technical trainings were conducted for 9 times

periodically.	in total. • Online follow-ups for manual revision were conducted for 8 times in total. • Regional trainings were held for 3 times (2 times in Fiji, once via online). • Seminars were held for 2 times (once on-site, once via online), with 306 cumulative participants. < Related material > • Record of activity(on-site, online) Training schedule: Attachment B-6.1 • Record of activity(on-site, online) Training report: Attachment B-6.2
1)-15. Knowledge on appropriate O&M of DGs is disseminated among stakeholders.	• On-site seminar was held on July 12, 2019. • Online seminar was held on July 5, 2023. < Related material > • Seminar report: Attachment B-6.2.1 / 6.2.6
2)-1. Current situation and future development plan of RE is reviewed.	• Questionnaire from JICA Expert Team was sent to TEC and related information was collected. • Training needs assessment report (TNA report) was made. • The target PV facilities of this project listed below were surveyed to assess the current condition. ➢ Government Building(PR: 77%) ➢ Media Corporation(PR:74%) ➢ TEC Power Plant(PR:46%) ➢ Hospital(PR:77%) ➢ • Marine Warehouse(PR:67%) < Related material > • Training needs assessment report (TNA): Attachment B-5
2)-2. Planning manual for Hybrid Power Generation System is prepared.	• Draft RE integration manual was made based on the Japanese standards and was submitted to C/P in March 2019. The structure of the manual is as follows: ➢ Chapter 1: RE integration plan ➢ Chapter 2: PV system O&M ➢ Chapter 3: Measuring instruments catalogue/manual ➢ Chapter 4: Maintenance schedule and inspection report < Related material > • RE training text: Attachment F-1.2
2)-3. Implementation result of planning manual for Hybrid Power Generation System is evaluated and the manual content is updated in the target area.	• Discussion on the items that could be handled by the target country and those that could not be in the draft RE integration manual was held. • Based on the discussion, the manual was revised in collaboration with C/P. The CEO of C/P approved the final draft. < Related material >

	• Manual and future work plan (including budget): Attachment B-11.2.1
2)-4. Operating conditions of the existing RE facilities are reviewed, including confirmation of objectively verifiable indicators for overall goal.	• Monthly submission of the performance ratio (PR) of RE target facilities, an indicator of their operating condition, was requested. • Evaluation of the submitted PR was made. • If the submitted PR value was far lower than the baseline value, possible causes and countermeasure were discussed with C/P. • The items above were conducted until June 2023, near the completion of the project.
	< Related material > • Record of activity(on-site, online): Attachment B-6 • Performance ratio value: Attachment B-9.2
2)-5. O&M manual for RE facilities is prepared.	• Draft RE O&M manual was made based on the Japanese standards and was submitted to C/P in March 2019. The structure of the manual is as follows: ➢ Chapter 1: RE integration plan ➢ Chapter 2: PV system O&M ➢ Chapter 3: Measuring instruments catalogue/manual ➢ Chapter4: Maintenance schedule and inspection report
	< Related material > • RE training text: AttachmentB-11.2
2)-6. Maintenance works are conducted according to O&M manual of RE facilities.	• Inspection check sheet for O&M was made in collaboration with C/P. • O&M related training on the use of donated measuring instruments was conducted. • Inspection schedule was made in collaboration with C/P. • Based on the above, request was made to conduct O&M following the manual, and gave advice with the assessment of the result.
	< Related material > • Record of activity(on-site, online): Attachment B-6.2 • Manual and future work plan (including budget): Attachment B-11.2
2)-7. The result of maintenance works is evaluated, and future maintenance work schedule together with budget is prepared.	• Future O&M work plan was made in collaboration with C/P. The final draft was shared with the CEO of C/P, and request for approval was made.
	< Related material > • Manual and future work plan (including budget): Attachment B-11.2
2)-8. Training program for Hybrid Power Generation System including O&M of RE facilities is conducted.	• On-site trainings for technical support were conducted for 4 times in total. • Online technical trainings were conducted for 8 times in total.

	• Online follow-ups for manual revision were conducted for 6 times in total. • Regional trainings were held for 3 times (2 times in Fiji, once via online). • Seminars were held for 2 times (once on-site, once via online), with 261 cumulative participants.
	< Related material > • Record of activity(on-site, online) Training schedule: Attachment B-6.1 • Record of activity(on-site, online) Training report: Attachment B-6.2
2)-9. Knowledge regarding Hybrid Power Generation System is disseminated among stakeholders.	• The 1st seminar was held on-site on July 12, 2009 • The 2nd seminar was held online on July 5, 2023.
	< Related material > • Seminar report: Attachment B-6.2

(3) Activity pertaining to “Survey and Analysis of Grid Stabilization in Tuvalu and Analysis of the Results”

Based on expertise in RE output fluctuation mitigation and grid stabilization (hybrid power generation system technology), a survey and study were conducted according to below process. In addition, challenges related to the integration of RE in the Funafuti grid were identified, and countermeasure technologies for grid stabilization will be proposed to aid the construction of an appropriate system for the grid. The result of this activity is shown in the attached activity report (Attachment B-13).

1) Analysis and understanding of current conditions

Information on the existing power system was collected, organized, and analyzed with the help of the local counterparts, in order to understand its current conditions and characteristics.

Specifically, the required power quality in terms of frequency, etc. and the operational status of existing power facilities (generation, protection, and distribution facilities) were confirmed.

2) Identify countermeasures according to the RE penetration

Based on the information on the Funafuti grid surveyed, the allowable amount of RE integration was assessed using the Algebraic Method for short-term frequency fluctuations, and the long-term supply-demand balance was assessed using HOMER Pro, a microgrid design support software. Through these tasks, challenges related to the stable operation of the grid were identified, and the potential countermeasures were organized.

3) Study of proposed countermeasures to maximize RE

While considering trends in the development of grid stabilization technologies in Japan and overseas and utilizing the expertise gained in the remote islands of Okinawa, measures to maximize

RE penetration (transition to a RE-centered power supply composition) in the target region with the aim of achieving a 100% RE power supply were proposed.

4) Feedback of study results

The results of the above study were organized for use in maximizing the RE penetration in Tuvalu, and the findings were shared with Tuvalu Electricity Corporation (TEC).

8.3.3 Project purpose and indicators (result)

Project purpose: Hybrid Power Generation System is introduced.		
Indicator ①	Improvement of specific fuel consumption of pilot DG units (better than the baseline data set at the beginning of the Project)	- SFC of the pilot DG units before and after the project are compared in the table below. - As OH of the pilot DG units has not been conducted, SFC improvement has not been confirmed.
Indicator ②	Improvement of performance ratio for RE power generation systems (better than the baseline data set at the beginning of the Project)	Performance ratio of the pilot PV facilities before and after the project are compared in the table below.
Indicator ③	Proper application of planning and O&M method of Hybrid Power Generation System	As RE integration plan and RE O&M manual were collaboratively revised to suit their situation, its proper application is expected.
Indicator② is to be evaluated with counterpart self-evaluation using check sheet that summarizes judgment criteria for “proper application”, etc. evaluation by Japanese experts, and stakeholder opinion.		

Indicator① (Comparison of specific fuel consumption)

No.	DG unit	Baseline	Latest data	Note (Reasons for low value, etc.)
1	Unit 6	0.260 L/kWh	0.274 L/kWh	(Output 84% 2023/6/29) OH not implemented
2	Unit 7		0.272 L/kWh	(Output 84% 2023/6/29) OH not implemented
3	Unit 8		0.267 L/kWh	(2022/8/31) OH not implemented
For conducting OH, preparing for temporary power source in order to secure reserve capacity was requested to TEC at the beginning of the second phase. However, TEC could not follow through due to inability to secure budget for it.				

Indicator② (Comparison of performance ratio)

No.	PV facility name	Baseline	2023 average	Note (Reasons for low value, etc.)
1	Government Building	77%	42.4%	2 units of inverters have not been operated since 2021 due to substrate failure. Although TEC procured new substrates for repair, they were lost and therefore repair work has not been started. TEC reported that spare parts were currently being procured (as of July

				2023).
2	Media Corporation	74%	54.1%	• It was reported in 2021 that some PV panels were broken. • Repair work requires bucket trucks, but as they are used for other work, repair work has not been implemented. • Given that insulation resistance value was also low, it was explained that PCS could be inoperative due to cable failure. • Advice was given to TEC to conduct inspection frequently under different weather conditions (both sunny and rainy) and share the measured data. • This condition has been continuing in 2023 since June 2021.
3	TEC Power Plant	46%	63.0%	• In operation without particular issues.
4	Hospital	77%	57.0%	• As variation in monthly PR data was observed from the beginning, instruction was given to closely observe the facility operating conditions. • To identify the cause, request to inspect (I-V curve, insulation resistance, open-circuit voltage, visual inspection, etc.) and share the result was made (the data has not yet been received as of 2023).
5	Marine Warehouse	67%	9.8%	• PR value has been low since the beginning of monitoring. • According to interview with TEC, the cause of malfunction is assumed to be cable rupture. • Information on the replacement plan for the ruptured cable was requested. However, as bucket truck is not available for this work, repair work has not been conducted. • It was reported that repair work was in progress in 2022, but its completion has not been reported as of July 2023. • Another information was received that replacement of 2 units of PCS was being considered.

8.3.4 Degree of achievement for project output

Output 1): Appropriate and economical system for O&M of Diesel Generators (DGs) is enhanced.			Status of achievement: Achieved
Indicator ①	Adequacy on the use of the work schedule, check sheets and manual for the maintenance work for the pilot DG units	• Maintenance work plan was made, but regular updates will be necessary. • Existing check sheets made by TEC were used. The manual is planned to be used in the next OH, which is approved by CEO.	
Indicator ②	Number of training participants who are conducting operation and	< Cumulative total > • On-site trainings for technical support were	

	maintenance of DG based on the learnings from the training program	conducted for 5 times in total, with cumulative participants of 147 people. • Online technical trainings were conducted for 9 times in total, with cumulative participants of 47 people. • Online follow-ups for manual revision were conducted for 3 times in total, with cumulative participants of 8 people. • Training in Japan was conducted once, with cumulative participants of 34 people. • Regional trainings were held for 3 times (2 times in Fiji, once via online), with cumulative participants of 52 people. • Seminars were held for 2 times, with total 8 participants.
Output 2): Methodology for appropriate planning and O&M of Hybrid Power Generation System is established.		Status of achievement: Achieved
Indicator ③	Number of training participants who learned the planning method of the Hybrid Power Generation System	< Cumulative total > • On-site trainings for technical support were conducted for 5 times in total, with cumulative participants of 141 people. • Online technical trainings were conducted for 8 times in total, with cumulative participants of 44 people. • Online follow-ups for manual revision were conducted for 6 times in total, with cumulative participants of 21 people. • Regional trainings were held for 3 times (2 times in Fiji, once via online), with cumulative participants of 47 people. • Seminars were held for 2 times, with total 8 participants.
Indicator ④	Number of training participants who are conducting O&M of RE facilities based on the learnings from the training program	
Indicator ⑤	Preparation of related manuals for Hybrid Power Generation System	RE integration plan and RE O&M manual (draft) were made, and revised in collaboration with C/P to suit the condition of TEC.
Indicator ⑥	Adequacy of the use of the related manuals for Hybrid Power Generation System	As RE integration plan and RE O&M manual were collaboratively revised to suit their situation, its proper application is expected.

8.3.5 Capacity assessment

The following two items are important in order to achieve the objectives of this project in Tuvalu.

1. Enhancement of appropriate and economical system for O&M of Diesel Generators (DGs)

2. Establishment of methodology for appropriate planning and O&M of RE

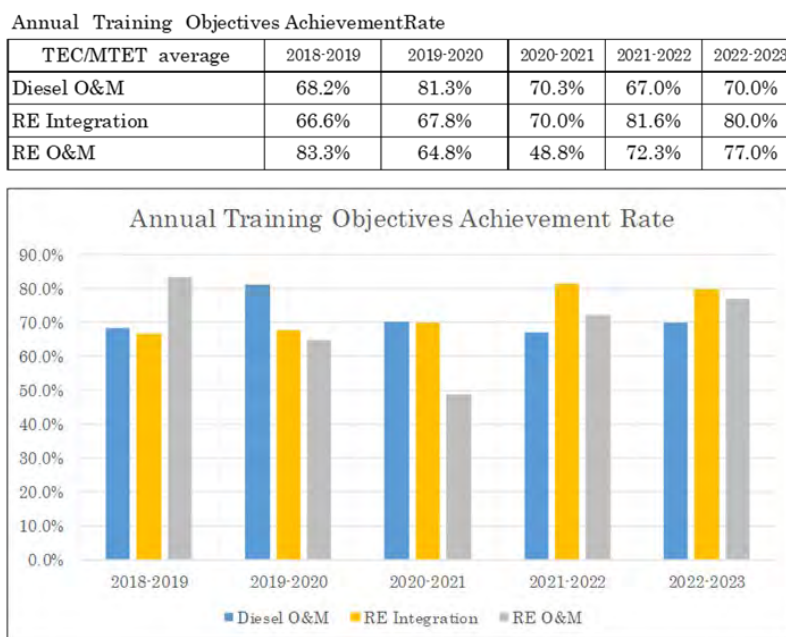
In order to achieve the abovementioned outputs, the Expert Team developed a curriculum that suited TEC's needs and provided trainings.

However, as on-site trainings that would have been effective became unfeasible due to COVID-19

pandemic, online trainings were provided to supplement them.

In addition, annual capacity assessment was conducted to assess the degree of achievement in the core trainers' knowledge and skills. The assessment was made with test results, evaluations from their superiors, evaluation by the Expert team, and training attendance rate as the indicators. See Capacity Assessment Report for each period for details.

The results of the five-year project are shown in the following graph.



1. For appropriate and economical DG O&M, the average achievement rate of the five years was 71.36%. A general increase in the average can be observed in the first two years of the project before COVID-19 pandemic from the graph above, showing the positive impact of the on-site hands-on trainings. However, the average achievement rate for the last three years of the project, in which one core trainer left TEC in 2020 and trainings were held online instead of on-site due to the pandemic, was approximately 70%. A slight decrease in the achievement rate can be observed in 2021 as well, as other core trainer appointed by JCC left TEC.

As the knowledge and skills of the core trainers have not reached the level for independently conducting overhaul (OH) by TEC, a supervisor from overseas is necessary. Conducting the next OH by referring to the maintenance manuals developed under this project would enhance their knowledge and skill levels.

2. With regard to appropriate RE integration plan, the achievement rate in the last two years of the project is high, at approximately 80%. This seems to be because there was no change of MTET core trainers during the last two years of the project and stabilized the achievement rate.

In addition, it is the Expert Team's belief that having Mr. Mafalu, CEO of TEC, on board for the revision of RE Integration manual and giving instructions to the core trainers contributed for the

increase in the achievement rate.

Although the number of core trainers for appropriate RE O&M decreased from two to one in the last two years of the project, the achievement rate of approximately 75% is commendable, given the drop in the 3rd year to 48.8% as a result of shifting the trainings online as well as the initially selected core trainer leaving TEC. While RE core trainers possess knowledge and skills on PV facilities, providing financial as well as systematic support from the TEC management is necessary for implementing O&M.

8.4 Kiribati-related activity results

8.4.1 Overall goal and indicators of the project (repeated from Chapter 4)

(1) Overall goal and indicators

Overall goal: Energy security is improved, and greenhouse gases are reduced through the reduction of fossil fuels consumption.

Indicator①: Reduced amount of CO₂ emission* of power utilities in the target area

Indicator②: Reduced amount of diesel fuel* of power utilities in the target area

Indicator③: Increased capacity (kW) and actual generated energy (kWh)* of renewable energy facilities of power utilities in the target area

*In comparison to the indicators at the time of baseline survey

(2) Project purpose and indicators

Project purpose: Hybrid Power Generation System is introduced.

Indicator①: Improvement of specific fuel consumption of pilot DG units (better than the baseline data set at the beginning of the Project)

Indicator②: Improvement of performance ratio for RE power generation systems (better than the baseline data set at the beginning of the Project)

Indicator③: Proper application of planning and O&M method of Hybrid Power Generation System

(3) Outputs (expected effect)

Output 1): Appropriate and economical system for O&M of Diesel Generators (DGs) is enhanced.

Output 2): Methodology for appropriate planning and O&M of Hybrid Power Generation System is established.

Indicator①: Adequacy on the use of the work schedule, check sheets and manual for the maintenance work for the pilot DG units

Indicator②: Number of training participants who are conducting operation and maintenance of DG based on the learnings from the training program

Indicator③: Number of training participants who learned the planning method of the Hybrid Power Generation System

Indicator④: Number of training participants who are conducting O&M of RE facilities based on the learnings from the training program

Indicator⑤: Preparation of related manuals for Hybrid Power Generation System

Indicator⑥: Adequacy of the use of the related manuals for Hybrid Power Generation System

8.4.2 Content of activities

(1) Activities related to output 1)

1) **Appropriate and economical system for O&M of Diesel Generators (DGs) is enhanced.**

Hands-on trainings intended to improve basic knowledge of DG and skills were provided for the counterparts in order to improve DG operation and maintenance.

The following contents were instructed on basic knowledge of DG.

- Principle of DG
- DG parts (cylinder head, piston, crank shaft, etc.)
- Explanation on each utility (fuel, lubricating oil, cooling water, air, exhaust gas) and auxiliary equipment
- Governor function, importance of specific fuel consumption management, measurement method, etc.
- Power plant operation, economic load dispatch control (EDC), future expansion plan, etc.

The following contents were instructed on DG maintenance knowledge and skill.

- Safety
- Various kinds of maintenance (preventive maintenance, periodic maintenance, overhaul, etc.)
- Daily inspection check sheet preparation and recording
- Maintenance method of each engine part, disassembly, cleaning, inspection, testing, and assembling, etc.
- Recording and preparing report
- Troubleshooting
- Maintenance of electrical equipment (electrical board, circuit breaker, generator, etc.)
- Inspection method, adjustment, points to note, etc. were instructed on-site at hands-on trainings
- DG O&M manual preparation
- DG future maintenance plan preparation

* See “Training curriculum (Attachment: F-0.1)” for details.

(2) Activities related to output 2)

1) **Methodology for appropriate planning of Hybrid Power Generation System is established.**

The following contents on necessary regulations (case example of Japan) and items to be studied for integrating and expanding RE were instructed on-site or via online.

- Overview of power system simulation

- Grid code
- Introduction of case example in Okinawa
- Introducing storage battery (concept of kW and kWh)
- HOMER

RE integration planning manual was prepared in collaboration with C/Ps based on the items above.

2) Methodology for O&M of Hybrid Power Generation System is established.

Lecture on RE inspection method in Japan was conducted and “inspection check sheet” and “inspection plan” were made in collaboration with C/Ps. In addition, necessary equipment for inspection were provided, and effective inspection method for early detection of malfunctions was established. During COVID-19 pandemic, result of periodic inspections and performance ratio (PR value) were reviewed via online and advice was given.

The result of activities pertaining to output 1 and 2 specified in PDM are shown in the table below.

Project activity results (Kiribati)

【Kiribati】	
Output 1): Appropriate and economical system for O&M of Diesel Generators (DGs) is enhanced. Output 2): Methodology for appropriate planning and O&M of Hybrid Power Generation System is established.	
Activities	Activity results
1)-1. Operational conditions of the existing DGs are reviewed, including confirmation of objectively verifiable indicators for overall goal.	• Specific fuel consumption of pilot DG units was measured in the 1st on-site survey (August 2017). • As specific fuel consumption is an important indicator for this project, existing flow meter which had not been calibrated for approximately 20 years were replaced, and benchmark was set to SFC=0.273 L/kWh. • Questionnaire from JICA Expert Team was sent to PUB and related information was collected. • Technical knowledge and skills of C/P were assessed, and training needs assessment report (TNA report) was made.
	< Related material > • Training needs assessment report (TNA): Attachment C-5
1)-2. Asset management plan of DG is reviewed including financial evaluation on overhaul.	• Using HOMER software, Asset Management Plan was made with the following process: ① Collected information. ② Organized assessment conditions. (system load increase:3% and 6%) ③ Capacity of temporary power source necessary for conducting OH of pilot DG units was studied (if the pilot DG units are shut down, power supply

	capacity becomes insufficient) ④ Contribution from PV was calculated by analyzing the current per-unit electricity tariff. i)Unit price is 55.94 ¢ , with only DG ii)Rate of PV contribution is approx. 8%, with an annual saving of 1,255,200 AUD (approx. 100 million JPY/ conversion rate 1AUD: 80JPY) • The result above was summarized in a report, and Ministry of Infrastructure and Sustainable Energy (MISE) of Kiribati revised the tariff. • PUB was able to receive support for procuring new DG from other donors using the report, and was able to prepare for the OH of the pilot DG units. < Related material > • Asset Management Plan : Attachment C-12
1)-3. Specific fuel consumption of pilot DG units is measured.	• Instruction on the proper SFC measurement method was provided for several times either on-site or via online for DG C/P of PUB. SFC measurement record sheet was also made and the C/P were instructed to use it. • Education on SFC monitoring, including assessing engine condition, economic efficiency, etc. was provided. • As it was time for periodic OH, instruction to measure SFC every month was given. In addition, the Expert Team requested to share the measured data every month via email. • OH of DG unit 3 was conducted in November 2021, and improvement in SFC was observed. (SFC before OH:0.278 L/kWh / SFC after OH:0.269 L/kWh) Benchmark: SFC=0.273 L/kWh The latest measured data are as follows: Unit 3 0.276 L/kWh(Output 84% 2023/6/29) Unit 4 0.267 L/kWh(Output 84% 2023/6/28) Unit 5 0.284 L/kWh(2023/5/26) < Related material > • DG training text : Attachment F-1.1 • Record of activity(on-site, online) Training report: Attachment C-6.2 • Specific fuel consumption: Attachment C-9.1
1)-4. Improvement plan for the operation of pilot DG units is prepared.	• Power plant operation improvement plan was formulated in the 1st phase. In specific, 17 items that need to be improved, including building (1 item), electrical (5 items), mechanical (11 items), as well as 5 items on operation and maintenance were summarized and explained to C/P. < Related material >

1)-5. Existing spare parts and maintenance tools of pilot DG units are confirmed.	• Improvement plan: Attachment C-10 The following were confirmed on-site during the 1st phase in 2019: • Spares were organized in workshop shelves. • There were only a few spare parts for OH, and spares for emergency were not prepared. Necessary spare parts are ordered at the timing of OH. • General tools for maintenance and special tools and measuring instruments for OH were available. < Related material > • Spare parts list: Attachment C-11.1.5 • Tool and measuring instrument list: Attachment C-11.1.6 • Consumables list: Attachment C-11.1.7
1)-6. Improvement plan for the operation of pilot DG units is implemented.	• Explanation on the items that required improvement were explained to PUB staff and generation manager using the list made in activity 1)-4, and requested for implementation. • 5 items out of 17 have been implemented at the time of project completion. The remaining 12 are ongoing (procurement of tools, facility change, etc.). • 2 out of 5 items on O&M that require improvement were implemented. < Related material > • Improvement plan: Attachment C-10
1)-7. The result of implementation of the improvement plan is evaluated, and improvement plan is updated.	• The result of implementation of the improvement plan were confirmed at each visit and online training. • Implementation of the improvement plan seems to have contributed for power plant maintenance. • There was lack of knowledge on maintenance at the beginning of the project which was approx. 20 years after the start of power plant operation. Currently knowledge on maintenance among C/P seems to have improved through participation in the project activities. • After the validity of the improvement plan was confirmed, update of the plan was requested. • Maintenance staff of PUB make improvements as needed.
1)-8. The concept of Economic Dispatch Control (EDC) is shared among operators and applied for DG operation, if possible.	• Education on Economic load Dispatch Control (EDC) was conducted by on-site or online training. • Bikenibeu power plant is usually operated by load sharing operation of 2 DG units (each unit has almost the same output with each other). • As there is no difference in SFC between the two units with this operating condition, introducing EDC would not reduce fuel consumption. • Control device of ComAp is used on generators for frequency control by isochronous mode, which would

	also make EDC introduction difficult.																																																						
	< Related material > • DG training text: Attachment F-1.1.2/7																																																						
1)-9. Necessary spare parts and maintenance tools for the pilot DG units are prepared.	• Spare parts needed for OH were prepared by PUB, and measuring instruments and general tools were provided by the JICA Expert Team. The provided equipment is listed below. <table border="1"> <thead> <tr> <th>No.</th><th>Procured equipment</th></tr> </thead> <tbody> <tr><td>1</td><td>Fuel flow meter</td></tr> <tr><td>2</td><td>Digital Pressure Calibrator</td></tr> <tr><td>3</td><td>Digital multimeter</td></tr> <tr><td>4</td><td>Digital thermometer</td></tr> <tr><td>5</td><td>Instrumentation signal measurement/Generator</td></tr> <tr><td>6</td><td>Ohm meter</td></tr> <tr><td>7</td><td>Air compressor kit</td></tr> <tr><td>8</td><td>Air hose</td></tr> <tr><td>9</td><td>Various types of fittings</td></tr> <tr><td>10</td><td>Battery HiTester</td></tr> <tr><td>11</td><td>Clamp on AC/DC HiTester</td></tr> <tr><td>12</td><td>Radiation thermometer</td></tr> <tr><td>13</td><td>Battery hydrometer</td></tr> <tr><td>14</td><td>Vibration measuring instrument</td></tr> <tr><td>15</td><td>Digital panel meter</td></tr> <tr><td>16</td><td>DC input converter</td></tr> <tr><td>17</td><td>Intake filter</td></tr> <tr><td>18</td><td>INSULTEX Tape</td></tr> <tr><td>19</td><td>Pyranometer & thermometer</td></tr> <tr><td>20</td><td>String Tracer(I -V curve tracer)</td></tr> <tr><td>21</td><td>Cell Line Checker</td></tr> <tr><td>22</td><td>HOMER PRO software</td></tr> <tr><td>23</td><td>Insulation Tester</td></tr> <tr><td>24</td><td>Thermographic Camera</td></tr> <tr><td>25</td><td>Digital multimeter</td></tr> <tr><td>26</td><td>Mower</td></tr> </tbody> </table> *Including equipment provided for RE training • Education on how to use the measuring instruments was provided on-site and online < Related material > • Record of provided equipment: Attachment C-8	No.	Procured equipment	1	Fuel flow meter	2	Digital Pressure Calibrator	3	Digital multimeter	4	Digital thermometer	5	Instrumentation signal measurement/Generator	6	Ohm meter	7	Air compressor kit	8	Air hose	9	Various types of fittings	10	Battery HiTester	11	Clamp on AC/DC HiTester	12	Radiation thermometer	13	Battery hydrometer	14	Vibration measuring instrument	15	Digital panel meter	16	DC input converter	17	Intake filter	18	INSULTEX Tape	19	Pyranometer & thermometer	20	String Tracer(I -V curve tracer)	21	Cell Line Checker	22	HOMER PRO software	23	Insulation Tester	24	Thermographic Camera	25	Digital multimeter	26	Mower
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26	Mower																																																						
1)-10. Maintenance work schedule for the pilot DG units is prepared.	• DG C/P of PUB made an OH schedule based on previous experience in OH, and utilized it for OH of DG unit 3 conducted in November 2021. < Related material > • DG future work plan (including budget): Attachment C-11.1.2																																																						

1)-11. Check sheets and maintenance manuals for maintenance works for pilot DG units are prepared.	The following materials were submitted to PUB, and a lecture on periodic maintenance and inspection was conducted to encourage it. • DG Inspection sheet • Daily patrol sheet • DG's O&M Manual < Related material > • DG training text: Attachment C-1.1 • DG inspection sheet: Attachment C-11.1.3 • DG daily patrol sheet: Attachment C-11.1.4
1)-12. Maintenance works (daily/partial inspection/overhaul work) for pilot DG units are conducted in accordance with the maintenance schedule.	• Due to COVID-19 travel restrictions, support for OH of Unit 3 conducted in October-November 2021 was provided remotely. • Zoom meetings were held 3 times/week, and the Expert Team gave advice on the matters PUB requested. • Interview survey was conducted after the completion of OH, and evaluated the overall OH work. • It is commendable that the OH of Unit 3 was conducted entirely by PUB maintenance staff, unlike previous OH where a supervisor from overseas was usually invited. This also contributed for cost reduction. < Related material > • Record of activity(on-site, online) : Attachment C-6.2 • Overhaul evaluation report : C-13 ➢ DG Unit 3 Overhaul evaluation report ➢ Overhaul daily report ➢ DG3 OH Maintenance Report(PUB)
1)-13. 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.	• In accordance with the maintenance intervals set by the generator maintenance manual, future maintenance plan was made. • The future maintenance plan includes schedule, budget, and necessary spare parts. • The budget was made based on the information provided by PUB. • The future O&M plan was finalized in collaboration with PUB. < Related material > • DG future work plan (including budget): Attachment C-11.1.2 • PUB DG Unit 3 Overhaul evaluation report: Attachment C-13.1 • PUB DG Unit 3 Overhaul daily report: Attachment C-13.2 • DG Overhaul Maintenance Report (PUB) Attachment C-13.3
1)-14. Specific fuel consumption of the pilot DG units is measured before and after	SFC measurement before and after Unit 3 overhaul in Oct-Nov 2021 showed improvement: (Before OH: September 2021)=0.278 L/kWh

	implementation of the related project activities.	(After OH: November 2021)=0.269 L/kWh *Improved by 0.009 point
		< Related material > • Specific fuel consumption: Attachment C-9.1
1)-15.	Related training programs for appropriate O&M system for DGs are implemented periodically.	• On-site trainings for technical support were conducted for 5 times in total. • Online technical trainings were conducted for 10 times in total. • Online follow-ups for manual revision were conducted for 3 times in total. • Regional trainings were held for 3 times (2 times in Fiji, once via online). • Seminars were held for 2 times (once on-site, once via online), with 400 cumulative participants.
		< Related material > • Record of activity(on-site, online) Training schedule: Attachment C-6.1 • Record of activity(on-site, online) Training report: Attachment C-6.2
1)-16.	Knowledge on appropriate O&M of DGs is disseminated among stakeholders.	• On-site seminar was held on July 19, 2019. • Online seminar was held on June 20, 2023.
		< Related material > • Seminar report: Attachment B-6.2.1 / 6.2.6
2)-1.	Current situation and future development plan of RE is reviewed.	• Questionnaire from JICA Expert Team was sent to PUB and related information was collected. • Training needs assessment report (TNA report) was made. • The target PV facilities of this project listed below were surveyed to assess the current condition. ➢ PEC Fund(PR:75%)
		< Related material > • Training needs assessment report (TNA): Attachment C-5
2)-2.	Planning manual for Hybrid Power Generation System is prepared.	• Draft RE integration manual was made based on the Japanese standards and was submitted to C/P in March 2019. The structure of the manual is as follows: ➢ Chapter 1: RE integration plan ➢ Chapter 2: PV system O&M ➢ Chapter 3: Measuring instruments catalogue /manual. ➢ Chapter 4: Maintenance schedule and inspection report
		< Related material > • RE training text: Attachment F-1.2
2)-3.	Implementation result of planning manual for Hybrid Power Generation System is	• Discussion on the items that could be handled by the target country and those that could not be in the draft RE integration manual was held.

evaluated and the manual content is updated in the target area.	Based on the discussion, the manual was revised in collaboration with C/P. The final draft was shared with the CEO of C/P, and request for approval was made.
	< Related material > Manual and future work plan (including budget): Attachment C-11.2.1
2)-4. Operating conditions of the existing RE facilities are reviewed, including confirmation of objectively verifiable indicators for overall goal.	- Monthly submission of the performance ratio (PR) of RE target facilities, an indicator of their operating condition, was requested. - Evaluation of the submitted PR was made. - If the submitted PR value was far lower than the baseline value, possible causes of malfunctions and countermeasure were discussed with C/P. - The items above were conducted until June 2023, near the completion of the project.
	< Related material > - Record of activity(on-site, online): Attachment C-6 - Performance ratio value: Attachment C-9.2
2)-5. O&M manual for RE facilities is prepared.	- Draft RE O&M manual was made based on the Japanese standards and was submitted to C/P in March 2019. The structure of the manual is as follows: ➤ Chapter 1: RE integration plan ➤ Chapter 2: PV system O&M ➤ Chapter 3: Measuring instruments catalogue/manual ➤ Chapter 4: Maintenance schedule and inspection report
	< Related material > RE training text: Attachment C-11.2.1
2)-6. Maintenance works are conducted according to O&M manual of RE facilities.	- Inspection check sheet for O&M was made in collaboration with C/P. - O&M related training on the use of donated measuring instruments was conducted. - Inspection schedule was made in collaboration with C/P. - Based on the above, request was made to conduct O&M following the manual, and gave advice with the assessment of the result.
	< Related material > - Record of activity(on-site, online): Attachment C-6.2 - Manual and future work plan (including budget): Attachment C-11.2
2)-7. The result of maintenance works is evaluated, and future maintenance work schedule together with budget is prepared.	Future O&M work plan was made in collaboration with C/P. The final draft was shared with the CEO of C/P, and request for approval was made.
	< Related material > Manual and future work plan (including budget):

		Attachment C-11.2
2)-8.	Training program for Hybrid Power Generation System including O&M of RE facilities is conducted.	• On-site trainings for technical support were conducted for 3 times in total. • Online technical trainings were conducted for 8 times in total. • Online follow-ups for manual revision were conducted for 6 times in total. • Regional trainings were held for 3 times (2 times in Fiji, once via online). • The number of cumulative participants was 176.
		< Related material > • Record of activity(on-site, online) Training schedule: Attachment C-6.1 • Record of activity(on-site, online) Training report: Attachment C-6.2
2)-9.	Knowledge regarding Hybrid Power Generation System is disseminated among stakeholders.	• On-site seminar was held on July 19, 2019. • Online seminar was held on June 20, 2023.
		< Related material > • Seminar report: Attachment C-6.2.1 / 6.2.6

8.4.3 Project purpose and indicators (result)

Project purpose: Hybrid Power Generation System is introduced.		
Indicator ①	Improvement of specific fuel consumption of pilot DG units (better than the baseline data set at the beginning of the Project)	• SFC of the pilot DG units before and after the project are compared in the table below.
Indicator ②	Improvement of performance ratio for RE power generation systems (better than the baseline data set at the beginning of the Project)	• Performance ratio of the pilot PV facilities before and after the project are compared in the table below.
Indicator ③	Proper application of planning and O&M method of Hybrid Power Generation System	• As RE integration plan and RE O&M manual were collaboratively revised to suit their situation, its proper application is expected.
Indicator②③is to be evaluated with counterpart self-evaluation using check sheet that summarizes judgment criteria for “proper application”, etc., evaluation by Japanese experts, and stakeholder opinion.		

Indicator①(Comparison of specific fuel consumption)

No.	DG facility name	Baseline	Latest data	Note (Reasons for low value, etc.)
1	DG #3	0.273 L/kWh	0.277 L/kWh (June 2023)	After OH (October 2021) SFC:0.269 L/kWh
2	DG #4	0.273 L/kWh	0.267 L/kWh	Top overhaul was conducted after a generator

			(June 2023)	fire incident in 2021. With the cylinder head being defective, however, its output had to be restricted. Due to inefficient low-load operation, SFC value is poor.
3	DG #5	0.273 L/kWh	0.284 L/kWh (May 2023)	OH not conducted

Indicator②(Comparison of performance ratio)

No.	PV facility name	Baseline	2023 average	Note (Reasons for low value, etc.)
1	PEC Fund	75%	62.3%	• PR value has been lower than the baseline value since the beginning of monitoring. • Monthly average for 2020-2022 has been 50-60%. • PCS malfunctions are temporarily fixed each time it occurs. • According to PUB (July 2023), DC breaker trip of PCS No.3 after heavy rain could be the cause of PR values being lower than the baseline value. To identify the cause, the Expert Team advised to conduct inspection by taking measurements (insulation resistance measurement, etc.).

8.4.4 Degree of achievement for project output

Output 1): Appropriate and economical system for O&M of Diesel Generators (DGs) is enhanced.			Status of achievement: Achieved
Indicator ①	Adequacy on the use of the work schedule, check sheets and manual for the maintenance work for the pilot DG units	• Maintenance work plan was made, but regular updates will be necessary. • Check sheets were used, and were simplified as a result.	
Indicator ②	Number of training participants who are conducting operation and maintenance of DG based on the learnings from the training program	• On-site trainings for technical support were conducted for 5 times in total, with cumulative participants of 234 people. • Online technical trainings were conducted for 10 times in total, with cumulative participants of 74 people. • Online follow-ups for manual revision were conducted for 3 times in total, with cumulative participants of 11 people. • Training in Japan was held once, with cumulative participants of 34 people. • Regional trainings were held for 3 times (2 times in Fiji, once via online), with cumulative participants of 45 people. • Seminars were held for 2 times, with total 6 participants.	

Output 2): Methodology for appropriate planning and O&M of Hybrid Power Generation System is established.			Status of achievement: Achieved
Indicator ③	Number of training participants who learned the planning method of the Hybrid Power Generation System	- On-site trainings for technical support were conducted for 3 times in total, with cumulative participants of 72 people. - Online technical trainings were conducted for 8 times in total, with cumulative participants of 43 people. - Online follow-ups for manual revision were conducted for 6 times in total, with cumulative participants of 14 people. - Regional trainings were held for 3 times (2 times in Fiji, once via online), with cumulative participants of 45 people. - Seminars were held for 2 times, with 7 total participants.	
Indicator ④	Number of training participants who are conducting O&M of RE facilities based on the learnings from the training program	Currently, 3 of the training participants in this project from PUB are in charge of conducting O&M.	
Indicator ⑤	Preparation of related manuals for Hybrid Power Generation System	RE integration plan and RE O&M manual (draft) were made based on the Japanese standards, revised in collaboration with C/P to suit the condition of PUB, and were approved by CEO of C/P.	
Indicator ⑥	Adequacy of the use of the related manuals for Hybrid Power Generation System	As RE integration plan and RE O&M manual were collaboratively revised to suit their situation, its proper application is expected.	

8.4.5 Capacity assessment

The following two items are important in order to achieve the objectives of this project in Kiribati.

1. Enhancement of appropriate and economical system for O&M of Diesel Generators (DGs)
2. Establishment of methodology for appropriate planning and O&M of RE

In order to achieve the abovementioned outputs, the Expert Team developed a curriculum that suited PUB's needs and provided trainings.

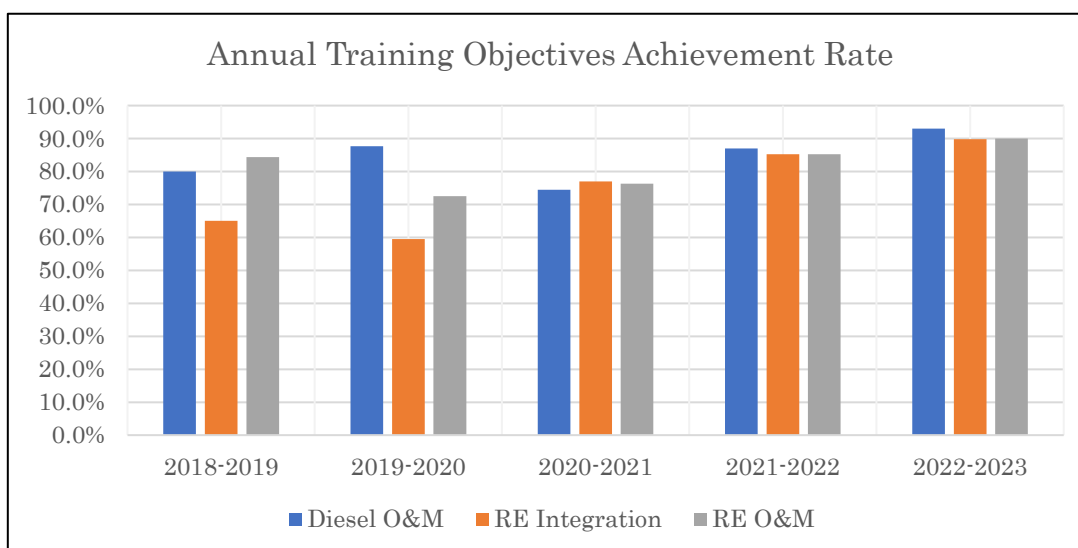
However, as on-site trainings that would have been effective became unfeasible due to COVID-19 pandemic, online trainings were provided to supplement them.

In addition, annual capacity assessment was conducted to assess the degree of achievement in the core trainers' knowledge and skills. The assessment was made with test results, evaluations from their superiors, evaluation by the Expert team, and training attendance rate as the indicators. See Capacity Assessment Report for each period for details.

The results of the five-year project are shown in the following graph.

Annual Training Objectives Achievement rate

PUB average	2018-2019	2019-2020	2020-2021	2021-2022	2022-2023
Diesel O&M	80.0%	87.7%	74.5%	87.0%	93.0%
RE Integration	65.0%	59.5%	77.0%	85.2%	89.8%
RE O&M	84.4%	72.5%	76.3%	85.2%	90.0%



1. The average achievement rate of the five terms was 84.44% for appropriate and economic DG O&M. Although the achievement rate exceeded 80% in the first two years of the project, it decreased in 2020-2021 when trainings were held online instead of on-site due to COVID-19 pandemic. That said, 74.5% achievement rate was a relatively good result considering that the trainings were held online. In addition, at the end of 2021, PUB maintenance staff members conducted DG Unit 3 overhaul by themselves without inviting a supervisor from overseas, and successfully improved the specific fuel consumption. Considering this was not possible at the beginning of the project, this was a significant achievement. The Expert Team is convinced that the maintenance system will be improved further with more experience in conducting OH in the future.
2. The achievement rate has increased year by year for appropriate RE integration plan, and it is commendable that the rate achieved 90% in the last 2022-2023 period. The Expert Team believes that the female core trainer's dedication led to the increase in the achievement rate. She is expected to play an important role as an assistant to the generation manager in the future.
3. The core trainers for RE integration plan also participated in the trainings for appropriate RE O&M as main participants. The average achievement rate of the five terms was 81.67%, a commendable result. As the core trainers of Kiribati possess sufficient knowledge and skills, providing support from PUB management to ensure the sustainability of O&M activities, by strengthening maintenance system and providing necessary spare parts, is necessary.

8.5 FSM-related activity results

8.5.1 Overall goal and indicators of the project (repeated from Chapter 4)

(1) Overall goal and indicators

Overall goal: Energy security is improved, and greenhouse gases are reduced through the reduction of fossil fuels consumption.

Indicator①: Reduced amount of CO₂ emission* of power utilities in the target area

Indicator②: Reduced amount of diesel fuel* of power utilities in the target area

Indicator③: Increased capacity (kW) and actual generated energy (kWh)* of renewable energy facilities of power utilities in the target area

*In comparison to the indicators at the time of baseline survey

(2) Project purpose and indicators

Project purpose: Hybrid Power Generation System is introduced.

Indicator①: Improvement of specific fuel consumption of pilot DG units (better than the baseline data set at the beginning of the Project)

Indicator②: Number of the units Economic Dispatch Control (EDC) properly applied (Target number set at the beginning of the Project)

Indicator③: Proper application of planning and O&M method of Hybrid Power Generation System

Note: Indicator② is to be evaluated with counterpart self-evaluation using check sheets that summarize judgment criteria for “proper application”, etc., evaluation by Japanese experts, and stakeholder opinion.

(3) Outputs (expected effect)

Output 1): Appropriate and economical system for O&M of Diesel Generators (DGs) is enhanced.

Output 2): Methodology for appropriate planning and O&M of Hybrid Power Generation System is established.

Indicator①: Adequacy on the use of the work schedule, check sheets and manual for the maintenance work for the pilot DG units

Indicator②: Number of training participants who are conducting operation and maintenance of DG based on the learnings from the training program

Indicator③: Number of training participants who learned the planning method of the Hybrid Power Generation System

Indicator④: Number of training participants who are conducting O&M of RE facilities based on the learnings from the training program

Indicator⑤: Preparation of related manuals for Hybrid Power Generation System

Indicator⑥: Adequacy of the use of the related manuals for Hybrid Power Generation System

8.5.2 Content of activities

(1) Activities related to output 1)

1) Appropriate and economical system for O&M of Diesel Generators (DGs) is enhanced.

Hands-on trainings intended to improve basic knowledge of DG and skills were provided for the counterparts in order to improve DG operation and maintenance.

The following contents were instructed on basic knowledge of DG.

- Principle of DG
- DG parts (cylinder head, piston, crank shaft, etc.)
- Explanation on each utility (fuel, lubricating oil, cooling water, air, exhaust gas) and auxiliary equipment
- Governor function, importance of specific fuel consumption management, measurement method, etc.
- Power plant operation, economic load dispatch control (EDC), future expansion plan, etc.

The following contents were instructed on DG maintenance knowledge and skill.

- Safety
- Various kinds of maintenance (preventive maintenance, periodic maintenance, overhaul, etc.)
- Daily inspection check sheet preparation and recording
- Maintenance method of each engine part, disassembly, cleaning, inspection, testing, and assembling
- Recording and preparing report
- Troubleshooting
- Maintenance of electrical equipment (electrical board, circuit breaker, generator, etc.)
- Inspection method, adjustment, points to note, etc. were instructed on-site at hands-on trainings
- DG O&M manual preparation
- DG future maintenance plan preparation

* See “Training curriculum (Attachment: F-0.1)” for details.

(2) Activities related to output 2)

1) Methodology for appropriate planning of Hybrid Power Generation System is established.

The following contents on necessary regulations (case example of Japan) and items to be studied for integrating and expanding RE were instructed on-site or via online.

- Overview of power system simulation
- Grid code
- Introduction of case example in Okinawa
- Introducing storage battery (concept of kW and kWh)
- HOMER

RE integration planning manual was prepared in collaboration with C/Ps based on the items above.

2) Methodology for O&M of Hybrid Power Generation System is established.

Lecture on RE inspection method in Japan was conducted and “inspection check sheet” and “inspection plan” were made in collaboration with C/Ps. In addition, necessary equipment for inspection were provided, and effective inspection method was established. During COVID-19 pandemic, result of periodic inspections and performance ratio (PR value) were reviewed via online and advice was given.

The result of activities pertaining to output 1 and 2 specified in PDM are shown in the table below.

Project activity results (FSM)

【FSM】																		
Output 1): Appropriate and economical system for O&M of Diesel Generators (DGs) is enhanced.																		
Output 2): Methodology for appropriate planning and O&M of Hybrid Power Generation System is established.																		
Activities	Activity results																	
1)-1. Operational conditions of the existing DGs are reviewed, including confirmation of objectively verifiable indicators for overall goal.	- Specific fuel consumption of pilot DG units was reviewed in the 1st JCC meeting (November 2017). - As specific fuel consumption is an important indicator for this project, existing flow meter in Pohnpei and Kosrae were replaced, and benchmark was set for each state as follows:<table><tr><th>State</th><th>Unit</th><th>SFC [L/kWh]</th></tr><tr><td>Pohnpei</td><td>#1～#5</td><td>0.282</td></tr><tr><td>Chuuk</td><td>#1, #2</td><td>0.254</td></tr><tr><td rowspan="2">Yap</td><td>#1, #2</td><td>0.261</td></tr><tr><td>#3</td><td>0.265</td></tr><tr><td>Kosrae</td><td>#9, #10</td><td>0.278</td></tr></table> - Relevant information was collected based on the questionnaire from JICA Expert Team to power utility of each state (YSPSC, CPUC, PUC, KUA). - Technical knowledge and skills of C/P were assessed, and training needs assessment report (TNA report) was made. < Related material > (Pohnpei) - Training needs assessment report (TNA): Attachment D-1-5 (Chuuk) - Training needs assessment report (TNA): Attachment D-2-5 (Yap) - Training needs assessment report (TNA): Attachment D-3-5 (Kosrae)	State	Unit	SFC [L/kWh]	Pohnpei	#1～#5	0.282	Chuuk	#1, #2	0.254	Yap	#1, #2	0.261	#3	0.265	Kosrae	#9, #10	0.278
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	• Training needs assessment report (TNA): Attachment D-4-5																									
1)-2. Specific fuel consumption of pilot DG units is measured.	• Instruction on the proper SFC measurement method was provided for several times either on-site or via online for DG C/P of each state. SFC measurement record sheet was also made, and the C/P were instructed to use it. • Education on SFC monitoring, including assessing engine condition, economic efficiency, etc. was provided. • Instruction to measure SFC every month was given. In addition, the Expert Team requested to share the measured data every month via email. < Related material > • DG training text : Attachment F-1.1 (Pohnpei) • Record of activity(on-site, online) Training report: Attachment D-1-6.2 • Record sheet • Specific fuel consumption: Attachment D-1-9.1 (Chuuk) • Record of activity(on-site, online) Training report: Attachment D-2-6.2 • Record sheet • Specific fuel consumption: Attachment D-2-9.1 (Yap) • Record of activity(on-site, online) Training report: Attachment D-3-6.2 • Record sheet • Specific fuel consumption: Attachment D-3-9.1 (Kosrae) • Record of activity(on-site, online) Training report: Attachment D-4-6.2 • Record sheet • Specific fuel consumption: Attachment D-4-9.1																									
1)-3. Improvement plan for the operation of pilot DG units is prepared.	• Power plant operation improvement plan was formulated in the 1st phase. <table><tr><td>State</td><td>Power plant</td><td>Mechanical</td><td>Electrical</td><td>O&M</td></tr><tr><td>Pohnpei</td><td>4</td><td>3</td><td>3</td><td>6</td></tr><tr><td>Chuuk</td><td>1</td><td>5</td><td>3</td><td>4</td></tr><tr><td>Yap</td><td>3</td><td>4</td><td>6</td><td>8</td></tr><tr><td>Kosrae</td><td>3</td><td>3</td><td>5</td><td>10</td></tr></table> The items that need to be improved as listed above were summarized and explained to C/P in each state. < Related material > (Pohnpei)	State	Power plant	Mechanical	Electrical	O&M	Pohnpei	4	3	3	6	Chuuk	1	5	3	4	Yap	3	4	6	8	Kosrae	3	3	5	10
State	Power plant	Mechanical	Electrical	O&M																						
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Yap	3	4	6	8																						
Kosrae	3	3	5	10																						

	• Operation improvement plan : Attachment D-1-10 Improvement plan works report (Pohnpei) (Chuuk) • Operation improvement plan : Attachment D-2-10 Improvement plan works report (Chuuk) (Yap) • Operation improvement plan : Attachment D-3-10 Improvement plan works report (Yap) (Kosrae) : • Operation improvement plan : Attachment D-4-10 Improvement plan works report (Kosrae)																									
1)-4. Existing spare parts and maintenance tools of pilot DG units are confirmed.	• The following were confirmed in 2019 while visiting Kosrae during the 1st phase. 1)Necessary spares and spare parts were available. 2)General tools for maintenance, and special tools and measuring instruments for OH were available. < Related material > (Kosrae) • Spare parts list: Attachment D-4-11.1.5 • Tool and measuring instrument list: Attachment D-4-11.1.6 • Consumables list: Attachment D-4-11.1.7																									
1)-5. Improvement plan for the operation of pilot DG units is implemented.	• Explanation on the items that required improvement were explained to staff members and generation manager of each state using the list made in activity 1)-3, and requested for implementation.<table><tr><td>State</td><td>Power plant</td><td>Mechanical</td><td>Electrical</td><td>O&M</td></tr><tr><td>Pohnpei</td><td>0/4</td><td>2/3</td><td>0/3</td><td>0/6</td></tr><tr><td>Chuuk</td><td>0/1</td><td>5/5</td><td>2/3</td><td>4/4</td></tr><tr><td>Yap</td><td>3/4</td><td>2/4</td><td>6/6</td><td>7/8</td></tr><tr><td>Kosrae</td><td>3/3</td><td>2/3</td><td>4/5</td><td>7/10</td></tr></table> • Pohnpei A total of 14 items, including 4 items related to power plant building, 1 item on mechanical, 3 items on electrical, and 6 items on O&M have not been implemented. They are expected to be resolved when a new power plant is built. • Chuuk A total of 2 items, including 1 item related to power plant building, and 1 item on electrical have not been implemented. In addition, CPUC suggested 8 additional items independently, and reported that they were all implemented. • Yap A total of 4 items, including 1 item related to power plant building, 2 item on mechanical, and 1 item on	State	Power plant	Mechanical	Electrical	O&M	Pohnpei	0/4	2/3	0/3	0/6	Chuuk	0/1	5/5	2/3	4/4	Yap	3/4	2/4	6/6	7/8	Kosrae	3/3	2/3	4/5	7/10
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Kosrae	3/3	2/3	4/5	7/10																						

	O&M have not been implemented. • Kosrae 2 items have not been implemented. 3 items on O&M are items mentioned in relation to RE. • Instruction to improve the remaining items was given to each state. < Related material > (Pohnpei) • Improvement plan : Attachment D-1-10 (Chuuk) • Operation improvement plan : Attachment D-2-10 (Yap) • Operation improvement plan : Attachment D-3-10 (Kosrae) : • Operation improvement plan : Attachment D-4-10
1)-6. The result of implementation of the improvement plan is evaluated, and improvement plan is updated.	• The result of implementation of the improvement plan were confirmed at each visit and online training. • Implementation of the improvement plan seems to have contributed for power plant maintenance. • There was little knowledge on maintenance at the beginning of the project. Currently knowledge on maintenance among C/P seems to have improved through participation in the project activities. • After the validity of the improvement plan was confirmed, update of the plan was requested. • Maintenance staff of PEC, CPUC, YSPSC, and KUA make improvements as needed.
1)-7. The concept of Economic Dispatch Control (EDC) is shared among operators and applied for DG operation, if possible.	• Education on Economical load Dispatch Control (EDC) was conducted by on-site or online training. • Pohnpei Introducing EDC is difficult because monitoring with SCADA is conducted, and multiple generators are operated by load sharing (isochronous mode). • Chuuk 2 DG units (Unit 1 and 2) are operated mainly by load sharing (isochronous mode) with a control device of ComAp. As there is no difference in SFC between the two units, introducing EDC would not reduce fuel consumption. • Yap Introducing EDC is difficult because wind and DG are automatically controlled by Hybrid Wizard device, including DG start-up and shut down. • Kosrae 2 DG units, namely Unit 9 and 10, are operated by load sharing (isochronous mode). As there is no difference in SFC between the two units, introducing EDC would not reduce fuel consumption.

	• Power plant in each state generally conducts load sharing operation with multiple generators (with almost equivalent output for each unit). • There is no difference in SFC under this operating condition, so as introducing EDC would not reduce fuel consumption, EDC cannot be introduced.																																																										
1)-8. Necessary spare parts and maintenance tools for the pilot DG units are prepared.	< Related material > • DG training text: Attachment F-1.1 • Spare parts needed for OH were prepared by the power utility of each state, and measuring instruments and general tools were provided by JICA Expert Team. The provided equipment is listed below. ① Provided for Pohnpei, Chuuk, Yap, and Kosrae <table border="1"> <thead> <tr> <th>No.</th><th>Procured equipment</th></tr> </thead> <tbody> <tr><td>1</td><td>Battery HiTester</td></tr> <tr><td>2</td><td>Clamp on AC/DC HiTester</td></tr> <tr><td>3</td><td>Radiation thermometer</td></tr> <tr><td>4</td><td>Battery hydrometer</td></tr> <tr><td>5</td><td>Vibration measuring instrument</td></tr> <tr><td>6</td><td>Pyranometer & thermometer</td></tr> <tr><td>7</td><td>String Tracer(I -V curve tracer)</td></tr> <tr><td>8</td><td>Cell Line Checker</td></tr> <tr><td>9</td><td>HOMER PRO software</td></tr> <tr><td>10</td><td>Insulation Tester</td></tr> <tr><td>11</td><td>Thermographic Camera</td></tr> <tr><td>12</td><td>Digital multimeter</td></tr> </tbody> </table> ② Provided for Pohnpei <table border="1"> <thead> <tr> <th>No.</th><th>Procured equipment</th></tr> </thead> <tbody> <tr><td>1</td><td>Fuel flow meter</td></tr> <tr><td>2</td><td>Fan Unit (For Power Conditioner)</td></tr> <tr><td>3</td><td>Mower</td></tr> <tr><td>4</td><td>High pressure washer</td></tr> </tbody> </table> ③ Provided for Chuuk <table border="1"> <thead> <tr> <th>No.</th><th>Procured equipment</th></tr> </thead> <tbody> <tr><td>1</td><td>Mower</td></tr> <tr><td>2</td><td>High pressure washer</td></tr> </tbody> </table> ④ Provided for Yap <table border="1"> <thead> <tr> <th>No.</th><th>Procured equipment</th></tr> </thead> <tbody> <tr><td>1</td><td>Mower</td></tr> <tr><td>2</td><td>High pressure washer</td></tr> </tbody> </table> ⑤ Provided for Kosrae <table border="1"> <thead> <tr> <th>No.</th><th>Procured equipment</th></tr> </thead> <tbody> <tr><td>1</td><td>Fuel flow meter</td></tr> <tr><td>2</td><td>Digital Pressure Calibrator</td></tr> <tr><td>3</td><td>Digital multimeter</td></tr> <tr><td>4</td><td>Digital thermometer</td></tr> </tbody> </table>	No.	Procured equipment	1	Battery HiTester	2	Clamp on AC/DC HiTester	3	Radiation thermometer	4	Battery hydrometer	5	Vibration measuring instrument	6	Pyranometer & thermometer	7	String Tracer(I -V curve tracer)	8	Cell Line Checker	9	HOMER PRO software	10	Insulation Tester	11	Thermographic Camera	12	Digital multimeter	No.	Procured equipment	1	Fuel flow meter	2	Fan Unit (For Power Conditioner)	3	Mower	4	High pressure washer	No.	Procured equipment	1	Mower	2	High pressure washer	No.	Procured equipment	1	Mower	2	High pressure washer	No.	Procured equipment	1	Fuel flow meter	2	Digital Pressure Calibrator	3	Digital multimeter	4	Digital thermometer
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		5	Instrumentation signal measurement/Generator			
		6	Ohm meter			
		7	Air compressor kit			
		8	Air hose			
		9	Various types of fittings			
		*Including equipment provided for RE training • Education on how to use the measuring instruments was provided on-site and online				
		< Related material > (Pohnpei) • Record of provided equipment: Attachment D-1-8 (Chuuk) • Record of provided equipment: Attachment D-2-8 (Yap) • Record of provided equipment: Attachment D-3-8 (Kosrae) • Record of provided equipment: Attachment D-4-8				
		1)-9.	Maintenance work schedule for the pilot DG units is prepared.	• JICA Expert Team prepared OH maintenance work schedule based on the OH record of OEPC's power plants on remote islands, and explained it to C/P of each state.		
				< Related material > (Pohnpei) • DG future work plan (including budget): Attachment D-1-11.1.2 (Chuuk) • DG future work plan (including budget): Attachment D-2-11.1.2 (Yap) • DG future work plan (including budget): Attachment D-3-11.1.2 (Kosrae) • DG future work plan (including budget): Attachment D-4-11.1.2		
				1)-10.	Check sheets and maintenance manuals for maintenance works for pilot DG units are prepared.	The following materials were submitted to C/P of each state, and a lecture on periodic maintenance and inspection was conducted to encourage it. • DG Inspection sheet • Daily patrol sheet • DG's O&M Manual However, the check sheets which JICA Expert Team and the C/P of each state made have not been used. < Reason > Each state already has its own DG Inspection sheet and Daily patrol sheet, and the operators are used to the existing ones, so using the sheets revised in this project is

	difficult. The operational data mainly of DG is recorded in PC, and generation manager prepares monthly reports. < Related material > • DG training text: Attachment F-1.1 (Pohnpei) • DG inspection sheet: Attachment D-1-11.1.3 • DG daily patrol sheet: Attachment D-1-11.1.4 (Chuuk) • DG inspection sheet: Attachment D-2-11.1.3 • DG daily patrol sheet: Attachment D-2-11.1.4 (Yap) • DG inspection sheet: Attachment D-3-11.1.3 • DG daily patrol sheet: Attachment D-3-11.1.4 (Kosrae) • DG inspection sheet: Attachment D-4-11.1.3 • DG daily patrol sheet: Attachment D-4-11.1.4
1)-11. Maintenance works (daily/partial inspection/overhaul work) for pilot DG units are conducted in accordance with the maintenance schedule.	• In each state, daily patrol is conducted but not recorded. Staff members conduct it when they receive an instruction to do it from generation manager. JICA Expert Team requested to keep patrol records. • Pohnpei OH of Unit 1 was conducted in January 2022. Currently OH cannot be conducted due to budgetary constraints. OH of Unit 4 is under consideration. • Chuuk OH of Unit 1 and 2 was conducted in December 2022. • Yap Conducting OH is under consideration. • Kosrae OH of Unit 9 and 10 is planned within 2023. < Related material > (Pohnpei) • Record of activity(on-site, online) Training report : Attachment D-1-6.2 (Chuuk) • Record of activity(on-site, online) Training report : Attachment D-2-6.2 (Yap) • Record of activity(on-site, online) Training report : Attachment D-3-6.2 (Kosrae) • Record of activity(on-site, online) Training report : Attachment D-4-6.2
1)-12. The result of maintenance works is evaluated, and future maintenance work schedule together with budget	• In accordance with the maintenance intervals set by the generator maintenance manual, future maintenance plan was made. • The future maintenance plan includes schedule, budget,

(including sub-contract fee, cost for tools and equipment) is prepared.	and necessary spare parts. • The budget was made based on the information provided by each state. • The result cannot be verified as OH has not yet been implemented. • The future O&M plan was finalized in collaboration with each state. < Related material > (Pohnpei) • DG future work plan (including budget): Attachment D-1-11.1.2 (Chuuk) • DG future work plan (including budget): Attachment D-2-11.1.2 (Yap) • DG future work plan (including budget): Attachment D-3-11.1.2 (Kosrae) • DG future work plan (including budget): Attachment D-4-11.1.2
1)-13. Specific fuel consumption of the pilot DG units is measured before and after implementation of the related project activities.	• Pohnpei SFC did not improve because OH was not conducted during the project period. In addition, fuel flow meter provided in this project is malfunctioning, and cannot take accurate flow rate measurements. • Chuuk As OH was conducted during the project period, SFC was improved. • Yap SFC has been low due to low-load operation with automatic control. • Kosrae SFC improvement was unlikely due to fuel leak. < Related material > (Pohnpei) • Specific fuel consumption: Attachment D-1-9.1 (Chuuk) • Specific fuel consumption: Attachment D-2-9.1 (Yap) • Specific fuel consumption: Attachment D-3-9.1 (Kosrae) • Specific fuel consumption: Attachment D-4-9.1
1)-14. Related training programs for appropriate O&M system for DGs are implemented periodically.	(Pohnpei) • On-site trainings for technical support were conducted for 4 times in total. • Online technical trainings were conducted for 9 times in total.

	• Online follow-ups for manual revision were conducted for 3 times in total. (Chuuk) • On-site trainings for technical support were conducted for 5 times in total. • Online technical trainings were conducted for 8 times in total. • Online follow-ups for manual revision were conducted for 3 times in total. (Yap) • On-site trainings for technical support were conducted for 2 times in total. • Online technical trainings were conducted for 9 times in total. • Online follow-ups for manual revision were conducted for 3 times in total. (Kosrae) • On-site trainings for technical support were conducted for 5 times in total. • Online technical trainings were conducted for 9 times in total. • Online follow-ups for manual revision were conducted for 2 times in total. < Related material > (Pohnpei) • Record of activity(on-site, online) Training schedule: Attachment D-1-6.1 • Record of activity(on-site, online) Training report: Attachment D-1-6.2 (Chuuk) • Record of activity(on-site, online) Training schedule: Attachment D-2-6.1 • Record of activity(on-site, online) Training report: Attachment D-2-6.2 (Yap) • Record of activity(on-site, online) Training schedule: Attachment D-3-6.1 • Record of activity(on-site, online) Training report: Attachment D-3-6.2 (Kosrae) • Record of activity(on-site, online) Training schedule: Attachment D-4-6.1 • Record of activity(on-site, online) Training report: Attachment D-4-6.2
1)-15. Knowledge on appropriate O&M of DGs is disseminated among stakeholders.	• On-site seminar was held in Yap on July 26, 2019. • Online seminar was held on July 6, 2023. < Related material > (Pohnpei)

	• Seminar report: Attachment D-1-6.2 (Chuuk) • Seminar report: Attachment D-2-6.2 (Yap) • Seminar report: Attachment D-3-6.2 (Kosrae) • Seminar report: Attachment D-4-6.2
2)-1. Current situation and future development plan of RE is reviewed.	• Questionnaire from JICA Expert Team was sent to YSPSC, CPUC, PUC, and KUA and related information was collected. • Training needs assessment report (TNA report) was made. • The target PV facilities of this project listed below were surveyed to assess the current condition. < Yap > • PEC Fund(PR:66%) < Chuuk > • Airport(PR:72%) • PEC Fund(PR:71%) < Pohnpei > • COM(PR:76%) • President Office(PR:78%) • PEC Fund(PR:71%) < Kosrae > • PEC Fund(PR:66%) • EU (PR:56%) < Related material > (Pohnpei) • Training needs assessment report (TNA): Attachment D-1-5 (Chuuk) • Training needs assessment report (TNA): Attachment D-2-5 (Yap) • Training needs assessment report (TNA): Attachment D-3-5 (Kosrae) • Training needs assessment report (TNA): Attachment D-3-5
2)-2. Planning manual for Hybrid Power Generation System is prepared.	• Draft RE integration manual was made based on the Japanese standards and was submitted to C/P in March 2019. The structure of the manual is as follows: ➢ Chapter 1: RE integration plan ➢ Chapter 2: PV system O&M ➢ Chapter 3: Measuring instruments catalogue/manual ➢ Chapter 4: Maintenance schedule and inspection report < Related material >

	• RE training text: Attachment F-1.2
2)-3. Implementation result of planning manual for Hybrid Power Generation System is evaluated and the manual content is updated in the target area.	• Discussion on the items that could be handled by the target country and those that could not be in the draft RE integration manual was held. • Based on the discussion, the manual was revised in collaboration with C/P. The CEO of C/P in Chuuk, Yap, and Pohnpei approved the final draft. Final draft of the work plan was shared with the CEO of C/P in Pohnpei, and request for approval was made. < Related material > (Pohnpei) • Manual and future work plan: Attachment D-1-11.2 (Chuuk) • Manual and future work plan: Attachment D-2-11.2 (Yap) • Manual and future work plan: Attachment D-3-11.2 (Kosrae) • Manual and future work plan: Attachment D-4-11.2
2)-4. Operating conditions of the existing RE facilities are reviewed, including confirmation of objectively verifiable indicators for overall goal.	• Monthly submission of the performance ratio (PR) of RE target facilities, an indicator of their operating condition, was requested. • Evaluation of the submitted PR was made. • If the submitted PR value was far lower than the baseline value, possible causes of malfunctions and countermeasure were discussed with C/P. • The items above were conducted until June 2023, near the completion of the project. < Related material > (Pohnpei) • Record of activity(on-site, online): Attachment D-1-6 • Performance ratio value: Attachment D-1-9.2 • Report record for RE facilities: Attachment D-1-11.3 (Chuuk) • Record of activity(on-site, online): Attachment D-2-6 • Performance ratio value: Attachment D-2-9.2 • Response record for RE facilities: Attachment D-2-11.3 (Yap) • Record of activity(on-site, online): Attachment D-3-6 • Performance ratio value: Attachment D-3-9.2 • Response record for RE facilities: Attachment D-3-11.3 (Kosrae) • Record of activity(on-site, online): Attachment D-4-6 • Performance ratio value: Attachment D-4-9.2 • Response record for RE facilities: Attachment D-4-11.3

2)-5. O&M manual for RE facilities is prepared.	• Draft RE O&M manual was made based on the Japanese standards and was submitted to C/P in March 2019. The structure of the manual is as follows: ➤ Chapter 1: RE integration plan ➤ Chapter 2: PV system O&M ➤ Chapter 3: Measuring instruments catalogue/manual ➤ Chapter 4: Maintenance schedule and inspection report < Related material > • RE training manual: Attachment F-1.2
2)-6. Maintenance works are conducted according to O&M manual of RE facilities.	• Inspection check sheet for O&M was made in collaboration with C/P. • O&M related training on the use of donated measuring instruments was conducted. • Inspection schedule was made in collaboration with C/P. • Based on the above, request was made to conduct O&M following the manual, and gave advice with the assessment of the result. < Related material > (Pohnpei) • Record of activity(on-site, online) Training report: Attachment D-1-6.2 • Manual and future work plan (including budget): Attachment D-1-11.2 (Chuuk) • Record of activity(on-site, online) Training report: Attachment D-2-6.2 • Manual and future work plan (including budget): Attachment D-2-11.2 (Yap) • Record of activity(on-site, online) Training report: Attachment D-3-6.2 • Manual and future work plan (including budget): Attachment D-3-11.2 (Kosrae) • Record of activity(on-site, online) Training report: Attachment D-4-6.2 • Manual and future work plan (including budget): Attachment D-4-11.2
2)-7. The result of maintenance works is evaluated, and future maintenance work schedule together with budget is prepared.	• Future O&M work plan was made in collaboration with C/P. The final draft was approved by the CEO of C/P in Chuuk, Yap, and Pohnpei. Final draft of the work plan was shared with the CEO of C/P in Pohnpei, and request for approval was made. < Related material > (Pohnpei) • Manual and future work plan: Attachment D-1-11.2

	(Chuuk) • Manual and future work plan: Attachment D-2-11.2 (Yap) • Manual and future work plan: Attachment D-3-11.2 (Kosrae) • Manual and future work plan: Attachment D-4-11.2
2)-8. Training program for Hybrid Power Generation System including O&M of RE facilities is conducted.	(Pohnpei) • On-site trainings for technical support were conducted for 5 times in total. • Online technical trainings were conducted for 8 times in total. • Online follow-ups for manual revision were conducted for 6 times in total. (Chuuk) • On-site trainings for technical support were conducted for 5 times in total. • Online technical trainings were conducted for 8 times in total. • Online follow-ups for manual revision were conducted for 6 times in total. (Yap) • On-site trainings for technical support were conducted for 4 times in total. • Online technical trainings were conducted for 8 times in total. • Online follow-ups for manual revision were conducted for 6 times in total. (Kosrae) • On-site trainings for technical support were conducted for 5 times in total. • Online technical trainings were conducted for 8 times in total. • Online follow-ups for manual revision were conducted for 6 times in total. < Related material > (Pohnpei) • Record of activity(on-site, online) Training schedule: Attachment D-1-6.1 • Record of activity(on-site, online) Training report: Attachment D-1-6.2 (Chuuk) • Record of activity(on-site, online) Training schedule: Attachment D-2-6.1 • Record of activity(on-site, online) Training report: Attachment D-2-6.2 (Yap) • Record of activity(on-site, online) Training schedule: Attachment D-3-6.1

		- Record of activity(on-site, online) Training report: Attachment D-3-6.2 (Kosrae) - Record of activity(on-site, online) Training schedule: Attachment D-4-6.1 - Record of activity(on-site, online) Training report: Attachment D-4-6.2
2)-9.	Knowledge regarding Hybrid Power Generation System is disseminated among stakeholders.	- On-site seminar was held in Yap on July 26, 2019. - Online seminar was held on July 6, 2023.
		< Related material > (Pohnpei) - Seminar report: Attachment D-1-6.2 (Chuuk) - Seminar report: Attachment D-2-6.2 (Yap) - Seminar report: Attachment D-3-6.2 (Kosrae) - Seminar report: Attachment D-4-6.2

8.5.3 Project purpose and indicators (result)

Project purpose: Hybrid Power Generation System is introduced.		
Indicator ①	Improvement of specific fuel consumption of pilot DG units (better than the baseline data set at the beginning of the Project)	SFC of the pilot DG units before and after the project are compared in the table below.
Indicator ②	Improvement of performance ratio for the RE power generation systems (better than the baseline data set at the beginning of the Project)	Performance ratio of the pilot PV facilities before and after the project are compared in the table below.
Indicator ③	Proper application of planning and O&M method of Hybrid Power Generation System	As RE integration plan and RE O&M manual were collaboratively revised to suit their situation, its proper application is expected.
Indicator②③is to be evaluated with counterpart self-evaluation using check sheet that summarizes judgment criteria for “proper application”, etc., evaluation by Japanese experts, and stakeholder opinion.		

Indicator①(Comparison of specific fuel consumption)

State	No.	DG facility name	Baseline	Latest data	Note (Reasons for low value, etc.)
Yap	1	Unit 1	0.261 L/kwh	0.270 L/kwh	(Output 32% 2022/8/22) Operated under low load
	2	Unit 2	0.261 L/kwh	0.282 L/kwh	(Output 40% 2022/8/22) Operated under low load

	3	Unit 3	0.261 L/kwh	0.299 L/kwh	(Output 38% 2022/8/22) Operated under low load
Chuuk	1	Unit 1	0.247 L/kwh	0.238 L/kwh	(Output 79% 2023/7/14) OH conducted in 2022/12
	2	Unit 2	0.249 L/kwh	0.243 L/kwh	(Output 88% 2022/12/7) OH conducted in 2022/12
Pohnpei	1	Unit 1	0.282 L/kwh	0.322 L/kwh	(Output 68% 2023/1/20) OH not implemented
	2	Unit 2	0.282 L/kwh	0.295 L/kwh	(Output 68% 2023/1/20) OH not implemented
	3	Unit 3	0.282 L/kwh	0.273 L/kwh	(Output 64% 2023/1/20) OH not implemented
	4	Unit 4	0.232 L/kwh	-	Generator failure
	5	Unit 5	0.264 L/kwh	0.265 L/kwh	(Output 51% 2023/1/20) Operated under low load
Kosrae	1	Unit 9	0.261 L/kwh	0.270 L/kwh	(Output 80% 2023/1/27) Ongoing fuel leak
	2	Unit 10	0.261 L/kwh	0.270 L/kwh	(Output 80% 2023/1/27) Ongoing fuel leak

Indicator②(Comparison of performance ratio)

State	No.	PV facility name	Baseline	2023 average	Note (Reasons for low value, etc.)
Yap	1	PEC Fund	66%	71.6%	• Cable improvement work was conducted between April-December 2022. • PR value has recovered since January 2023. • Working without problem.
Chuuk	1	Airport	72%	-	• As the necessary parts for repairing PCS were no longer in production, CPUC was considering a replacement. • Expert Team suggested for procuring alternative product. • It was confirmed that the panel was broken and some strings were not operational. • As of the March 2023 visit, all the modules and racks were removed, and work for replacing PCS, etc. was ongoing.
	2	PEC Fund	71%	73.9%	• Working without problem.
Pohnpei	1	COM	76%	-	• As PCS cannot start automatically after outage, it causes decrease in generated electricity (decrease in PR value) • There was a case in which PCS was shut down due to the buried cable connecting to PCS within the PV system being submerged in water.

					As rainwater is not drained properly within the buried cable duct, draining needs to be considered (assessment as of the February 2023 visit).
	2	President Office	78%	-	- All 3 PCS units are malfunctioning since around 2020, such as stopping operation and displaying error messages. - Recovery operation was attempted based on advice from a Japanese manufacturer (Kyocera), but could not improve the condition. - Currently repair preparation is ongoing under another JICA project (follow-up project). - As the facility is shut down, measured data of PR value cannot be obtained (assessment as of the February 2023 visit).
	3	PEC Fund	71%	-	- The facility was not operational due to malfunction, but repair work was conducted. - Completion test was conducted during the January 2023 visit, and confirmed that operation resumed. (Request was made to share the PR value after resuming operation)
Kosrae	1	PEC Fund	66%	66.4%	- PR value decreased since May 2023 due to inverter fault. - PR value before the fault was around the baseline value or higher. 72.9 % (April 2023), 74.4% (March 2023)
	2	EU	56%	55.7%	Working without problem

8.5.4 Degree of achievement for project output

Output 1): Appropriate and economical system for O&M of Diesel Generators (DGs) is enhanced.			Status of achievement: Achieved
Indicator ①	Adequacy on the use of the work schedule, check sheets and manual for the maintenance work for the pilot DG units	Almost achieved. - Maintenance work plan was made, but regular updates will be necessary. - Existing check sheets made by each state were used. - The manual needs to be revised by comparing the manufacture manual used in each state and OH result once again.	
Indicator ②	Number of training participants who are	On-site technical support trainings had cumulative total 343 participants.	

	conducting operation and maintenance of DG based on the learnings from the training program	Pohnpei: held 5 times with 130 cumulative participants. Chuuk: held 5 times with 80 cumulative participants. Yap: held 5 times with 64 cumulative participants Kosrae: held 5 times with 69 cumulative participants. - Online technical support trainings had cumulative total 190 participants. Pohnpei: held 9 times with 74 cumulative participants. Chuuk: held 8 times with 29 cumulative participants. Yap: held 9 times with 64 cumulative participants Kosrae: held 9 times with 23 cumulative participants. - Online follow-ups for manual revision had cumulative total 32 participants. Pohnpei: 3 times with 10 cumulative participants Chuuk: held 3 times with 6 cumulative participants. Yap: held 3 times with 12 cumulative participants Kosrae: held 2 times with 4 cumulative participants. - Regional trainings were held for 3 times (2 times in Fiji, once via online), with cumulative participants of 161 people. Pohnpei: 40 people Chuuk: 47 people Yap: 46 people Kosrae: 28 people - Training in Japan was held once with 136 cumulative participants. Pohnpei : 34 people Chuuk : 34 people Yap : 34 people Kosrae : 34 people - Seminars were held for 2 times, with 10 total participants. Pohnpei : 1 person Chuuk : 1 person Yap : 7 people Kosrae : 1 person

Output 2): Methodology for appropriate planning and O&M of Hybrid Power Generation System is established.		Status of achievement: Achieved
Indicator ③	• Number of training participants who learned the planning method of the Hybrid Power Generation System	• On-site technical support trainings had cumulative total 367 participants. Pohnpei: held 6 times with 134 cumulative participants Chuuk: held 6 times with 73 cumulative participants Yap: held 5 times with 72 cumulative participants Kosrae: held 6 times with 88 cumulative participants
Indicator ④	• Number of training participants who are conducting O&M of RE	• Online technical trainings were conducted for 9 times in

	facilities based on the learnings from the training program	total, with cumulative participants of 108 people. Pohnpei: held 8 times with 18 cumulative participants Chuuk: held 8 times with 30 cumulative participants Yap: held 8 times with 35 cumulative participants Kosrae: held 8 times with 25 cumulative participants • Online follow-ups for manual revision were conducted for 5 times in total, with cumulative participants of 47 people. - Pohnpei: held 6 times with 10 cumulative participants - Chuuk: held 6 times with 21 cumulative participants - Yap: held 6 times with 8 cumulative participants - Kosrae: held 6 times with 8 cumulative participants • Regional trainings were held for 3 times (2 times in Fiji, once via online), with cumulative participants of 172 people. - Pohnpei: 54 people - Chuuk: 51 people - Yap: 38 people - Kosrae: 29 people • Seminars were held for 2 times, with 17 total participants. - Pohnpei: 3 people - Chuuk: 4 people - Yap: 7 people - Kosrae: 3 people
Indicator ⑤	Preparation of related manuals for Hybrid Power Generation System	RE integration plan and RE O&M manual (draft) were made based on the Japanese standards, revised in collaboration with C/P to suit the local condition, and were approved by CEO of C/P.
Indicator ⑥	Adequacy of the use of the related manuals for Hybrid Power Generation System	As RE integration plan and RE O&M manual were collaboratively revised to suit their situation, its proper application is expected.

8.5.5 Capacity assessment

The following two items are important in order to achieve the objectives of this project in FSM.

1. Enhancement of appropriate and economical system for O&M of Diesel Generators (DGs)
2. Establishment of methodology for appropriate planning and O&M of RE

In order to achieve the abovementioned outputs, the Expert Team developed a curriculum that suited FSM's needs and provided trainings.

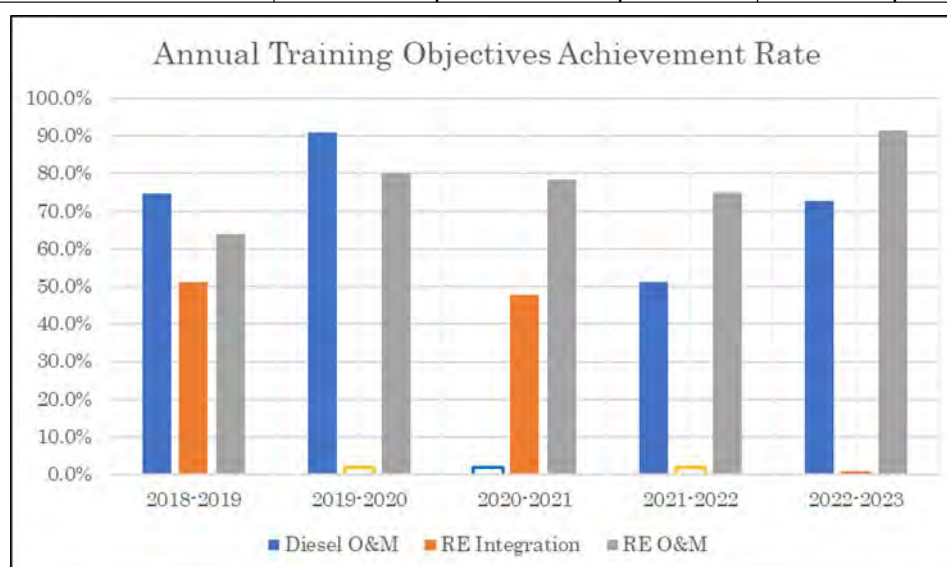
However, as on-site trainings that would have been effective became unfeasible due to COVID-19 pandemic, online trainings were provided to supplement them.

In addition, annual capacity assessment was conducted to assess the degree of achievement in the core trainers' knowledge and skills. The assessment was made with test results, evaluations from their superiors, evaluation by the Expert team, and training attendance rate as the indicators. See Capacity Assessment Report for each period for details.

8.5.5.1 Pohnpei (PUC)

Annual Training Objectives Achievement rate

PUC average	2018-2019	2019-2020	2020-2021	2021-2022	2022-2023
Diesel O&M	74.8%	91.0%	2.0%	51.3%	72.8%
RE Integration	51.3%	2.0%	47.7%	2.0%	1.0%
RE O&M	64.0%	80.0%	78.3%	75.0%	91.5%



1. The average achievement rate of the five terms was 72.48% for appropriate and economical DG O&M. Although the achievement rate decreased in 2020-2021 when trainings were held online instead of on-site due to COVID-19 pandemic, it increased by 21.5 point in the last evaluation period (2022-2023) and became 72.8%, a good result. It was admirable that the C/P of PUC participated in all of the online training sessions and scored high in the tests during 2022-2023.
2. With regard to appropriate RE integration plan, regrettably, C/P of PUC could not be evaluated after shifting the on-site training online. As RE integration is a difficult subject to understand without basic knowledge, JICA Expert Team would like to advice PUC management to nominate new C/P to resolve the issue. This is a very important challenge for the future RE integration in Pohnpei.
3. As the RE C/P of PUC for appropriate RE O&M were excellent, the average achievement rate of the last evaluation period (2022-2023) was 91.5%, an approximately 20-point increase from the previous period.

PUC needs to increase the number of PV maintenance staff along with increase in PV facility in Pohnpei. Assigning the core trainers approved by the JICA Expert Team for training new maintenance staff is recommended.

8.5.5.2 Chuuk (CPUC)

Annual Training Objectives Achievement rate

CPUC average	2018-2019	2019-2020	2020-2021	2021-2022	2022-2023
Diesel O&M	64.7%	91.7%	83.8%	80.5%	84.5%
RE Integration	51.0%	64.3%	71.9%	73.8%	72.8%
RE O&M	64.7%	64.8%	67.3%	73.0%	78.7%

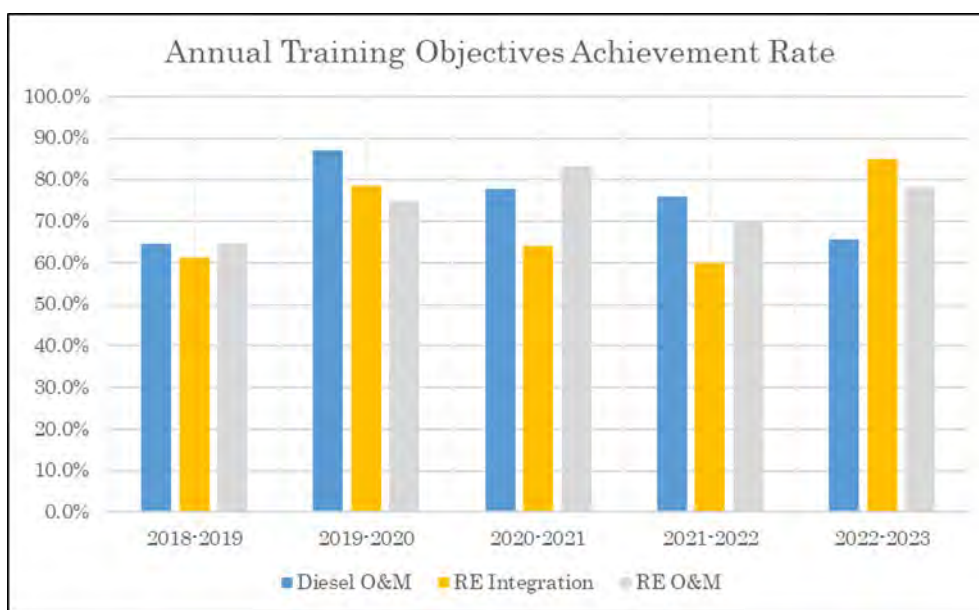


1. The average achievement rate of the five terms was 81.04% for appropriate and economical DG O&M. The DG core trainers steadily attended the online trainings and scored high in the tests assigned from the JICA Expert Team. It is commendable that they demonstrated their skills and maintained average achievement rate of over 80% throughout the five terms.
2. With regard to appropriate RE integration plan, the core trainers' hard work can be observed from their maintaining the average achievement rate of CPUC to be approximately 73%.
3. With regard to appropriate RE O&M, the achievement rate achieved 78.7% in the end. The rate increased steadily, which shows the core trainers' daily commitment to improve their technical skill. JICA Experts confirmed a good result of the core trainers' work on PV system inspection during the previous on-site training in Chuuk.

8.5.5.3 Yap (YSPSC)

Annual Training Objectives Achievement rate

YSPSC average	2018-2019	2019-2020	2020-2021	2021-2022	2022-2023
Diesel O&M	64.6%	87.0%	77.8%	76.0%	65.8%
RE Integration	61.3%	78.6%	64.0%	60.0%	85.0%
RE O&M	64.6%	75.0%	83.3%	70.0%	78.0%



1. With regard to appropriate and economical DG O&M, DG C/P were unable to attend neither on-site trainings nor regional trainings in Fiji due to sustained COVID-19 related travel restrictions. However, the fact that the achievement rate was maintained to be 74.24% on average confirms the importance of online training for improving skills of DG core trainers.
2. With regard to appropriate RE integration plan, although there was only one core trainer, he made a considerable effort and improved the achievement rate to 85.0% in the end, an approximately 25.0% increase from the previous term.

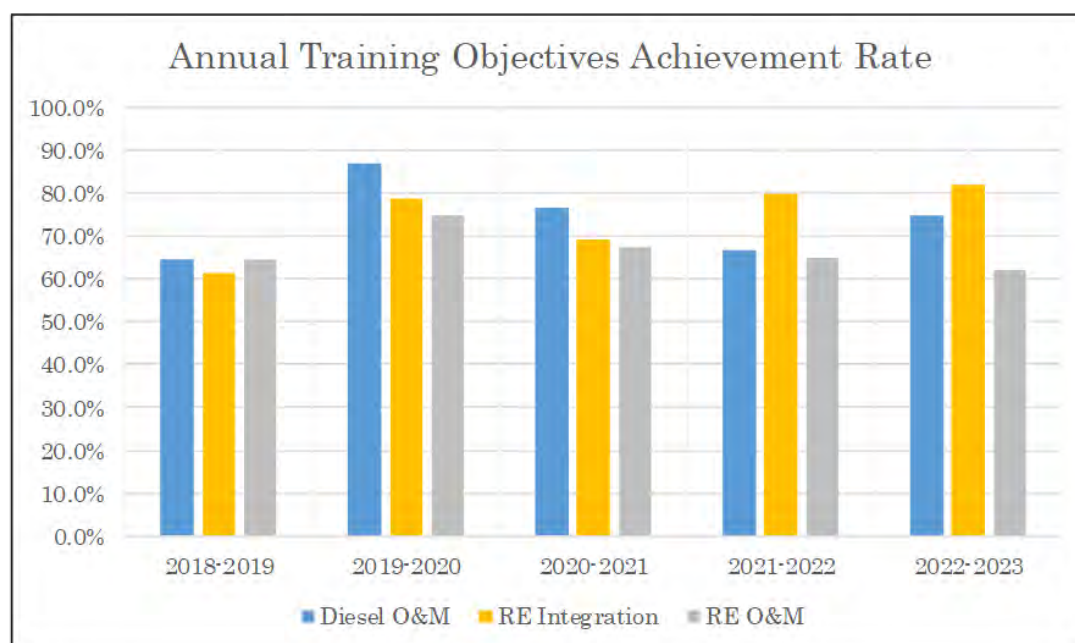
As previously recommended, JICA Expert Team would like YSPSC to assign one assistant staff for the core trainer to conduct revision and update of RE integration manual as well as survey on future RE project.

3. With regard to appropriate RE O&M, although the Expert Team could not conduct on-site trainings required for PV maintenance due to COVID-19 pandemic, the achievement rate of the last evaluation period (2022-2023) also increased by 8.0 point than in the previous term. This can be attributed to the core trainer's effort that he made by attending almost all of the trainings, although he was the only core trainer.

8.5.5.4 Kosrae (KUA)

Annual Training Objectives Achievement rate

KUA average	2018-2019	2019-2020	2020-2021	2021-2022	2022-2023
Diesel O&M	64.6%	87.0%	76.7%	66.5%	75.0%
RE Integration	61.3%	78.6%	69.3%	80.0%	82.0%
RE O&M	64.6%	75.0%	67.3%	65.0%	62.0%



1. With regard to appropriate and economical DG O&M, almost all the core trainers attended every training session, and scored high in the tests assigned from the JICA Expert Team. As a result, the achievement rate in the end was 75.0%, increasing by 8.5 point from the previous term.
2. With regard to appropriate RE integration plan, thanks to active participation of the C/P, the achievement rate of the last evaluation period (2022-2023) was 82.0%, a 2-point increase from the previous term. JICA Expert Team acknowledge that the C/P made their utmost efforts to complete RE integration manual including grid codes for RE.
3. With regard to appropriate RE O&M, as two out of the three core trainers did not attend online trainings, the achievement rate of the last evaluation period (2022-2023) for KUA was 62.0%, a 3-point decrease from the previous term. As the number of PV installations in Kosrae increases, it will be necessary for KUA to increase the number of PV maintenance personnel and to assign the core trainer approved by JICA Expert Team to train these new members.

8.6 RMI-related activity results

8.6.1 Overall goal and indicators of the project (repeated from Chapter 4)

(1) Overall goal and indicators

Overall goal: Energy security is improved and greenhouse gases are reduced through the reduction of fossil fuels consumption.

Indicator①: Reduced amount of CO₂ emission* of power utilities in the target area

Indicator②: Reduced amount of diesel fuel* of power utilities in the target area

Indicator③: Increased capacity (kW) and actual generated energy (kWh) of renewable energy facilities* of power utilities in the target area

*In comparison to the indicators at the time of baseline survey

(2) Project purpose and indicators

Project purpose: Hybrid Power Generation System is introduced.

Indicator①: Improvement of specific fuel consumption of pilot DG units (better than the baseline data set at the beginning of the Project)

Indicator②: Improvement of performance ratio for RE power generation systems (better than the baseline data set at the beginning of the Project)

Indicator③: Proper application of planning and O&M method of Hybrid Power Generation System

Note: Indicators②③ are to be evaluated with counterpart self-evaluation using check sheets that summarize judgment criteria for “proper application”, etc., evaluation by Japanese experts, and stakeholder opinion.

(3) Outputs (expected effect)

Output 1): Appropriate and economical system for O&M of Diesel Generators (DGs) is enhanced.

Output 2): Methodology for appropriate planning and O&M of Hybrid Power Generation System is established.

Indicator①: Adequacy on the use of the work schedule, check sheets and manual for the maintenance work for the pilot DG units

Indicator②: Number of training participants who are conducting operation and maintenance of DG based on the learnings from the training program

Indicator③: Number of training participants who learned the planning method of the Hybrid Power Generation System

Indicator④: Number of training participants who are conducting O&M of RE facilities based on the learnings from the training program

Indicator⑤: Preparation of related manuals for Hybrid Power Generation System

Indicator⑥: Adequacy of the use of the related manuals for Hybrid Power Generation System

8.6.2 Content of activities

(1) Activities related to output 1)

1) Appropriate and economical system for O&M of Diesel Generators (DGs) is enhanced.

Hands-on trainings intended to improve basic knowledge of DG and skills were provided for the counterparts in order to improve DG operation and maintenance.

The following contents were instructed on basic knowledge of DG.

- Principle of DG
- DG parts (cylinder head, piston, crank shaft, etc.)
- Explanation on each utility (fuel, lubricating oil, cooling water, air, exhaust gas) and auxiliary equipment
- Governor function, importance of specific fuel consumption management, measurement method, etc.
- Power plant operation, economic load dispatch control (EDC), future expansion plan, etc.

The following contents were instructed on DG maintenance knowledge and skill.

- Safety
- Various kinds of maintenance (preventive maintenance, periodic maintenance, overhaul, etc.)
- Daily inspection check sheet preparation and recording
- Maintenance method of each engine part, disassembly, cleaning, inspection, testing, and assembling, etc.
- Recording and preparing report
- Troubleshooting
- Maintenance of electrical equipment (electrical board, circuit breaker, generator, etc.)
- Inspection method, adjustment, points to note, etc. were instructed on-site at hands-on trainings
- DG O&M manual preparation
- DG future maintenance plan preparation

* See “Training curriculum (Attachment: F-0.1)” for details.

(2) Activities related to output 2)

1) Methodology for appropriate planning of Hybrid Power Generation System is established.

The following contents on necessary regulations (case example of Japan) and items to be studied for integrating and expanding RE were instructed on-site or via online.

- Overview of power system simulation
- Grid code
- Introduction of case example in Okinawa
- Introducing storage battery (concept of kW and kWh)
- HOMER

RE integration planning manual was prepared in collaboration with C/Ps based on the items above.

2) Methodology for O&M of Hybrid Power Generation System is established.

Lecture on RE inspection method in Japan was conducted and “inspection check sheet” and “inspection plan” were made in collaboration with C/Ps. In addition, necessary equipment for inspection were provided, and effective inspection method for early detection of malfunctions was established. During COVID-19 pandemic, result of periodic inspections and performance ratio (PR value) were reviewed via online, and advice was given.

The result of activities pertaining to output 1 and 2 specified in PDM are shown in the table below.

Project activity results (RMI)

【RMI】	
Output 1): Appropriate and economical system for O&M of Diesel Generators (DGs) is enhanced. Output 2): Methodology for appropriate planning and O&M of Hybrid Power Generation System is established.	
Activities	Activity results
1)-1. Operational conditions of the existing DGs are reviewed, including confirmation of objectively verifiable indicators for overall goal.	• Specific fuel consumption of pilot DG units was reviewed in the 1st on-site survey (November 2017). • As specific fuel consumption is an important indicator for this project, replacement of the existing flow meter which had not been calibrated was requested. • Questionnaire from JICA Expert Team was sent to MEC and related information was collected. • Technical knowledge and skills of C/P were assessed, and training needs assessment report (TNA report) was made.
	< Related material > • Training needs assessment report (TNA): Attachment E-5
1)-2. Specific fuel consumption of pilot DG units is measured.	• Instruction on the proper SFC measurement method was provided for several times either on-site or via online for DG C/P of MEC. SFC measurement record sheet was also made, and the C/P were instructed to use it. • Education on SFC monitoring, including assessing engine condition, economic efficiency, etc. was provided. • As it was time for periodic OH, instruction to measure SFC every month was given. In addition, the Expert Team requested to share the measured data every month via email. • Benchmark : SFC=0.269 L/kWh
	< Related material > • DG training text : Attachment F-1.1 • Record of activity(on-site, online) Training report: Attachment E-6.2 • Record sheet • Specific fuel consumption: Attachment E-9.1

1)-3. Improvement plan for the operation of pilot DG units is prepared.	- Power plant operation improvement plan was formulated in the 1st phase. In specific, 13 items that need to be improved, including building (4 items), electrical (3 items), mechanical (6 items), as well as 4 items on operation and maintenance were summarized and explained to C/P. < Related material > - Operation improvement plan: Attachment E-10 Improvement plan works report (Marshall)
1)-4. Existing spare parts and maintenance tools of pilot DG units are confirmed.	The following were confirmed on-site during the 1st phase in 2019: - Spare parts were stored in a warehouse, and managed with a ledger. - Spare parts for OH are checked for availability and ordered at the timings of OH. - General tools for maintenance and special tools and measuring instruments for OH were available. < Related material > - Spare parts list: Attachment E-11.1.5 - Tool and measuring instrument list: Attachment E-11.1.6 - Consumables list: Attachment E-11.1.7
1)-5. Improvement plan for the operation of pilot DG units is implemented.	- Explanation on the items that required improvement were explained to MEC staff and generation manager using the list made in activity 1)-3, and requested for implementation. - The following were confirmed at the time of project completion: - Out of the power plant building-related 4 items that required improvement, 2 items were canceled as a new building is planned to be built. The remaining 2 items were completed. 2 out of the 3 items related to electrical were completed. - Out of the mechanical-related 6 items that required improvement, 3 items related to the 1st Power plant were canceled as a new building is planned to be built. The remaining 3 items have not been implemented. 2 out of the 4 items related to O&M were completed. < Related material > - Operation improvement plan: Attachment E-10 Improvement plan works report (Marshall)
1)-6. The result of implementation of the improvement plan is evaluated, and improvement plan is updated.	- The result of implementation of the improvement plan were confirmed at each visit and online training. - As the DG C/P of MEC have responded poorly, their mindset towards maintenance needs to be improved. - The C/P appeared to think that improving existing

	power plant was meaningless as there was a plan to build a new power plant. • Many troubles happened at power plant might have taken up too much of their time and budget (such as bearing damage of Unit 7, and fire incident of the Unit 5 housing). • There was little knowledge on preventive maintenance at the beginning of the project, although approx. 20 years had passed after the commissioning of power plant. • Although the Expert Team requested for a revision of the operation improvement plan, more on-site trainings by the Expert Team seem to be necessary. • Maintenance staff of MEC make improvements as needed.																								
1)-7. The concept of Economic Dispatch Control (EDC) is shared among operators and applied for DG operation, if possible.	• Education on Economic load Dispatch Control (EDC) was conducted by on-site or online training. • Verification test on the possibility of EDC operation was conducted during the 3rd visit in February 2019. As the current DG dispatching done by MEC operator almost matched with the load distribution for each DG unit calculated by EDC program, the result showed no appreciable effect. The small number of DG units being operated (2-unit operation) is another possible factor for the result. • As the result suggests that improvement in SFC is unlikely with EDC, the Expert Team decided that introducing EDC and increasing burden on the operators would not be ideal. < Related material > • DG training text: Attachment F-1.1																								
1)-8. Necessary spare parts and maintenance tools for the pilot DG units are prepared.	• The equipment provided by JICA Expert Team is listed below. <table border="1"> <thead> <tr> <th>No.</th><th>Equipment Name</th></tr> </thead> <tbody> <tr><td>1</td><td>Digital Pressure Calibrator</td></tr> <tr><td>2</td><td>Digital multimeter</td></tr> <tr><td>3</td><td>Digital thermometer</td></tr> <tr><td>4</td><td>Instrumentation signal measurement/Generator</td></tr> <tr><td>5</td><td>Ohm meter</td></tr> <tr><td>6</td><td>Air compressor kit</td></tr> <tr><td>7</td><td>Air hose</td></tr> <tr><td>8</td><td>Various types of fittings</td></tr> <tr><td>9</td><td>Battery HiTester</td></tr> <tr><td>10</td><td>Clamp on AC/DC HiTester</td></tr> <tr><td>11</td><td>Radiation thermometer</td></tr> </tbody> </table>	No.	Equipment Name	1	Digital Pressure Calibrator	2	Digital multimeter	3	Digital thermometer	4	Instrumentation signal measurement/Generator	5	Ohm meter	6	Air compressor kit	7	Air hose	8	Various types of fittings	9	Battery HiTester	10	Clamp on AC/DC HiTester	11	Radiation thermometer
No.	Equipment Name																								
1	Digital Pressure Calibrator																								
2	Digital multimeter																								
3	Digital thermometer																								
4	Instrumentation signal measurement/Generator																								
5	Ohm meter																								
6	Air compressor kit																								
7	Air hose																								
8	Various types of fittings																								
9	Battery HiTester																								
10	Clamp on AC/DC HiTester																								
11	Radiation thermometer																								

		12	Battery hydrometer		
		13	Vibration measuring instrument		
		14	Pyranometer & thermometer		
		15	String Tracer(I -V curve tracer)		
		16	Cell Line Checker		
		17	HOMER PRO software		
		18	Insulation Tester		
		19	Cable junction box		
		20	Cable collector box		
		21	Thermographic Camera		
		22	Digital multimeter		
		23	Mower		
		24	High pressure washer		
		*Including equipment provided for RE training			
		• Education on how to use the measuring instruments was provided on-site and online			
< Related material >					
• Record of provided equipment: Attachment E-8					
1)-9.	Maintenance work schedule for the pilot DG units is prepared.	• JICA Expert Team prepared OH maintenance work schedule based on the OH record of OEPC’s power plants on remote islands, and explained it to C/P of MEC.			
		< Related material >			
		• DG future work plan (including budget): Attachment E-11.1.2			
1)-10.	Check sheets and maintenance manuals for maintenance works for pilot DG units are prepared.	• The following materials were submitted to MEC, and a lecture on periodic maintenance and inspection was conducted to encourage it. ➤ DG Inspection sheet ➤ Daily patrol sheet ➤ DG’s O&M Manual However, the check sheets which JICA Expert Team and MEC C/P made have not been used. < Reason > MEC already has its own DG Inspection sheet and Daily patrol sheet, and the operators are used to the existing ones, so using the sheets revised in this project is difficult. The operational data of DG has been recorded in PC for 2 years ago (for the pilot DGs).			
		< Related material >			
		• DG training text: Attachment F-1.1 • DG inspection sheet: Attachment E-11.1.3 • DG daily patrol sheet: Attachment E-11.1.4			
1)-11.	Maintenance works (daily/partial inspection/overhaul work) for pilot DG units are conducted in	• OH of pilot DG unit (unit 7) was conducted in 2020, and the Expert Team provided support remotely. • As trouble occurred on another DG unit in the power plant, OH of Unit 7 could not be conducted as			

accordance with the maintenance schedule.	scheduled, and eventually took approximately 2 months. • Post-OH questionnaire requested to the core trainers were not answered.
	< Related material > • Overhaul evaluation report: E-12
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.	• As the questionnaire in the previous activity 1)-11 was not answered, the result of OH could not be evaluated. Request to nominate new core trainer in consideration of the poor PC skill of the current core trainer was made to MEC, but was not acted upon. • In accordance with the maintenance intervals set by the generator maintenance manual, future maintenance plan was made. • The future maintenance plan includes schedule, budget, and necessary spare parts. • The budget was made based on the record of power plants in remote islands of Okinawa, so MEC needs to update it to suit their situation. • The result could not be verified as OH of Unit 6 has not yet been implemented.
	< Related material > • DG future work plan (including budget): Attachment E-11.1.2
1)-13. Specific fuel consumption of the pilot DG units is measured before and after implementation of the related project activities.	• SFC improvement is unknown as the post-OH (Unit 7 OH conducted during the project) questionnaire has not been answered. The reason provided was broken fuel flow meter (2022).
	< Related material > • Specific fuel consumption: Attachment E-9.1
1)-14. Related training programs for appropriate O&M system for DGs are implemented periodically.	• On-site trainings for technical support were conducted for 5 times in total. • Online technical trainings were conducted for 8 times in total. • Online follow-ups for manual revision were conducted once in total. • Regional trainings were held for 3 times (2 times in Fiji, once via online).
	< Related material > • Record of activity(on-site, online) Training schedule: Attachment E -6.1 • Record of activity(on-site, online) Training report: Attachment E-6.2
1)-15. Knowledge on appropriate O&M of DGs is disseminated among stakeholders.	• On-site seminar was held on July 19, 2019. • Online seminar was held on June 29, 2023.
	< Related material > • Seminar report: Attachment E-6.2.1 /6.2.5

2)-1. Current situation and future development plan of RE is reviewed.	• Questionnaire from JICA Expert Team was sent to MEC and related information was collected. • Training needs assessment report (TNA report) was made. • The target PV facilities of this project listed below were surveyed to assess the current condition. ➢ Hospital(PR:73%) ➢ Water Reservoir(PR:70%) < Related material > • Training needs assessment report (TNA): Attachment E-5
2)-2. Planning manual for Hybrid Power Generation System is prepared.	• Draft RE integration manual was made based on the Japanese standards and was submitted to C/P in March 2019. The structure of the manual is as follows: ➢ Chapter 1: RE integration plan ➢ Chapter 2: PV system O&M ➢ Chapter 3: Measuring instruments catalogue/manual. ➢ Chapter 4: Maintenance schedule and inspection report < Related material > • RE training text: Attachment F-1.2
2)-3. Implementation result of planning manual for Hybrid Power Generation System is evaluated and the manual content is updated in the target area.	• Discussion on the items that could be handled by the target country and those that could not be in the draft RE integration manual was held. • Based on the discussion, the manual was revised in collaboration with C/P. The CEO of C/P approved the final draft. < Related material > • Manual and future work plan (including budget): Attachment E-11.2.1
2)-4. Operating conditions of the existing RE facilities are reviewed, including confirmation of objectively verifiable indicators for overall goal.	• Monthly submission of the performance ratio (PR) of RE target facilities, an indicator of their operating condition, was requested. • Evaluation of the submitted PR was made. • If the submitted PR value was far lower than the baseline value, possible causes of malfunctions and countermeasure were discussed with C/P. • The items above were conducted until June 2023, near the completion of the project. • PR value measurement have not been made on the following 2 target facilities of the project due to the reasons confirmed as follows: ① Water reservoir PV has malfunction issues including burned cable and box, and these issues are either under consideration for improvement or being repaired. As resuming operation during the

	project period was unlikely, PR value could not be measured. ② As for Majuro hospital rooftop PV, the PC used to store generation data was found to be not operational. As the data is necessary to measure PR value, the Expert Team advised MEC to replace the PC early. Though MEC replied that replacement is under consideration, as of June 2023 near project completion, the PC has not been replaced.
	< Related material > • Record of activity(on-site, online): Attachment E-6 • Performance ratio value: Attachment E-9.2
2)-5. O&M manual for RE facilities is prepared.	• Draft RE O&M manual was made based on the Japanese standards and was submitted to C/P in March 2019. The structure of the manual is as follows: ➢ Chapter 1: RE integration plan ➢ Chapter 2: PV system O&M ➢ Chapter 3: Measuring instruments catalogue/manual. ➢ Chapter 4: Maintenance schedule and inspection report
	< Related material > • Manual for RE: Attachment E-11.2
2)-6. Maintenance works are conducted according to O&M manual of RE facilities.	• Inspection check sheet for O&M was made in collaboration with C/P. • O&M related training on the use of donated measuring instruments was conducted. • Inspection schedule was made in collaboration with C/P. • Based on the above, request was made to conduct O&M following the manual, and gave advice with the assessment of the result.
	< Related material > • Record of activity(on-site, online) Training report: Attachment E-6.2 • Manual and future work plan (including budget): Attachment E-11.2
2)-7. The result of maintenance works is evaluated, and future maintenance work schedule together with budget is prepared.	• Future O&M work plan was made in collaboration with C/P. The final draft was approved by the CEO of C/P.
	< Related material > • Manual and future work plan (including budget): Attachment E-11.2
2)-8. Training program for Hybrid Power Generation System including O&M of RE facilities	• On-site trainings for technical support were conducted for 5 times in total. • Online technical trainings were conducted for 8 times

is conducted.	in total.
	• Online follow-ups for manual revision were conducted for 6 times in total. • Regional trainings were held for 3 times (2 times in Fiji, once via online).
2)-9. Knowledge regarding Hybrid Power Generation System is disseminated among stakeholders.	< Related material > • Record of activity(on-site, online) Training schedule: Attachment E-6.1 • Record of activity(on-site, online) Training report: Attachment E-6.2
	• On-site seminar was held on July 19, 2019. • Online seminar was held on June 29, 2023. < Related material > • Seminar report: Attachment E-6.2.1 / 6.2.6

8.6.3 Project purpose and indicators (result)

Project purpose: Hybrid Power Generation System is introduced.		
Indicator ①	Improvement of specific fuel consumption of pilot DG units (better than the baseline data set at the beginning of the Project)	• SFC of the pilot DG units before and after the project could not be compared, due to flow meter failure. • From the SFC data shared by MEC in March 2023, the following concerns were identified: 1. As OH of DG Unit 6 has not been implemented yet, the SFC decreased by 0.015 L/kWh from the benchmark. 2. OH of DG Unit 7 was conducted in December 2021, and the SFC was improved. As only a year and a half has passed after the OH, SFC value has been good.
Indicator ②	Number of the units Economic Dispatch Control (EDC) properly applied (Target number set at the beginning of the Project: 5 units)	• Verification test on the possibility of EDC operation was conducted during a visit in February 2019. As the current DG dispatching done by MEC operator almost matched with the load distribution for each DG unit calculated by EDC program, the result showed no appreciable effect. The small number of DG units being operated (2-unit operation) is another possible factor for the result. • As the result suggests that improvement in SFC is unlikely with EDC, the Expert Team decided that introducing EDC and increasing burden on the operators would not be ideal.
Indicator	Improvement of performance ratio for	• Performance ratio of the pilot PV facilities

③	RE power generation systems (better than the baseline data set at the beginning of the Project)	before and after the project are compared in the table below.
Indicator ④	Proper application of planning and O&M method of Hybrid Power Generation System	• As RE integration plan and RE O&M manual were collaboratively revised to suit their situation, its proper application is expected.
Indicator②③is to be evaluated with counterpart self-evaluation using check sheet that summarizes judgment criteria for “proper application”, etc., evaluation by Japanese experts, and stakeholder opinion.		

Indicator ① (Comparison of specific fuel consumption)

No.	DG facility name	Baseline	Latest data	Note (Reasons for low value, etc.)
1	DG Unit 6	0.269 L/kWh	0.284 L/kWh ↑	October 19, 2022
2	DG Unit 7		0.263 L/kWh ↓	March 19, 2023

Indicator ② (Comparison of performance ratio)

No.	PV facility name	Baseline	2023 average	Note (Reasons for low value, etc.)
1	Hospital	73%	-	• PR value cannot be measured as the PC storing the generation data has not been working. • Suggestion to replace both the PC hardware and software was made (in the February 2023 visit) • IT department of MEC is to deal with the issue for recovery (according to interview with Mr. Francis in July 2023) .
2	Water Reservoir	70%	-	• Cable insulation condition has been reported to be bad since the beginning of the project. • Although the junction box was burnt, it remained without repair due to issue with installing service provider. • MEC responded independently to improve the situation (replacing PCS in anticipation of malfunction, and replacing buried cable with overhead facility). • PCS replacement and cable laying work was under way. • It was confirmed that resuming operation during the project period would be unlikely. • All the cables were disconnected

				(confirmed during the February 2023 visit). • Operation is expected to resume by Easter (Spring) 2024 (Interview with Mr. Steve at the end of June 2023).

8.6.4 Degree of achievement for project output

Output 1): Appropriate and economical system for O&M of Diesel Generators (DGs) is enhanced.			Status of achievement: Not yet achieved
Indicator ①	Adequacy on the use of the work schedule, check sheets and manual for the maintenance work for the pilot DG units	• Maintenance work plan was made, but regular updates will be necessary. • The check sheets have not been used by MEC, because the data has been managed with data logger. • The manual is planned to be revised again in the next OH.	
Indicator ②	Number of training participants who are conducting operation and maintenance of DG based on the learnings from the training program	• The number of total cumulative participants from MEC and KAJUR for DG trainings was 374 people. • On-site trainings for technical support were conducted for 5 times in total, with cumulative participants of 158 people. • Online technical trainings were conducted for 6 times in total, with cumulative participants of 32 people. • Support for OH of DG Unit 7 was provided remotely for 20 days. 2 core trainers participated, making the cumulative total participants to be 40 people. • Online follow-ups for manual revision were conducted for 3 times in total, with cumulative participants of 13 people. • Regional trainings were held for 3 times (2 times in Fiji, once via online), with cumulative participants of 54 people. • Seminars were held for 2 times, with 8 total participants.	
Output 2): Methodology for appropriate planning and O&M of Hybrid Power Generation System is established.			Status of achievement: Achieved
Indicator ③, ④	1. Number of training participants who learned the planning method of the Hybrid Power Generation System 2. Number of training participants who are conducting O&M of RE facilities based on the learnings from the training program	• The number of total cumulative participants from MEC and KAJUR for RE trainings was 332 people. • On-site trainings for technical support were conducted for 6 times in total, with cumulative participants of 174 people. • Online technical trainings were conducted for 8 times in total, with cumulative participants of 44 people. • Online follow-ups for manual revision were conducted for 6 times in total, with cumulative participants of 20 people • Regional trainings were held for 3 times (2 times in Fiji, once via online), with cumulative participants of 84 people.	

		• Seminars were held for 2 times, with total 10 participants.
Indicator ⑤	Preparation of related manuals for Hybrid Power Generation System	RE integration plan and RE O&M manual (draft) were made based on the Japanese standards, revised in collaboration with C/P to suit the condition of MEC, and were approved by CEO.
Indicator ⑥	Adequacy of the use of the related manuals for Hybrid Power Generation System	As RE integration plan and RE O&M manual were collaboratively revised to suit their situation, its proper application is expected.

8.6.5 Capacity assessment

The following two items are important in order to achieve the objectives of this project in RMI.

1. Enhancement of appropriate and economical system for O&M of Diesel Generators (DGs)

2. Establishment of methodology for appropriate planning and O&M of RE

In order to achieve the abovementioned outputs, the Expert Team developed a curriculum that suited MEC's needs and provided trainings.

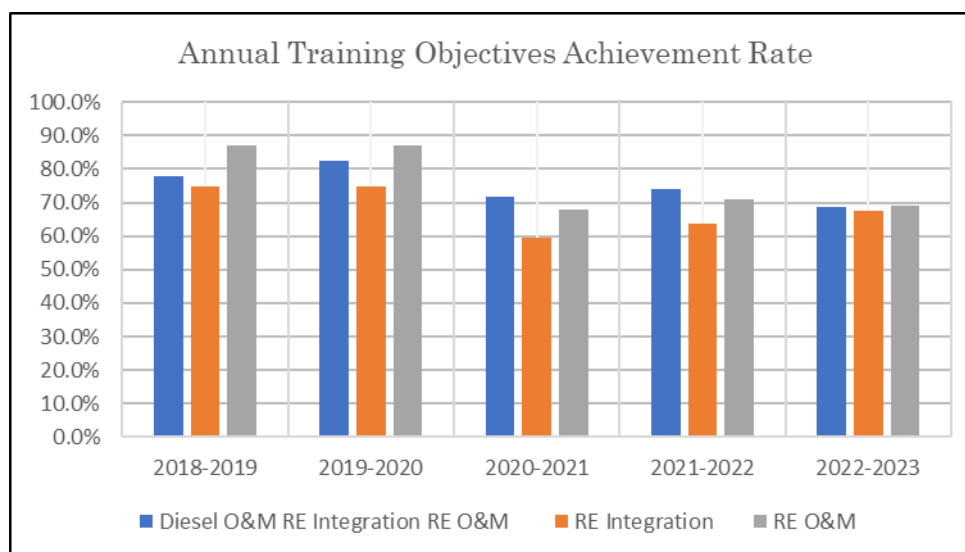
However, as on-site trainings that would have been effective became unfeasible due to COVID-19 pandemic, online trainings were provided to supplement them.

In addition, annual capacity assessment was conducted to assess the degree of achievement in the core trainers' knowledge and skills. The assessment was made with test results, evaluations from their superiors, evaluation by the Expert team, and training attendance rate as the indicators. See Capacity Assessment Report for each period for details.

The results of the five-year project are shown in the following graph.

Annual Training Objectives Achievement rate

MEC / KAJUR / NEO average	2018-2019	2019-2020	2020-2021	2021-2022	2022-2023
Diesel O&M	78.0%	82.5%	71.6%	74.0%	68.8%
RE Integration	75.0%	75.0%	59.4%	63.7%	67.5%
RE O&M	87.0%	87.0%	68.0%	71.0%	69.0%



1. The average training goal achievement rate of the five terms was 74.98% for appropriate and economical DG O&M. Although the average rate for the first two years of the project was 80% that showed the effect of on-site hands-on training, the average for the subsequent three years from 2020 when the training shifted online due to COVID-19 pandemic was approximately 71.5%, down by 8.5%. This shows that on-site face-to-face training is more effective than online training.

There is no problem in particular with the maintenance skills of the DG core trainers of MEC, and they are capable of conducting OH without inviting a supervisor from overseas. However, their lack of PC skills might have been the reason for their inability to prepare the reports and records requested during the project by the Expert Team. As such PC skills for keeping records will be essential in the future, this should be taken in consideration in future trainings.

Support from the generation manager for revising the future maintenance plan and the manuals would be necessary for the moment.

2. With regard to appropriate RE integration plan, the average achievement rate of the 5 years was 68.12%, and the achievement rate for the final term of 2022-2023 was 67.5%. It seemed that the core trainers did not have sufficient basic background knowledge required to understand the subject. They will need more experience to improve their skills for revising the manuals developed in this project.
3. The core trainers for RE integration plan also participated in the trainings for appropriate RE O&M as main participants. The average achievement rate of the five years was 74.40%, a commendable result. As they possess sufficient skills, providing support from MEC management to ensure the sustainability of O&M activities for the existing facilities, by strengthening maintenance system and providing necessary spare parts, is necessary. There are only 2 PV maintenance staff of MEC, and as they can go to remote island for work for a long time, it is concerned that inspection work in Majuro may not be implemented according to schedule.

8.7 Joint Coordinating Committee (JCC)

JCC meeting is held annually as a principle to consult and gain approval on project planning, assess the status of progress and achievement, consider challenges and important matters, and gain consensus. JCC meetings were held for two times in the phase 1 of the project, and for three times in the phase 2, therefore a total of five meetings were held for each country. The list of JCC meetings is shown in Table 8.8, and the record and overview of the meetings for each country are shown in Sections 8.8.1 through 8.7.5

Table 8.8 List of JCC meetings

	Fiji	Tuvalu	Kiribati	FSM	RMI
1st JCC meeting	Oct. 2, 2017	Sep. 11, 2017	Sep.20, 2017	Nov. 25, 2017	Dec. 4, 2017
	On-site	On-site	On-site	On-site	On-site
2nd JCC meeting	Dec.14, 2018	Nov. 5, 2018	Oct. 26, 2018	Jan. 29, 2019	Feb. 5, 2019
	On-site	On-site	On-site	On-site	On-site
3rd JCC meeting	Nov.15, 2019	Oct. 14, 2019	Oct. 3, 2019	Jan. 24, 2020	Jan.31,2020
	On-site	On-site	On-site	On-site	On-site
4th JCC meeting	Nov. 9, 2021	Oct. 27, 2021	Oct. 29, 2021	Oct. 26, 2021	Nov. 1, 2021
	Online	Online	Online	Online	Online
5th JCC meeting	Feb.10, 2023	May 9, 2023	Oct. 7, 2022	Apr. 7, 2023	Mar.22,2023
	On-site	Online	On-site	Online	On-site

8.7.1 Fiji

1) 1st JCC meeting

The 1st JCC meeting was held on October 2, 2017.

1st JCC meeting record (Fiji)

Date	October 2, 2017
Venue	Ministry of Infrastructure, Transport, Disaster Management & Meteorological Services Conference room
Participant	■Ministry of Infrastructure, Transport, Disaster Management & Meteorological Services (DOE) • Mr. Lui Naisara • Mr. Mikaele Belena • Mr. Inia Saula • Mr. Atesh Gosai ■Energy Fiji Limited (EFL) • Mr. Karunesh Rao • Mr. Alvin Prasad ■Pacific Power Association (PPA) • Mr. Andrew Daka ■JICA Fiji Office • Mr. Hiroyuki Sawada • Ms. Atsumi Kani • Ms. Chand Seema ■JICA Expert/Expert Team

	• Tadayuki Ogawa, Luis Kakefuku, Masanori Shimabuku, Hiroyuki Nakachi, Chihiro Tobaru
Agenda	1.Revision of PDM and PO 2.Project organization 3.TOT Training 4. Training in Japan
Overview	• Agreement was made on the content of support (PDM). • Participation in the Training in Japan in February next year is to be determined by the end of this month and will be reported. In addition to the 2 participants, addition of 1 participant for the training (at own expense) was requested. Japanese side is to consider and respond. • TOT training in Fiji is to be held at Lautoka Training Center in Nadi. Transportation cost from Suva was requested to be borne by Japanese side, but Fiji side is to consider to bear it first.
 Group photo of the meeting participants	

2) 2nd JCC meeting

The 2nd JCC meeting was held on December 14, 2018.

2nd JCC meeting record (Fiji)

Date	December 14, 2018
Venue	Ministry of Infrastructure, Transport, Disaster Management & Meteorological Services Conference room
Participant	■ Ministry of Infrastructure, Transport, Disaster Management & Meteorological Services (DOE) • Mr. Lui Naisara • Mr. Jeke Pai • Mr. Filimoni Tarai ■ Energy Fiji Limited (EFL) • Mr. Hasmukh Patel • Mr. Karunesh Rao ■ Pacific Power Association (PPA) • Mr. Gordon Chang ■ JICA Fiji Office • Ms. Yukari Ono • Mr. Yuma Eguchi • Ms. Chand Seema

	■ JICA Expert/Expert Team • Tadayuki Ogawa, Luis Kakefuku, Hideyasu Hokama
Agenda	1. Revision of PDM and PO 2. Project organization 3. Third Country Training 4. Equipment to be provided 5. Training manual
Overview	• The content of PDM was reviewed, and mutually confirmed the content of support. • The content of PO was reviewed, and mutually confirmed the schedule. • Project Monitoring Sheet was reviewed and mutually confirmed the implementing status. • Request was made on the attendance rate of the Project Counterpart (Core Trainers). • Content of the meeting minutes was mutually confirmed.
 Signing of meeting minutes  Group photo of the meeting participants	

3) 3rd JCC meeting

The 3rd JCC meeting was held on November 15, 2019.

3rd JCC meeting record (Fiji)

Date	November 15, 2019
Venue	Ministry of Infrastructure, Transport, Disaster Management & Meteorological Services Conference room
Participant	■ Ministry of Infrastructure, Transport, Disaster Management & Meteorological Services (DOE) • Mikaele Belena ■ Energy Fiji Limited (EFL) • Mr. Karunesh Rao ■ Pacific Power Association (PPA) • Mr. Gordon Chang ■ JICA Fiji Office • Chief representative Ono • Officer Eguchi • Ms. Chand Seema ■ JICA Expert/Expert Team • Tadayuki Ogawa, Luis Kakefuku, Hideyasu Hokama, Takahisa Watanabe

Agenda	1.Confirmation of Objectively Verifiable Indicator (OVI) 2.Confirmation of C/P of implementing organization in the target country (DOE,EFL,PPA) 3.1st Regional Training (Schedule, program, lecturers, etc.) 4. Future plan for regional trainings
Overview	- Implementing status of PDM and PO was mutually confirmed by both Fiji and JICA sides. - Objectives and contents of the 1st Regional Training was explained. 20 Candidate trainers for the regional trainings were confirmed (EFL 17 people, DOE 3 people). - Scheduling Expanded Regional Training for 7 additional countries (Cook Islands, Tonga, Samoa, Palau, Nauru, Solomon Islands, PNG) in 2020 was confirmed.
 During the JCC meeting  Signing of meeting minutes	

4) 4th JCC meeting

The 4th JCC meeting was held on November 9, 2021.

4th JCC meeting record (Fiji)

Date	November 9, 2021
Venue	Online meeting
Participant	■ Ministry of Infrastructure, Transport, Disaster Management & Meteorological Services (DOE) • Mr. Taitusi Vakadravuyaca • Mr. Mikaele Belena • Mr. Deepak Chand • Mr. Jeke Pai • Mr. Filimoni Tarai ■ Energy Fiji Limited (EFL) • Mr. Hasmukh Patel / Mr. Karunesh Rao ■ Pacific Power Association (PPA) • Gordon Chang ■ JICA Fiji Office • Chief representative Amaike • Officer Eguchi ■ JICA Expert/Expert Team • Tadayuki Ogawa, Luis Kakefuku, Masanori Shimabuku, Hideyasu Hokama, Hirokazu Nakamura

Agenda	1. Confirmation of Objectively Verifiable Indicator (OVI) 2. Confirmation of C/P of implementing organization in the target country (DOE, EFL, PPA) 3. Extension of project period 4. Technical support in the next phase 5. Candidate trainer
Overview	• Implementing status of PDM and PO was mutually confirmed by both Fiji and JICA sides. • Due to COVID-19 travel restrictions, the end of the project period was extended from June 2022 to June 2023. • The following were proposed for technical support items in the next phase. 1) Evaluation of impact on power system with simulation tool 2) Evaluation method of impact of variable RE expansion on power grid 3) Grid code 4) Demand response • 19 Candidate trainers for the regional trainings were confirmed (EFL 16 people, DOE 3 people). • Requirements for certification of trainers to be given at project completion were explained.
 During the JCC meeting (DOE)  During the JCC meeting (EFL)	

5) 5th JCC meeting

The 5th JCC meeting was held on February 10, 2023.

5th JCC meeting record (Fiji)

Date	February 10, 2023
Venue	DOE Conference room
Participant	■ Ministry of Infrastructure, Transport, Disaster Management & Meteorological Services (DOE) • Mr. Taitusi Vakadravuyaca • Mr. Mikaele Belena • Mr. Deepak Chand • Mr. Jeke Pai ■ Energy Fiji Limited (EFL) • Mr. Karunesh Rao • Mr. Maciu Waqaira ■ Embassy of Japan • Mr. Hiroki Tazawa ■ JICA Fiji Office • Chief representative Amaike • Officer Iwatani • Ms. Chand Seema

	■ JICA Expert/Expert Team • Tadayuki Ogawa, Naohiro Kojima, Luis Kakefuku, Watanabe
Agenda	1. Confirmation of Objectively Verifiable Indicator (OVI) 2. Confirmation of C/P of implementing organization in the target country (DOE, EFL, PPA) 3. Certification of trainers 4. 3rd Expanded Regional Training 5. Participation in TOTs-1 6. Training in Japan 7. Future training plan 8. Provision of equipment
Overview	• Implementing status of PDM and PO was mutually confirmed by both Fiji and JICA sides. • Regional trainer certificate is to be issued at project completion. • Expanded regional training to be held 4/17 - 4/28. • Training in Japan is scheduled in mid-May. • Thermographic Camera was provided for EFL.
  During the JCC meeting Group photo of the meeting participants	

8.7.2 Tuvalu

1) 1st JCC meeting

The 1st JCC meeting was held on September 11, 2017.

1st JCC meeting record (Tuvalu)

Date	September 11, 2017
Venue	Funafuti Lagoon Hotel Conference room
Participant	■ Ministry of Public Utilities and Infrastructure (MPUI) • Mr. Siemai Patiale Apinelu • Mr. Nielu Meisake • Mr. Imo Fiamalua • Mr. Puafolau G Malu ■ Tuvalu Electricity Corporation (TEC) • Mr. Mafalu Lotolua • Mr. Fatoga Talama • Mr. Namoto Kelisiano • Mr. Teafa Tautu ■ JICA Fiji Office • Mr. Shunichiro Ikeda • Ms. Atsumi Kani ■ JICA Expert/Expert Team • Tadayuki Ogawa, Luis Kakefuku, Masanori Shimabuku

Agenda	1. Revision of PDM and PO 2. Project monitoring sheet 3. Project implementing method 4. Training in Japan
Overview	• Agreement was made on the content of support (PDM). • Ministry of Public Utilities and Infrastructure (MPUI) staff is to attend RE lectures. • Participants for the Training in Japan in February next year were decided: 1) Molipi Tausi (Director of Energy) 2) Fatoga Talama (Generation Manager) • Japanese side to procure and replace existing 3 units of flow meter *Installation by Tuvalu side
 Signing of meeting minutes  Group photo of the meeting participants	

2) 2nd JCC meeting

The 2nd JCC meeting was held on November 5, 2018.

2nd JCC meeting record (Tuvalu)

Date	November 5, 2018
Venue	Funafuti Lagoon Hotel Conference room
Participant	■ Ministry of Public Utilities and Infrastructure (MPUI) Mr. Avafoa Irata ■ Tuvalu Electricity Corporation (TEC) • Mr. Mafalu Lotolua • Mr. Fatoga Talama • Mr. Teafa Tautu • Mr. Polu Tanei ■ JICA Expert/Expert Team • Tadayuki Ogawa, Luis Kakefuku, Yusuke Kuniba, Kaoru Ikehara
Agenda	1. Revision of PDM and PO 2. Project monitoring sheet 3. Project activity status 4. Regional training in Fiji 5. Equipment to be provided 6. Provision of a draft manual

Overview	• Implementing status of PDM and PO was mutually confirmed by both Tuvalu and JICA sides. • Change of core trainer (if any) was confirmed. • Pilot DG improvement plan was confirmed. • Baseline for SFC and PR were confirmed. • Objectives and contents of the 1st Regional Training to be held in Fiji next year was explained. • Provided equipment to be needed for maintenance was explained. • Draft manual is to be made and submitted.
	
During the meeting	Conclusion of meeting minutes

3)3rd JCC meeting

The 3rd JCC meeting was held on October 14, 2019.

3rd JCC meeting record (Tuvalu)

Date	October 14, 2019
Venue	Funafuti Lagoon Hotel Conference room
Participant	■ Ministry of Transport、 Energy and Tourism (MTET) Mr. Tele Siamua ■ Tuvalu Electricity Corporation(TEC) • Mr. Mafalu Lotolua • Mr. Namoto Kelisiano • Mr. Teafa Tautu • Mr. Taaku Sekielu ■ JICA Expert/Expert Team • Luis Kakefuku, Hideyasu Hokama
Agenda	1. Revision of PDM and PO 2. Safety measure 3. Project monitoring sheet 4. Project activity status 5. Regional training in Fiji 6. Equipment to be provided 7. Provision of a draft manual

Overview	• Implementing status of PDM and PO was mutually confirmed by both Tuvalu and JICA sides. • Change of core trainer (if any) was confirmed. • Pilot DG improvement plan was confirmed. • Preparation status of DG OH was confirmed. • Objectives and contents of the 1st Regional Training to be held in Fiji next year was explained. • Manual update
	
During the meeting	Signing of meeting minutes

4)4th JCC meeting

The 4th JCC meeting was held on October 27, 2021.

4th JCC meeting record (Tuvalu)

Date	October 27, 2021
Venue	Online meeting
Participant	■ Ministry of Transport、 Energy and Tourism (MTET) Mr. Vavau Fatuuga Permanent Secretary Mr. Simona Kilei, Director of Energy ■ Tuvalu Electricity Corporation(TEC) Mr. Mafalu Lotolua, General Manager Mr. Namoto Kelisiano, Generation Manager Mr. Taaku Esikielu, Distribution Manager ■ JICA Fiji Office • Chief representative Amaike, Officer Eguchi ■ JICA Headquarter/JICA Expert/Expert Team • Suzuki, Kojima, Ogawa, Kakefuku, Shimabuku, Hokama, Nakamura, Gaja • Hashimoto(Support)
Agenda	1. Revision of PDM and PO 2. Project monitoring sheet 3. Project activity status 5. Technical support in the next phase 6. Manual revision

Overview	• Implementing status of PDM and PO was mutually confirmed by both Tuvalu and JICA sides. • Change of core trainer (if any) was confirmed. • Due to COVID-19 travel restrictions, the end of the project period was extended from June 2022 to June 2023. • The following were proposed for technical support items in the next phase. 1) Evaluation of impact on power system with simulation tool 2) Evaluation method of impact of variable RE expansion on power grid 3) Grid code / Demand response • Preparation status of DG OH was confirmed. • Manual update
 During the meeting	

5) 5th JCC meeting

The 5th JCC meeting was held on May 9, 2023.

5th JCC meeting record (Tuvalu)

Date	May 9, 2023
Venue	Online meeting
Participant	■ Ministry of Transport、 Energy and Tourism (MTET) Mr. Asela Peneueta, Acting Secretary Mr. Fakalogomuna Houati, Renewable Energy Specialist ■ Tuvalu Electricity Corporation(TEC) Mr. Mafalu Lotolua, General Manager Mr. Namoto Kelisiano, Generation Manager Mr. Taaku Sekielu, Distribution Manager ■ JICA Fiji Office • Chief representative Amaike, Officer Iwatani ■ JICA Headquarter/JICA Expert/Expert Team • Ogawa, Kakefuku, Shimabuku, Hokama, Nakamura, Watanabe
Agenda	1. Revision of PDM and PO 2. Project monitoring sheet 3. Project activity status 4. Extension of project period 5. Technical support in the next phase

	6. Manual revision
Overview	- Implementing status of PDM and PO was mutually confirmed by both Tuvalu and JICA sides. - Change of core trainer (if any) was confirmed. - Sharing of photos and reports related to pilot DG improvement plan was requested to confirm the achievement status. - Confirmation of the storage condition of the provided equipment was requested. - TEC side is to secure necessary budget to repair broken PV system. - Technical support items for the next phase will be discussed with the Government of Tuvalu around August.
 During the meeting	

8.7.3 Kiribati

1)1st JCC meeting

The 1st JCC meeting was held on September 20, 2017.

1st JCC meeting record (Kiribati)

Date	September 20, 2017
Venue	Ministry of Infrastructure and Sustainable Energy(MISE) Conference room
Participant	■Ministry of Infrastructure and Sustainable Energy(MISE) • Mr. Benjamin Tokataake • Mr. Tioti Taaitee • Ms. Miriam I Tikana • Mr. Thomas Taoaba ■Public Utilities Board(PUB) • Mr. Wayne Brearly • Mr. Tenikoria Katauea • Mr. Tiaon Ankitino ■JICA Fiji Office • Mr. Shinya Tamio • Ms. Atsumi Kani • Ms. Akari Murao ■JICA Expert/Expert Team • Tadayuki Ogawa, Luis Kakefuku, Masanori Shimabuku, Yoshiharu Uechi, Toshiaki Kaneko
Agenda	1. Revision of PDM and PO 2. Project monitoring sheet

	3. Project implementing method 4. Training in Japan
Overview	• Agreement was made on the content of support (PDM). • Ministry of Public Utilities and Infrastructure (MPUI) staff is to attend RE lectures. • Participants for the Training in Japan in February next year were decided to be the following 2 people: 1) Kireua B. Kaiea (Energy Planner, MISE) 2) Tenikoria Katauea (Power Engineering Manager, PUB) • Japanese side to procure and replace existing 4 units of flow meter *Installation by Kiribati side
 Signing of meeting minutes  Group photo of the meeting participants	

2)2nd JCC meeting

The 2nd JCC meeting was held on October 26, 2018.

2nd JCC meeting record (Kiribati)

Date	October 26, 2018
Venue	Ministry of Infrastructure and Sustainable Energy(MISE) Conference room
Participant	■ Ministry of Infrastructure and Sustainable Energy(MISE) • Mr. Arobati Brechtefeld • Ms. Mwaati Oten • Mr. Thomas Taoaba ■ Public Utilities Board(PUB) • Mr. Wayne Brearly • Mr. Tenikoria Katauea ■ JICA Kiribati Field Office • Mr. Takashi Ikeda ■ JICA Expert/Expert Team • Tadayuki Ogawa, Luis Kakefuku, Kaoru Ikehara, Yoshiharu Uechi, Toshiaki Kaneko
Agenda	1. Revision of PDM and PO 2. Project monitoring sheet 3. Project activity status 4. Regional training in Fiji 5. Equipment to be provided 6. Provision of a draft manual

Overview	• Implementing status of PDM and PO was mutually confirmed by both Kiribati and JICA sides. • Change of core trainer (if any) was confirmed. • Pilot DG improvement plan was confirmed. • Objectives and contents of the 1st Regional Training to be held in Fiji next year was explained. • Provided equipment to be needed for maintenance was explained. • Draft manual is to be made and submitted.
	
During the meeting	Conclusion of meeting minutes

3)3rd JCC meeting

The 3rd JCC meeting was held on October 3, 2019.

3rd JCC meeting record (Kiribati)

Date	October 3, 2019
Venue	Ministry of Infrastructure and Sustainable Energy(MISE) Conference room
Participant	■ Ministry of Infrastructure and Sustainable Energy(MISE) • Mr. Saitofi Mika • Ms. Mwaati Oten • Mr. Thomas Taoaba ■ Public Utilities Board(PUB) • Mr. Tenikoria Katauea • Mr. Tebwatia Takau ■ JICA Expert/Expert Team • Luis Kakefuku, Hideyasu Hokama
Agenda	1. Revision of PDM and PO 2. Asset management plan 3. Project monitoring sheet 4. Project activity status 5. Regional training in Fiji 6. Equipment to be provided 7. Provision of a draft manual

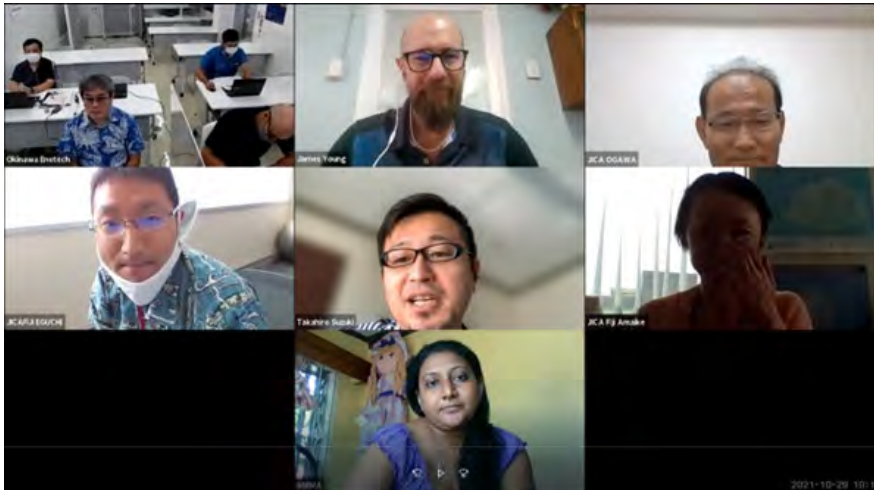
Overview	• Implementing status of PDM and PO was mutually confirmed by both Kiribati and JICA sides. • Change of core trainer (if any) was confirmed. • Pilot DG improvement plan was confirmed. • Preparation status of DG OH was confirmed. • Objectives and contents of the 1st Regional Training to be held in Fiji was explained. • Manual update
	
During the meeting	Signing of meeting minutes

4)4th JCC meeting

The 4th JCC meeting was held on October 27, 2021.

4th JCC meeting record (Kiribati)

Date	October 27, 2021
Venue	Online meeting
Participant	■ Ministry of Infrastructure and Sustainable Energy(MISE) Dr. Farran Redfern, Secretary Mr. Arobati Brechtefeld Deputy Secretary Mr. Kireua Kaiea, Energy Planner : Mr. Simon Reier, Urban Energy Planner ■ Public Utilities Board(PUB) Mr. James Yong, Chief Executive Officer Mr. Tenikoria Katauea, Power Engineering Manager ■ JICA Fiji Office • Chief representative Amaike, Officer Eguchi ■ JICA Headquarter/JICA Expert/Expert Team • Suzuki, Ogawa, Kakefuku, Shimabuku, Hokama, Watanabe, Gaja(Support)
Agenda	1. Revision of PDM and PO 2. Project monitoring sheet 3. Project activity status 4. Extension of project period 5. Manual revision

Overview	• Implementing status of PDM and PO was mutually confirmed by both Kiribati and JICA sides. • Change of core trainer (if any) was confirmed. • Due to COVID-19 travel restrictions, the end of the project period was extended from June 2022 to June 2023. • Manual update
 During the meeting	

5) 5th JCC meeting

The 5th JCC meeting was held on October 7, 2022.

5th JCC meeting record (Kiribati)

Date	October 7, 2022
Venue	MISE Conference room
Participant	■ Ministry of Infrastructure and Sustainable Energy(MISE) Ms. Moanibou Aareke Muller Ms. Miriam Toatara Mr. Thomas Taoaba ■ Public Utilities Board(PUB) Mr. James Yong, Chief Executive Officer ■ JICA Fiji Office • Officer Iwatani ■ JICA Kiribati Field Office • Matsui ■ JICA Headquarter/JICA Expert/Expert Team • Ogawa, Kakefuku, Hokama
Agenda	1. Revision of PDM and PO 2. Project monitoring sheet 3. Project activity status 4. Manual revision

Overview	• Implementing status of PDM and PO was mutually confirmed by both Kiribati and JICA sides. • Change of core trainer (if any) was confirmed. • Sharing of photos and reports related to pilot DG improvement plan was requested to confirm the achievement status. • Program and schedule of the 3rd Regional Training to be held in Fiji was explained. • Proper storage and maintenance of the equipment (already provided or to be provided) was requested. • JICA Expert Team requested the content of Unit 5 OH plan to be shared with the team. • Manual update
	
Signing of meeting minutes	Group photo of the meeting participants

8.7.4 FSM

1)1st JCC meeting

The 1st JCC meeting was held on November 25, 2017.

1st JCC meeting record (FSM: Kosrae state)

Date	November 25, 2017
Venue	Training room in the governor's office
Participant	■ Department of Resources and Development (R&D) • Mr. Marion Henry • Mr. Hubert Yamada ■ Kosrae State Government • Mr. Hon. Carson Sigrah ■ Yap State Public Service Corporation(YSPSC) • Mr. Victor Naveyan ■ Chuuk Public Utility Corporation(CPUC) • Mr. Mark Waite ■ Pohnpei Utilities Corporation(PUC) • Mr. Nixon T.Anson • Dackson Solomon ■ Kosrae Utilities Authority(KUA) • Mr. Nixon T.Anson • Dackson Solomon ■ JICA Micronesia Office • Shinji Shibata • Ms. Trish Faraah E.Billen ■ JICA Expert/Expert Team • Tadayuki Ogawa, Luis Kakefuku, Masanori Shimabuku, Hiroyuki Nakachi, Chihiro Tobaru, Takahisa Watanabe

Agenda	1. Revision of PDM and PO 2. Project monitoring sheet 3. Project implementing method 4. Training in Japan 5. Capacity assessment
Overview	• Agreement was made on the content of support (PDM). • Participants for the Training in Japan in February next year were decided to be the following 3 people: 1) Victor Nabeyan (Assistant General Manager, YSPSC) 2) Dackson Solomon (Power Generation Manager, PUC) 3) Hairom Livae (Customer Service Supervisor, KUA) • Information on the cost of the existing flow meter to be procured was requested to Pohnpei and Kosrae. • JICA Expert Team is to advice on the possibility of introducing EMS for efficient operation. • Next JCC meeting is to be held in Pohnpei.
 Signing of meeting minutes  Group photo of the meeting participants	

2) 2nd JCC meeting

The 2nd JCC meeting was held on January 29, 2019.

2nd JCC meeting record (FSM: Pohnpei state)

Date	January 29, 2019
Venue	PUC Conference room
Participant	■ Department of Resources and Development (R&D) • Mr. Marion Henry • Mr. Hubert Yamada ■ Yap State Public Service Corporation(YSPSC) • Mr. Victor Naveyan ■ Chuuk Public Utility Corporation(CPUC) • Ms. Lei Shirai ■ Pohnpei Utilities Corporation(PUC) • Mr. Nixon T.Anon • Dackson Solomon ■ Kosrae Utilities Authority(KUA) • Mr. Fred Skilling ■ Embassy of Japan • Councilor Sugiyama, Second Secretary Oda ■ JICA Micronesia Office • Shinji Shibata • Emi Toshima • Ms. Trish Faraah E.Billen ■ JIA Headquarter/JICA Expert/Expert Team • Research Officer Suzuki, Chief Research Officer Okumura, Tadayuki Ogawa, Masanori

	Shimabuku, Hirokazu Nakamura, Yuma Uezu, Yusuke Kuniba, Takahisa Watanabe ■ Consultant in charge of project evaluation • Kikukawa
Agenda	1. Revision of PDM and PO 2. Project monitoring sheet 3. Project activity status 4. Regional training in Fiji 5. Equipment to be provided 6. Provision of a draft manual
Overview	• Implementing status of PDM and PO was mutually confirmed by both FSM and JICA sides. • Change of core trainer (if any) was confirmed. • Pilot DG improvement plan was confirmed. • Objectives and contents of the 1st Regional Training to be held in Fiji next year was explained. • Provided equipment to be needed for maintenance was explained. • Draft manual is to be made and submitted.
  Signing of meeting minutes Group photo of the meeting participants	

3) 3rd JCC meeting

The 3rd JCC meeting was held on January 24, 2020.

3rd JCC meeting record (FSM: Yap state)

Date	January 24, 2020
Venue	Early Childhood Education Center
Participant	■ Department of Resources and Development (R&D) • Mr. Marion Henry • Mr. Hubert Yamada ■ Yap State Public Service Corporation (YSPSC) • Mr. Faustino R. Yangmong • Mr. John Chieng ■ Chuuk Public Utility Corporation (CPUC) • Ms. Lei Shirai ■ Pohnpei Utilities Corporation (PUC) • Mr. Nixon ■ Kosrae Utilities Authority (KUA) • Mr. Arthy G. Nena • Mr. Fred Skilling • Mr. Casey Freddy ■ JICA Micronesia Office • Emi Toshima • Ms. Trish Faraah E. Billen ■ JICA Expert/Expert Team • Tadayuki Ogawa, Luis Kakefuku, Hideyasu Hokama, Hiroyuki Nakachi

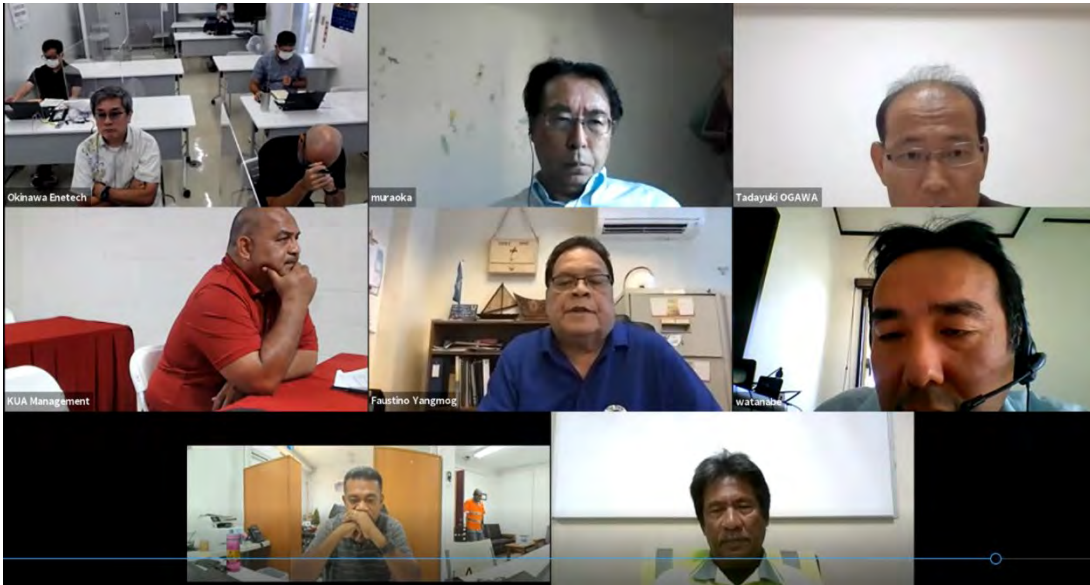
Agenda	1. Revision of PDM and PO 2. Project monitoring sheet 3. Project activity status 4. 2nd Regional training in Fiji 5. Provision of a draft manual
Overview	• Implementing status of PDM and PO was mutually confirmed by both FSM and JICA sides. • Change of core trainer (if any) was confirmed. • Pilot DG improvement plan was confirmed. • Discussion on SFC based on the result of 2019 was made. • Overview of the 2nd Regional Training (to be held around Oct. 2020) • Provided equipment to be needed for maintenance was explained. • Discussion on manual update • Next JCC meeting is to be held in Chuuk state (around January 2021).
  During the meeting Group photo of the meeting participants	

4) 4th JCC meeting

The 4th JCC meeting was held on October 26, 2021.

4th JCC meeting record (FSM)

Date	October 26, 2021
Venue	Online meeting
Participant	■ Yap State Public Service Corporation(YSPSC) Mr. Faustino Yangmong, General Manager Mr. Victor Nabeyan, Assistant General Manager ■ Chuuk Public Utility Corporation(CPUC) Ms. Lei Shirai, Chief Financial Officer ■ Pohnpei Utilities Corporation(PUC) Mr. Nixon Anson, General Manager Mr. Dackson Solomon, Manager, Power Generation Mr. Sidney Kilmete, Manager, Renewable Energy ■ Kosrae Utilities Authority(KUA) Mr. Fred Skilling, General Manager Mr. Casey Freddy, Customer Service Supervisor ■ JICA Micronesia Office • Chief representative Muraoka ■ JICA Expert/Expert Team • Ogawa, Kakefuku, Shimabuku, Hokama, Nakamura, Watanabe, Gaja • Hashimoto(Support)
Agenda	1. Revision of PDM and PO

	2. Project monitoring sheet 3. Project activity status 4. Manual revision
Overview	• Implementing status of PDM and PO was mutually confirmed by both FSM and JICA sides. • Change of core trainer (if any) was confirmed. • Discussion was made on OH implementation plan in Kosrae. • Discussion was made on SFC and Performance Ratio based on the shared data. • Manual update
 During the meeting	

5) 5th JCC meeting

The 5th JCC meeting was held on April 7, 2023.

5th JCC meeting record (FSM)

Date	April 7, 2023
Venue	Online meeting
Participant	■FSM R&D Mr. Faustino Yarofaisug, Assistant Secretary ■Yap State Public Service Corporation(YSPSC) Mr. Faustino Yangmong, General Manager ■Chuuk Public Utility Corporation(CPUC) Ms. Lei Shirai, Chief Financial Officer ■Pohnpei Utilities Corporation(PUC) Mr. Alex Nanpei, Chief of Planning and Engineering Services ■Kosrae Utilities Authority(KUA) Mr. Fred Skilling, General Manager Mr. Casey Freddy, Assistant Manager Mr. Hairom Livaie, Customer Service Supervisor ■JICA Micronesia Office • Chief representative Muraoka

	■ JICA Expert/Expert Team • Ogawa, Kakefuku, Shimabuku, Hokama, Nakamura, Watanabe
Agenda	1. Revision of PDM and PO 2. Project monitoring sheet 3. Project activity status 4. Extension of project period 5. Technical support in the next phase 6. Manual revision
Overview	• Implementing status of PDM and PO was mutually confirmed by both FSM and JICA sides. • Change of core trainer (if any) was confirmed. • Request for KUA to compare SFC value before and after OH was made. • Implementation status of the pilot DG unit operation improvement plan was requested to be shared. • Confirmation of the storage condition of the provided equipment was requested. • It was reported that FSM would be included in the target countries in the next phase.
 During the meeting	

8.7.5 RMI

1)1st JCC meeting

The 1st JCC meeting was held on December 4, 2017.

1st JCC meeting record (RMI)

Date	December 4, 2017
Venue	Ministry of Natural Resources and Commerce(MNRC) Conference room
Participant	■ Ministry of Natural Resources and Commerce(MNRC) • Mr. Iva Reimers-Roberto • Mr. David Paul • Mr. Benjamin Wakefield ■ Marshalls Energy Company(MEC) • Mr. Steve Wakefield ■ Kwajalein Atoll Joint Utility Resources (KAJUR) • Mr. Romeo Alfred

	■ Embassy of Japan in the Republic of the Marshall Islands : Chizuru Seki ■ JICA Marshall Islands Office : • Nobuaki Matsui ■ JICA Expert/Expert Team : Tadayuki Ogawa, Luis Kakefuku, Masanori Shimabuku, Hiroyuki Nakachi, Chihiro Tobaru, Takahisa Watanabe
Agenda	1. Revision of PDM and PO 2. Project monitoring sheet 3. Project implementing method 4. Core trainer 5. Baseline for project evaluation 6. Training in Japan
Overview	• Agreement was made on the content of support (PDM). • Participants for the Training in Japan in February next year were decided to be the following 2 people: 1) Damian Milne (RE Manager, MEC) 2) Charlie Mark (Lead Mechanics, KAJUR) • Unit 7 was decided to be overhauled. Core trainers from KAJUR will also be invited. • Information on the cost of flow meter to be procured for Unit 6 and 7 was requested. • JICA Expert Team is to advice on the possibility of introducing EMS for efficient operation.
 Signing of meeting minutes  Group photo of the meeting participants	

2) 2nd JCC meeting

The 2nd JCC meeting was held on February 5, 2019.

2nd JCC meeting record (RMI)

Date	February 5, 2019
Venue	Ministry of Natural Resources and Commerce (MNRC) Conference room
Participant	■ National Energy Office(NEO) • Ms. Angeline Heine • Mr. Mahendra Kumar ■ Marshalls Energy Company(MEC) • Ms. Kayo Yamaguchi-Kotton • Mr. Damien Milne • Rao Peddi ■ Embassy of Japan • Mr. Norio Saito • Ms. Chizuru Seki ■ JICA Marshall Islands Office • Nobuaki Matsui

	■ JICA Expert/Expert Team • Tadayuki Ogawa, Masanori Shimabuku, Yuma Uezu, Takahisa Watanabe, Kikukawa
Agenda	1. Revision of PDM and PO 2. Project monitoring sheet 3. Project activity status 4. Regional training in Fiji 5. Equipment to be provided 6. Provision of a draft manual
Overview	• Implementing status of PDM and PO was mutually confirmed by both RMI and JICA sides. • Change of core trainer (if any) was confirmed. • Pilot DG improvement plan was confirmed. • Objectives and contents of the 1st Regional Training to be held in Fiji next year was explained. • Provided equipment to be needed for maintenance was explained. • Draft manual is to be made and submitted.
 During the meeting  Signing of meeting minutes	

3) 3rd JCC meeting

The 3rd JCC meeting was held on January 31, 2020.

3rd JCC meeting record (RMI)

Date	January 31, 2020
Venue	Ministry of Natural Resources and Commerce (MNRC) Conference room
Participant	■ National Energy Office(NEO) • Ms. Angeline Heine • Mr. Benjamin Wakefield ■ Marshalls Energy Company(MEC) • Mr. Steve Wakefield • Ms. Kayo Yamaguchi Kotton • Mr. Francis Takatsuki ■ Embassy of Japan • Ms. Hitomi Obata • Mr. Sho Matsumura ■ JICA Marshall Islands Office • Mr. Shumon Yoshihara ■ JICA Expert/Expert Team • Luis Kakefuku, Hideyasu Hokama, Hiroyuki Nakachi, Fumihiro Shinjo (Observer)
Agenda	1. Revision of PDM and PO 2. Project monitoring sheet

	3. Project activity status 4. 2nd Regional training in Fiji 5. Provision of a draft manual
Overview	• Implementing status of PDM and PO was mutually confirmed by both RMI and JICA sides. • Change of core trainer (if any) was confirmed. • Pilot DG improvement plan was confirmed. • Discussion on SFC based on the result of 2019 was made. • Overview of the 2nd Regional Training (to be held around Oct. 2020) • Provided equipment to be needed for maintenance was explained. • Discussion on manual update • Next JCC meeting is to be held in Chuuk state (around January 2021).
  During the meeting Group photo of the meeting participants	

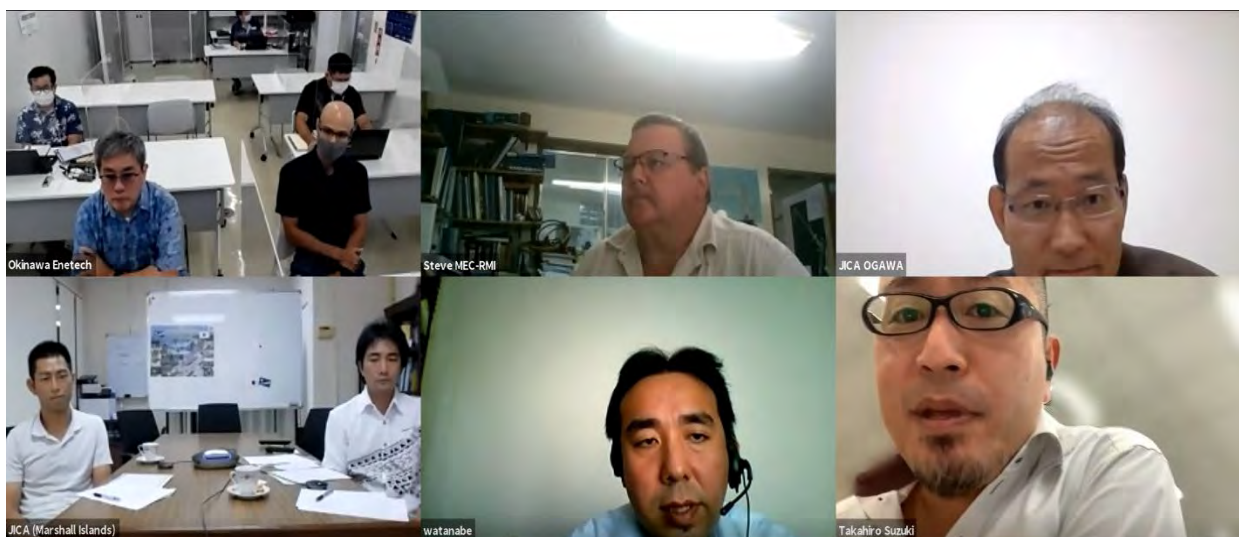
4) 4th JCC meeting

The 4th JCC meeting was held on November 1, 2021.

4th JCC meeting record (RMI)

Date	November 1, 2021
Venue	Online meeting
Participant	■ National Energy Office (NEO) Mr. Benjamin Wakefield, Assistant Director ■ Marshalls Energy Company (MEC) Mr. Steve Wakefield, Chief Technical Officer ■ Kwajalein Atoll Joint Utility Resources (KAJUR) Mr. Joseph Pedro, General Manager Mr. Samuel Greig, Chief Technical Officer ■ JICA Marshall Islands Office Mr. Yoshiki Narita, Project Formulation Advisor ■ JICA Expert/Expert Team • Ogawa, Suzuki, Kakefuku, Shimabuku, Hokama, Watanabe, Gaja (Support)
Agenda	1. Revision of PDM and PO 2. Project monitoring sheet 3. Project activity status 4. Extension of project period 5. Manual revision

Overview	• Implementing status of PDM and PO was mutually confirmed by both RMI and JICA sides. • Change of core trainer (if any) was confirmed. • Discussion was made on SFC and Performance Ratio based on the shared data. • Due to COVID-19 travel restrictions, the end of the project period was extended from June 2022 to June 2023. • Manual update



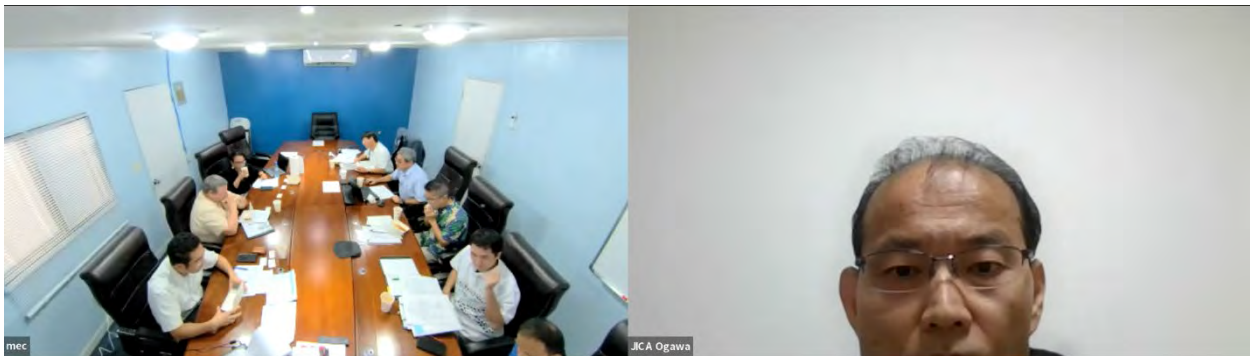
During the meeting

5)5th JCC meeting

The 5th JCC meeting was held on March 22, 2023.

5th JCC meeting record (RMI)

Date	March 22, 2023
Venue	Online meeting
Participant	■ National Energy Office(NEO) Ms. Angeline Heine, Director ■ Ministry of Foreign Affairs & Trade Mr. Takamasa Ando, Aid Coordination Advisor ■ Marshalls Energy Company(MEC) Mr. Steve Wakefield, Chief Technical Officer ■ Kwajalein Atoll Joint Utility Resources (KAJUR) Mr. Joseph Pedro, General Manager (on-line) Mr. Samuel Greig, Chief Technical Officer (on-line) ■ Embassy of Japan in the Republic of the Marshall Islands Mr. Noriyuki Nakamura, First Secretary ■ JICA Marshall Islands Office Mr. Hikoyuki Ukai, Resident Representative Mr. Yoshiki Narita, Project Formulation Advisor Mr. Mea Abraham, Program Officer ■ JICA Expert/Expert Team • Kakefuku, Shimabuku, Hokama, Watanabe

Agenda	1. Revision of PDM and PO 2. Project monitoring sheet 3. Project activity status 4. Extension of project period 5. Technical support in the next phase 6. Manual revision
Overview	• Implementing status of PDM and PO was mutually confirmed by both RMI and JICA sides. • Change of core trainer (if any) was confirmed. • Confirmation of the storage condition of the provided equipment was requested. • JICA will support networking with Yap and Chuuk.
 During the meeting	

8.8 Third country training (regional training)

The regional training is a technical training that EFL, the project implementing organization of Fiji that is well-placed to play a leading role in the power supply services in the Pacific Island region, provides for the other target countries of the project (Tuvalu, Kiribati, FSM, and RMI). The trainings were held three times in total during the project period using EFL-owned Lautoka Training Center as the main venue. Adding on to the skills EFL has cultivated so far, this training aims to provide the participants with opportunities to improve their skills and knowledge with support provided by the Expert Team, and to motivate them to serve as leaders.

① 1st Regional training result

The 1st regional training was held from November 18 to November 29, 2019, which included DG training for five days and RE training for five days. Two participants from the power utility of each target country were requested to participate in this training in general. For RE training, participants from regulatory agencies (1 person) were also accepted.

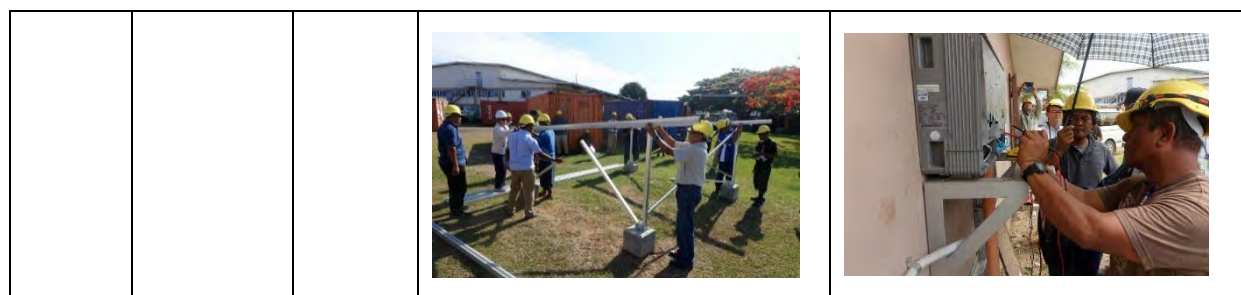
Table 8.9.1 1st Regional training (Persons in charge from the Expert Team)

Session	Date	Area	Persons in charge from the Expert Team
1st	2019/11/18 ~ 2019/11/22	DG	• Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Hideyasu Hokama (DG economic operation/C) • Ken Miyagi (DG maintenance-mechanical/A) • Riki Oshiro (DG maintenance-electrical/A)
	2019/11/25 ~ 2019/11/29	RE	• Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Masanori Shimabuku (Deputy chief/ Hybrid power generation system human resource development/A) • Tomohiro Shiohama (RE integration plan/A) • Kaoru Ikehara (RE O&M/B)

Table 8.9.2 1st Regional training result

Session	Date	Field	Trainer	Participating country/participant (affiliation) (# of participant)
1st	2019/11/1 8~ 2019/11/2 2	DG	■Energy Fiji Limited (EFL) • Uate Biutanaseva • Epeli Rokodrakiya • Semesa Qalo • Sabitesh Ajay Pal • Sumendra Prasad • Waisea Tuamoto • Rusiate Jale Faivakibau • Tobia Waqanitabua Nayaqayaqa • Neipolione Gatanitubei	■Tuvalu (2 people) • Tinilau Tito Saosaoa(TEC) • Teipauli William(TEC) ■Kiribati (2 people) • Tion Tebakabu(PUB) • Tanua Tikoro(PUB) ■FSM(Yap) (2 people) • Yardfaliut Roroino(YSPSC) • Igem Cristopher(YSPSC) ■FSM(Chuuk) (1 people) • Reyes Jimmy(CPUC) ■FSM (Pohnpei) (2 people) • Solomon Dackson(PUC) • Lohn Richard(PUC) ■FSM(Kosrae) (2 people) • Taulupe Atelea Lopati(KUA) • Albert Ronald P.(KUA) ■RMI (4 people) • Reimers Richard Jr.(MEC) • Laiden Paulson(MEC) • Thomas Lomona(KAJUR) • Jacob Sheldon(KAJUR)
				

				
	2019/11/25 ~ 2019/11/29	RE	■ Department of Energy (DOE) • Deepak Shanil Chand • Filimoni Tarai ■ Energy Fiji Limited (EFL) • Rusiate Jale Faivakibau • Sabitesh • Jase Dautei • Mitieli Beranadoi • Maciu Waqaira • Krishneel Prasad • Maikeli Lutunauro Naciqa	■ Tuvalu (4 people) • Tanei Polu(TEC) • Tautu Teafa(TEC) • Siamua Tele(MTET) • Imo Fiamalua(Observer) ■ Kiribati (3 people) • Aree Tebike(PUB) • Mikaere Bauro(PUB) • Taoaba Thomas Tebateki(MISE) ■ FSM(Yap) (2 people) • Chaem Charles Laman(YSPSC) • Choay Jacob(Jake) (YSPSC) ■ FSM(Chuuk) (1 person) • Francis Albert(CPUC) ■ FSM (Pohnpei) (2 people) • Kilmete Sidney(PUC) • Pelep Julian(PUC) ■ FSM(Kosrae) (2 people) • Taulupe Atelea Lopati(KUA) • Sigrah Gifford I(KUA) ■ RMI (5 people) • Takatsuki Francis Koi(MEC) • Billy Schutz(MEC) • Wakefield Benjamin Samuel(NEO) • Jorlanin Joe(KAJUR) • Noel Patric(KAJUR)
				



② 2nd Regional training result

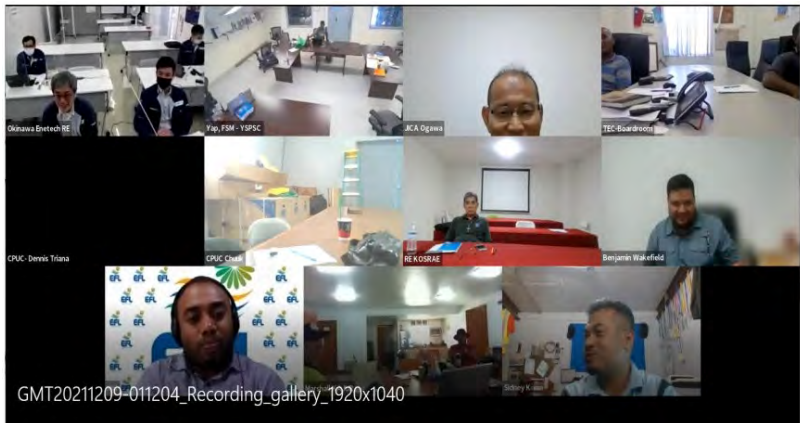
The 2nd regional training was held online from November 15 to December 8, 2021, which included DG training for eight days and RE training for eight days. In general, the participants of the 1st regional training were requested to participate, but as it was held online, observers were also allowed to participate.

2nd Regional training (Persons in charge from the Expert Team)

Session	Date	Area	Persons in charge from the Expert Team
2nd	2021/11/15～ 2021/11/24	DG	• Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Hideyasu Hokama (DG economic operation/C)
	2021/11/29～ 2021/12/8	RE	• Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Masanori Shimabuku (Deputy chief/ Hybrid power generation system human resource development/A) • Hirokazu Nakamura (RE O&M/A)

2nd Regional training result

Session	Date	Area	Trainer	Participating country/participant (affiliation) (# of participant)
2nd	2021/11/15～ 2021/11/24	DG	■ Energy Fiji Limited (EFL) • Epeli Rokodrakiya • Sabitesh Ajay Pal • Waisea Tuamoto • Rusiate Jale Faivakibau • Tobia Waqanitabua • Nayaqayaqa • Anasa Wainimala • Etika Rokobuli • Isimeli Nabalarua	■ Tuvalu (2 people) • Tinilau Tito Saosaoa(TEC) • Teipauli William(TEC) ■ Kiribati (2 people) • Taakau Teebwatia(PUB) • Mikaere Bauro(PUB) ■ FSM(Yap) (2 people) • Yarofaliut Rowino(YSPSC) • Igem Cristopher(YSPSC) ■ FSM(Chuuk) (2 people) • Reyes Jimmy(CPUC) • Triana Dennis(CPUC) ■ RMI (3 people) • Reimers Richard Jr.(MEC) • Laiden Paulson(MEC) • Jacob Sheldon(KAJUR)

			
2021/11/29～ 2021/12/8	RE	■ Department of Energy (DOE) • Deepak Shanil Chand • Waisale Vulagi ■ Energy Fiji Limited (EFL) • Sabitesh • Mitieli Berandoi • Maciu Waqaira • Krishneel Prasad • Maikeli Lutunauro Naciqa • Josese Atama	■ Tuvalu (2 people) • Tautu Teafa(TEC) • Sekielu Taaku(TEC) ■ FSM(Yap) (2 people) • Chaem Charles Laman(YSPSC) • Choay Jacob(Jake) (YSPSC) ■ FSM(Chuuk) (2 people) • Francis Albert(CPUC) • Triana Dennis(CPUC) ■ FSM (Pohnpei) (1 person) • Kilmete Sidney(PUC) ■ FSM(Kosrae) (1 person) • Protacio Gerardo(KUA) ■ RMI (5 people) • Takatsuki Francis Koi(MEC) • Billy Schutz(MEC) • Wakefield Benjamin Samuel(NEO) • Jorlanin Joe(KAJUR) • Noel Patric(KAJUR)
			

③ 3rd Regional training result

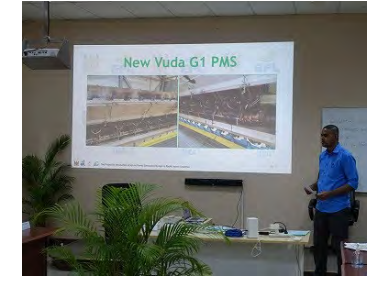
The 3rd regional training was held in Fiji from February 13 to February 24, 2023, which included DG training for five days and RE training for five days. In general, two power utility employees from each target country, who were in principle the participants of the 1st and 2nd regional trainings, were requested to participate. For RE training, participants from regulatory agencies (1 person) were also accepted.

3rd Regional training (Persons in charge from the Expert team)

Session	Date	Area	Persons in charge from the Expert Team
3rd	2023/2/13～ 2023/2/17	DG	• Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Hideyasu Hokama (DG economic operation/C) • Tokumitsu Kakazu (DG maintenance-electrical/B)
	2023/2/20～ 2023/2/24	RE	• Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Masanori Shimabuku (Deputy chief/ Hybrid power generation system human resource development/A) • Kaoru Ikehara (RE O&M/B)

3rd Regional training result

Session	Date	Area	Trainer	Participating country/participant (affiliation) (# of participant)
3rd	2023/2/13～ 2023/2/17	DG	■ Energy Fiji Limited (EFL) • Sabitesh Ajay Pal • Waisea Tuamoto • Rusiate Jale Faivakibau • Tobia Waqanitabua - Nayaqayaya • Etika Rokobuli • Isimeli Nabalarua • Apenisa • Ravneel • Maikeli.N	■ Tuvalu (2 people) • Eliata Vaeluaga(TEC) • Teipauli William(TEC) ■ Kiribati (2 people) • Taakau Teebwatia(PUB) • Takenteiti Tonana ■ FSM(Chuuk) (2 people) • Reyes Jimmy(CPUC) • Triana Dennis(CPUC) ■ FSM (Pohnpei) (2 people) • Elpert Elias • Richard Lohn ■ FSM(Kosrae) (4 people) • Tedrick J Joseph • Ronald P.Albert • Daniel J.Tokeak • Jerry John

			 	 
	2023/2/20～ 2023/2/24	RE	■ Department of Energy (DOE) • Deepak Shanil Chand • Waisale Vulagi • Filimoni Tarai ■ Energy Fiji Limited (EFL) • Sabitesh • Maciu Waqaira • Josese Atama • Om Dutt Sharma • Basante Komar • Manoj • Rusiate • Maikeli D • Rishad • Mohammed • Maikeli Lutunauro Naciqa	■ Tuvalu (3 people) • Tautu Teafa(TEC) • Sekielu Taaku(TEC) • Simona S.kilei(MTET) ■ Kiribati (3 people) • Tebike Aree • Mary Rui • Burennata Teinamotuna)(MISE) ■ FSM(Yap) (3 people) • Chaem Charles Laman(YSPSC) • Choay Jacob(Jake) (YSPSC) • John Chieng (YSPSC) ■ FSM(Chuuk) (3 people) • Francis Albert(CPUC) • Lims Setik(CPUC) • Triana Dennis(CPUC) ■ FSM (Pohnpei) (2 people) • Kilmete Sidney(PUC) • Julian Pelep(PUC) ■ FSM(Kosrae) (1 person) • Protacio Gerardo(KUA) ■ RMI (6 people) • Takatsuki Francis Koi(MEC) • Damien M.Milne(MEC) • Billy Schutz(MEC) • Wakefield Benjamin Samuel(NEO) • Jorlanin Joe(KAJUR) • Noel Patric(KAJUR)



8.9 Third Country Training (For additional countries)

The Third Country Training (Expanded Regional Training) is a technical training that EFL, the project implementing organization of Fiji that is well-placed to play a leading role in the power supply services in the Pacific Island region, provides for the seven countries added as participant countries, namely Samoa, Tonga, Cook Islands, Nauru, Papua New Guinea, Solomon Islands, and Palau, to the target countries of the project (Tuvalu, Kiribati, FSM, and RMI). The training was held three times in total during the project period using EFL-owned Lautoka Training Center as the main venue. Adding on to the skills EFL has cultivated so far, this training aims to provide the participants with opportunities to improve their skills and knowledge with support provided by the Expert Team, and to motivate them to serve as leaders.

① 1st Expanded Regional Training result.

- The 1st expanded regional training was held online from March 2 to March 24, 2021, which included DG training for six days and RE training for six days. The training program began on Tuesday, rescheduled from Monday in the original schedule, as Monday in Japan time was Sunday in Palau.
- Two participants from the power utility of each target country were requested to participate in this training in general.
- For RE training, participants from regulatory agencies (1 person) were also accepted.

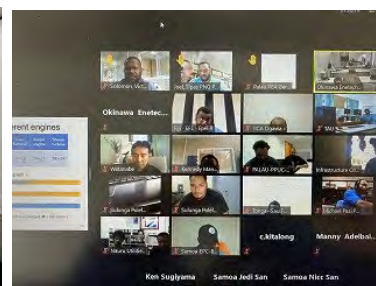
1st Expanded Regional Training (Persons in charge from the Expert Team)

Session	Date	Area	Persons in charge from the Expert Team
1st	2021/3/2～ 2021/3/10	DG	• Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Hideyasu Hokama (DG economic operation/C)
	2021/3/16～ 2021/3/24	RE	• Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Masanori Shimabuku (Deputy chief/ Hybrid power generation)

			system human resource development/A) • Hirokazu Nakamura (RE O&M/A)

1st Expanded Regional Training result.

Session	Date	Area	Trainer	Participating country/participant (affiliation) (# of participant)
1st	2021/3/2~ 2021/3/10	DG	■ Energy Fiji Limited (EFL) • Epeli Rokodrakiya • Waisea Tuamoto • Anasa Wainimala • Neipolione Gatanitubei	■ Samoa (2 people) • Nicky ah Tong(EPC) • Brendan Gwilliam(EPC) ■ Tonga (2 people) • Sau IPaea Tupou(TPL) • Sulunga Polelei(TPL) ■ Cook Islands (2 people) • Tepou Raita(TAU) • Karorangi Tararo(TAU) ■ Nauru (2 people) • Kobe Dame(NUC) • Jonpeal Rodiben(NUC) ■ PNG (3 people) • Joel Sipas(PPL) • Michael Pasi(PPL) ■ Solomon Islands (2 people) • Victor Sao Hoasirao(SP) • Kennedy Manehaita(SP) ■ Palau (2 people) • Sione Isechal(PPUC) • Samuel Hesus(PPUC)
	2021/3/16~ 2021/3/24	RE	■ Department of Energy (DOE) • Deepak Shanil Chand • Waisale Vulagi • Filimoni Tarai ■ Energy Fiji Limited (EFL) • Sabitesh Ajay Pal • Mitieli Berandoi • Krishneel Prasad • Josese Atama • Stiveni Tuisaravere	■ Samoa (3 people) • Nicollo Moeono Meredith(EPC) • Teuga Fuimaono(EPC) • Toiata Apelu Uili(MNRE) ■ Tonga (2 people) • Nikolasi Fonua(TPL) • Painsi Tuuua Lie(TPL) ■ Cook Islands (3 people) • Tei Nia • Daniel Uira • Teina Matatu Nootai ■ Nauru (3 people) • Javic Dube(NUC)



			• Nathanael Cadell Zaharias(NUC) • Rotui Star(DCCNR) ■ PNG (1 person) • Michael Pasi(PPL) ■ Solomon Islands (2 people) • Palmer Anisi(SP) • Jefferson Maerua ■ Palau (2 people) • Bill Jasmer(PPUC) • Gerald Tulop(PEA)
		 	

② 2nd Expanded Regional Training result

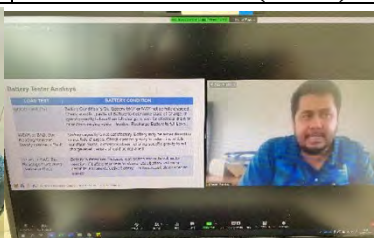
- The 2nd expanded regional training was held online from March 29 to April 28, 2022, which included DG training for eight days and RE training for seven days.
- Two participants from the power utility of each target country were requested to participate in this training in general.
- For RE training, participants from regulatory agencies (1 person) were also accepted.

2nd Expanded Regional Training (Persons in charge from the Expert Team)

Session	Date	Area	Persons in charge from the Expert Team
2nd	2022/3/29～ 2022/4/8	DG	• Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Hideyasu Hokama (DG economic operation/C)
	2022/4/19～ 2022/4/28	RE	• Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Masanori Shimabuku (Deputy chief/ Hybrid power generation system human resource development/A) • Hirokazu Nakamura (RE O&M/A)

2nd Expanded Regional Training result

Session	Date	Area	Trainer	Participating country/participant (affiliation) (# of participant)
2nd	2022/3/29～ 2022/4/8	DG	■ Energy Fiji Limited (EFL) • Waisea Tuamoto • Sabitesh Ajay Pal • Rusiate Jale Faivakibau	■ Samoa (2 people) • Nicky ah Tong(EPC) • Brendan Gwilliam(EPC) ■ Tonga (2 people)

		• Isimeli Nabalarua • Maikeli L.Naciqa	• Fineula Tu'i'onetoa (TPL) • Painitu'uua Lie(TPL) ■ Cook Islands (2 people) • Tepou Raita(TAU) • Karorangi Tararo(TAU) ■ Nauru (2 people) • Kobe Dame(NUC) ■ PNG (3 people) • Michael Pasi(PPL) ■ Solomon Islands (2 people) • Victor Sao Hoasirao(SP) • Kennedy Manehaita(SP) ■ Palau (2 people) • Samuel Hesús(PPUC) • Josiah Immanuel(PPUC)
		 	
2022/4/19～ 2022/4/28	RE	■ Department of Energy (DOE) • Deepak Shanil Chand • Waisale Vulagi • Filimoni Tarai ■ Energy Fiji Limited (EFL) • Sabitesh Ajay Pal • Krishneel Prasad • Josese Atama • Maikeli L.Naciqa • Maciu Waqaira • Maikeli Drose	■ Samoa (3 people) • Nicollo Moeono • Meredith(EPC) • Teuga Fuimaono(EPC) • Toiata Apelu Uili(MNRE) ■ Tonga (2 people) • Finau Katoanga(TPL) • Tevita Paletua(TPL) ■ Cook Islands (3 people) • Teina Matatu Nootai(ICI) • Makara Murare(TAU) • Daniel Webb(TAU) ■ PNG (1 person) • Michael Pasi(PPL) ■ Solomon Islands (3 people) • Palmer Anisi(SP) • Jefferson Maeriuva(SP) • Charles Fox Bako(MMERE) ■ Palau (2 people) • Howard Keishy(PPUC) • Uchelel Stevenson(PPUC)
		 	

③ 3rd Expanded Regional Training result

- The 3rd expanded regional training was held in Fiji from April 17 to April 28, 2023, which included DG training for five days and RE training for five days.
- Two participants from the power utility of each target country were requested to participate in this training in general.
- For RE training, participants from regulatory agencies (1 person) were also accepted.

3rd Expanded Regional Training (Persons in charge from the Expert Team)

Session	Date	Area	Persons in charge from the Expert Team
3rd	2023/4/17～ 2023/4/21	DG	• Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Masanori Shimabuku (Deputy chief/ Hybrid power generation system human resource development/A)
	2023/4/25～ 2023/4/29	RE	• Luis Kakefuku (Chief/ Hybrid power generation system human resource development) • Masanori Shimabuku (Deputy chief/ Hybrid power generation system human resource development/A) • Takayuki Sunagawa (RE integration plan/B) • Kaoru Ikehara (RE O&M/B)

3rd Expanded Regional Training Result

Session	Date	Area	Trainer	Participating country/participant (affiliation) (# of participant)
3rd	2023/4/17～ 2023/4/21	DG	■ Energy Fiji Limited (EFL) • Waisea Tuamoto • Sabitesh Ajay Pal • Rusiate Jale Faivakibau • Isimeli Nabalarua • Maikeli L.Naciqa • Tobia Nayaqayaqa • Etika Rokobuli • Karan Nair	■ Samoa (2 people) • Nicky ah Tong(EPC) • Brendan Gwilliam(EPC) ■ Tonga (2 people) • Sau`l Paea Tupou(TPL) • Sulunga Polelei(TPL) ■ Cook Islands (2 people) • Tepou Raita(TAU) • Siuea Tairi(TAU) ■ Nauru (2 people) • Kobe Dame(NUC) • T.J Detsiogo(NUC) ■ PNG (3 people) • Joel Sipas(PPL) • John Pokon(PPL) ■ Solomon Islands (2 people) • Victor Sao Hoasirao(SP) • Kennedy Manehaita(SP) ■ Palau (2 people) • Sione Isechal(PPUC) • Ramon Adelbai(PPUC)

				
	2023/4/25～ 2023/4/29	RE	■ Department of Energy (DOE) • Deepak Shanil Chand • Waisale Vulagi • Filimoni Tarai ■ Energy Fiji Limited (EFL) • Sabitesh Ajay Pal • Krishneel Prasad • Josese Atama • Maikeli L.Naciqa • Maciu Waqaira • Maikeli Drose • Rusiate Jale Faivakibau • Mohammed Ahzaaz	■ Samoa (3 people) • Leata Polataivao Tangatauli(EPC) • Mulinuu Ualesi(EPC) • Fefiloi Renate Kerstin(MNRE) ■ Tonga (2 people) • Fineula Tuionetoa(TPL) • Paini Tuuua Lie(TPL) • Ofa Mei Sene Takai(MEIDECC) ■ Cook Islands (3 people) • Teina Matatu Nootai(ICI) • Makara Murare(TAU) • Paul Karorangi Tararo(TAU) ■ PNG (1 person) • Joel Sipas(PPL) • John Daryl Pokon(PPL) • Filma Simon(NEA) ■ Solomon Islands (2 people) • Palmer Anisi(SP) • Joshua Liuga Suiramo(SP) • Charles Bako(MMERE) ■ Palau (2 people) • Diego Terteruich Polycarp(PPUC) • Princeton Richard(PPUC) • Nadjia Techitong Benhart(PEWA)



8.10 Trainings in Japan

Trainings in Japan were conducted with the aim of technology transfer through the introduction of hybrid power system operating status and grid stabilization technologies in island regions of Japan. The content of the trainings are as follows:

- Introduction of policies and technologies on hybrid power generation system introduction and operation in remote island regions of Japan
- Site visits related to high-efficient operation of DG and optimal power plant operation in remote island regions of Japan
- Introduction of DG maintenance techniques unique to remote island regions of Japan

8.10.1 Training record

In this project, trainings in Japan were held for three times, as listed below.

No.	Date	Area	Target	Overview
1st training in Japan	February 19, 2018-March 2, 2018	RE	• Managers at power utilities • Staff members of regulatory agencies	• Introduction of RE integration technology in Okinawa main island and remote islands • Site visits to RE facilities in Okinawa main island and remote islands • Introduction of latest technology and site visit of manufacturers in the Mainland
2nd training in Japan	October 1, 2018-October 19, 2018	DG	Staff members (mechanical and electrical) in utility companies	• Introduce DG maintenance technique and know-how cultivated in remote islands of Okinawa prefecture, and provide effective technology transfer by collaboratively conduct maintenance activities on site (OJT)

3rd training in Japan	May 15, 2023- May 26, 2023	DG RE	Staff members (mechanical and electrical) in Fiji	• Introduction of RE integration technology in Okinawa main island and remote islands • Site visits to RE facilities in Okinawa main island and remote islands • Introduction of latest technology and site visit of manufacturers in the Mainland

8.10.2 Training details

① 1st Training in Japan (for details, see “Work completion report for the 1st training in Japan” for details)

This training received participants for a total of two weeks. The first week included presentations and introduction of related facilities on RE integration and hybrid power generation system in Okinawa Main Island and remote islands, and provided information on mitigation method for issues and challenges in expanding RE integration.

The latter week intended to provide participants with experience on latest technologies, with presentations and factory tours on equipment of RE and hybrid power generation system (storage batteries and control equipment, etc.) and system operation at equipment manufacturers from which equipment was previously procured and research/verification facilities in various parts of Japan.

■ Training schedule

- The first training in Japan was held from February 19 to March 2, 2018, in which training was held for 5 days in Okinawa, and 5 days in the Mainland.

Schedule of the training is shown below.

Date	Time		Contents
Feb.19 Mon	10:00	~ 10:30	Courtesy Visit to President of Okinawa Enetech
	10:30	~ 11:30	Program Orientation (training purpose, outline, schedule)
	13:30	~ 13:50	Courtesy Visit to President of Okidenkigyo
	14:00	~ 16:00	Technical Training System/Control Center
Feb.20 Tue	10:00	~ 11:00	Outline of Okinawa's main island system
	11:00	~ 12:00	Stabilization technology of electric power system
	13:00	~ 14:00	Introduction of renewal energy technology in Okinawa remote Islands (Hateruma, Tarama)
	14:00	~ 15:00	Experimental study on stabilization of sunlight and wind power
	15:00	~ 16:00	Introduction of Lighting Protection Measures
Feb.21 Wed	10:30	~ 11:30	ShinTarama Power Station
	13:00	~ 15:00	Tarama Wind Turbine Hybrid System/Stabilizer/Photovoltaic System
Feb. 22 Thu	9:20	~ 11:40	Miyako EMS (Energy Management System) Experimental System
	13:00	~ 15:00	Miyako Mega Solar System
Feb. 23 Fri	10:00	~ 11:00	Abu Mega Solar
	12:00	~ 13:00	Ogimi Wind Turbine Demonstration Facilities
Sat			Moving to Japan Mainland
Sun			
Feb.26 Mon	9:00	~ 11:00	Nissin Electric Co. Control Device Factory
	14:00	~ 16:00	Hitachi Chemical Co.Storage Battery Plant
Feb.27 Tue	13:30	~ 15:00	Hitachi Chemical Co Product Show Room
Feb.28 Wed	10:00	~ 12:00	National Institute of Advanced Industrial Science and Technology (AIST), Fukushima Renewable Energy Institute AIST (FREIA)
	13:30	~ 15:00	Fukushima Airport Solar Park
Mar. 1 Thu	10:00	~ 12:00	Central Research Institute of Electric Power Industry (CRIEPI)
Mar. 2 Fri	9:00	~ 10:00	Courtesy Visit to JICA Headquarters
	10:00	~ 11:00	(PM) Evaluation Meeting
	11:30	~ 12:00	(PM) Closing Ceremony
Sat			Return Home
Sun			

■ Training participants

This training was provided for staff members of power utilities and regulatory agencies, and 11 people from five countries participated. List of the participants is shown below.

Country	Name	Organization
Fiji	Mr. Atesh Gosai	Senior Scientific officer, Department of energy, Ministry of Infrastructure and Transport (MOIT)
	Mr. Krishneel Prasad	Unit Leader, System Studies and Protection, FEA
Kiribati	Mr. Thomas Taoaba	Renewable Energy Planner
	Mr. Tenikoria Katauea	Power Engineering Manager
Tuvalu	Mr. Fatoga Talama	Generation Manager
FSM	Mr. Victor Nabeyan	Assistant General Manager, YSPSC
	Mr. Francis Albert	Head, Power Distribution, CPUC
	Mr. Dackson Solomon	Manager, Power Generation, PUC
	Mr. Hairom Livae	Customer Service Supervisor, KUA
RMI	Mr. Charlie Mark	Lead Mechanics
	Mr. Damian Milne	RE Manager

■ Photos of the training



③ 2nd Training in Japan (for details, see “Work completion report for the 2nd training in Japan” for details)

The purpose of the training was to provide an opportunity to participate in the overhaul (maintenance) of DG unit 7 of Kume island power plant of Okinawa Electric Power Company, Incorporated, and learn the know-how cultivated in Okinawa, including maintenance method and key points, etc. The training was provided by dividing the participants in two groups (mechanical and electrical) and staying in Kume Island for approximately three weeks from October 1 to 19. The training items for the mechanical and electrical groups are listed below.

■ Training schedule

Schedule of the training is shown below.

■ Training participants

This training was provided for staff members of power utilities in the target countries, and 18 people from five countries participated. List of the participants is shown below.

No	date		time			item	Contents
1	9/26	WED					Moving to Japan
2	9/27	THU				Lecture	Briefing
3	9/28	FRI	9:00 ~ 12:00			presentation	Country report presentation
4	9/29	SAT	14:00 ~ 17:00				sightseeing
5	9/30	SUN					
6	10/1	MON	10:00 ~ 10:15			Courtesy Visit	Courtesy Visit to Okinawa Enetech president
			10:15 ~ 11:00			Lecture	Training program orientation, interchange of opinions
			12:35 ~ 13:15			Move	【Move】NAHA airport→Kumejima island(JTA210)
7	10/2	TUE	9:00 ~ 12:00			Lecture	Overview of periodic inspection, teacher introduction,safety education,supplies(helmet, working uniform)
			13:00 ~ 16:00			Training	Overview of kume power plant(lecture, site visit
			8:30 ~ 9:00			Lecture	Overview today's training(1st)
			9:00 ~ 16:00			Training	•Meeting of dismantling and inspecting •data collection •DG curing •Maintenance of cylinder head •Maintenance of piston
							•Meeting prior to work •Inspection of DC power source •Cleaning(Check of Battery, Visual check of Panel)
8	10/3	WED	8:30 ~ 9:00			Lecture	Overview today's training
			9:00 ~ 16:00			Training	•Maintenance of cylinder head •Maintenance of piston •Maintenance of Cylinder liner
							•Inspection of Generator(Insulation resistance measuring,removal of covering, Change of filter and washing,Visual check,Measurement of air-gap)
9	10/4	THU	8:30 ~ 9:00			Lecture	Overview today's training
			9:00 ~ 16:00			Training	•Maintenance of cylinder head •Maintenance of piston •Maintenance of Cylinder liner •Maintenance of main metal
							•Inspection of Generator(Inside checking) •Check of circuit breaker(prior to check for Insulation resistance measuring,Oiling for moving part,Change for insulation oil, After the check Insulation resistance measuring)
10	10/5	FRI	8:30 ~ 9:00			Lecture	Overview today's training
			9:00 ~ 16:00			Training	•Maintenance of cylinder head •Maintenance of piston •Maintenance of filter
							•Inspection of Generator(Inside checking) •Checking of protective relay
11	10/6	SAT	16:00 ~ 17:00				
12	10/7	SUN	8:30 ~ 9:00				
13	10/8	Mon	8:30 ~ 9:00			Lecture	
			9:00 ~ 16:00			Training	•Maintenance of cylinder head •Maintenance of piston •Maintenance of filter
							•Inspection of Generator(Inside checking) •Checking of protective relay •calibration for meter •Check of watt-hour meter
14	10/9	Tue	8:30 ~ 9:00			Lecture	
			9:00 ~ 16:00			Training	•Maintenance of cylinder head •Maintenance of piston •air /primary/secondary/ •Maintenance for lube oil cooler
							•Inspection of Generator(Inside checking) •calibration for meter •Check of watt-hour meter
15	10/10	Wed	8:30 ~ 9:00			Lecture	
			9:00 ~ 16:00			Training	•Maintenance of cylinder head •Maintenance for auxiliary parts for DG •air /primary/secondary/ •Maintenance for lube oil cooler
							•Inspection of Generator(Insulation resistance measuring, attaching cover,cleaning)
16	10/11	Thu	8:30 ~ 9:00			Lecture	
			9:00 ~ 16:00			Training	•Maintenance of cylinder head Maintenance for auxiliary parts for DG •Maintenance for filter •Maintenance for auxiliary machine
							•Cleaning for panel(Visual check for relay, Checking for terminal for loosening, sequence check)
17	10/12	Fri	8:30 ~ 9:00			Lecture	
			9:00 ~ 16:00			Training	•Maintenance for turbochager •Maintenance for filter •Maintenance for auxiliary machine •Maintenance for generator
							•Cleaning for pane(Visual check for relay, Checking for terminal for loosening, Insulation resistance measuring for auxiliary machine)
18	10/13	Sat					
19	10/14	Sun					
20	10/15	Mon	8:30 ~ 9:00			Lecture	
			9:00 ~ 16:00			Training	•Maintenance for auxiliary machine •Maintenance for auxiliary machine in Controller
							•Test run , recording data
21	10/16	Tue	8:30 ~ 9:00			Lecture	
			9:00 ~ 16:00			Training	•Preparation for operation •Test for protective device •Test run
							•finishing,cleaning
22	10/17	Wed	8:30 ~ 9:00			Lecture	
			9:00 ~ 16:00			Training	•Test run
23	10/18	Thu	8:30 ~ 9:00			Lecture	
			9:00 ~ 16:00			Training	• Test run, finishing
							• Test run
24	10/19	Fri	8:30 ~ 9:00			Lecture	
			10:00 ~ 11:00				Evaluation meeting
			11:30 ~ 12:00				
25	10/20	Sat					
26	10/21	Sun					
27	10/22	Mon	10:00 ~ 12:00				Closing ceremony
28	10/23	Tue					Return Home

Country	Organization	Name	Position
Fiji	Energy Fiji Limited (EFL)	Mr. SALOBO Anasa Wainimala	Team Leader Thermal Generation North
		Mr. SAULECA Epeli Rokodrokaya	Training Officer Mechanical
Tuvalu	Tuvalu Electricity Corporation (TEC)	Mr. TINILAU Tito Saosaoa	Mechanic
		Mr. KALELE Mika	Diesel Mechanic Operator
Kiribati	Public Utilities Board (PUB)	Mr. TAAKAU TEEBWATIA	Engineer
		Mr. MIKAERE Bauro	Instrumentation & PV supervisor
FSM	Pohnpei Utilities Corporation (PUC)	Mr. YAMADA Winfred	Manager, Diesel Plant
		Mr. SANTIAGO Selestino R	Electrical Supervisor
	Kosrae Utilities Authority (KUA)	Mr. ALBERT Ronald P	Chief Operator
		Mr. ALOKOA Careston T	Operator
	Chuuk Public Utilities Corporation (CPUC)	Mr. REYES Jimmy	Lead Mechanic
		Mr. HALLERS Augustine	RE Technician
Marshall	Yap State Public Service Corporation (YSPSC)	Mr. YITHEMANG Casmero	Machanics Supervisor
		Mr. IGEM Christopher	Electrician
	Kwajalein Atoll Joint Utility Resources (KAJUR)	Mr. MARK Charles	Mechanic Foreman
		Mr. PATRICK Noel	Electrical
	The Marshalls Energy Company (MEC)	Mr. REIMERS Richard Jr	Lead Mechanic
		Mr. LAIDEN Paulson	Electrical & HVAC

■ Photos of the training



④ 3rd Training in Japan (for details, see “Work completion report for the 3rd training in Japan” for details)

This training received participants for a total of two weeks. The first week included presentations and introduction of related facilities on RE integration and hybrid power generation system in Okinawa Main Island and remote islands and provided information on mitigation method for issues and challenges in expanding RE integration.

The latter week intended to provide participants with experience on latest technologies, with presentations and factory tours on equipment of RE and hybrid power generation system (DG and related facilities, PV panels, etc.) and system operation at equipment manufacturers from which equipment was previously procured and research/verification facilities in various parts of Japan.

■ Training schedule

Schedule of the training is shown below.

Date		Time		Training Content
5/10	Wed			Arrival of Training Participants
5/11	Thu			Briefing 1
5/12	Fri			General Orientation (Recorded video)
5/13	Sat			
5/14	Sun			
5/15	Mon	10:00	~ 10:30	Courtesy Visit to President of Okinawa Enetech
		10:30	~ 11:30	Program Orientation (Training purpose, overview, schedule, etc.)
		14:40	~ 15:30	Facility Tour Load Dispatch Center
		15:30	~ 16:30	Review and Expectations for the Training Participants
5/16	Tue	10:00	~ 10:45	Overview of Kurima Island Microgrid (MG) Verification Project
		10:50	~ 11:35	Overview of Okinawa Main Island Grid
		11:40	~ 12:25	• Overview of the Dual Fuel Engine introduced to Miyako Daini Power Plant • Operating Cost Reduction through Improving Capacity Factor of Small Scale Generation Facility
		14:30	~ 16:00	Steam Power Plant Facility Tour: Gushikawa Thermal Power Plant (90min)
5/17	Wed	9:30	~ 11:00	Kurima Island Verification Project Facility (Including Grid stabilizers/PV facilities)
		13:30	~ 14:30	Miyakojima City Eco Island PR Building "Eco Park Miyako"
5/18	Thu	10:45	~ 11:15	Overview of Kumejima Town Energy Vision and the Kumejima Model (Kumejima Town Project Development Office)
		12:45	~ 14:20	Deep Sea Water Research Center (Overview of OTEC Demonstration Facility, Facility Tour, and Q&A) (Fishery Research Introduction: Seaweed Culture Verification and Oyster Culture)
		14:25	~ 15:25	Facility Tour of Deep Sea Water Business Park (3 businesses, including travel time)
5/19	Fri	10:00	~ 11:00	Abu Mega Solar Demonstration Research Facility
		13:30	~ 14:30	Nakijin Wind Power Plant
5/20	Sat			
5/21	Sun			
5/22	Mon			Kawasaki Heavy Industries (Diesel Engine Manufacturing Plant)
		9:00	~ 11:30	Kobe Works • Facility Tour and Overview of Gas Engine Plant • Facility Tour of Training Center
		13:00	~ 16:00	Kawasaki Heavy Industries (Hydrogen-related Facility) • Facility Tour of Kobe Liquefied Hydrogen Receiving Terminal "Hy touch Kobe" (on Kobe Airport Island) • Facility Tour and Overview of "Smart Community Technology Development Project Utilizing Hydrogen Cogeneration Systems" (on Kobe Port Island)
5/23	Tue	13:00	~ 15:00	Nisshin Electric Control Equipment Works
5/24	Wed	10:00	~ 12:00	Aichi Electric (Facility Tour of Transformer Works)
5/25	Thu	10:00	~ 12:30	Kaneka Solartech
5/26	Fri	10:30	~ 10:40	Courtesy Visit to JICA Headquarter (HQ)
		10:40	~ 11:40	Evaluation Meeting
		11:40	~ 12:00	Closing Ceremony
5/27		21:25	~ 9:05	Participants' Departure (FJ350 Narita→NADI)

■ Training participants

This training was provided for staff members of Energy Fiji Limited and regulatory agencies, and 13 people participated. List of the participants is shown below.

Name		Title	Departure
1	Mr. NAIGIA Filimoni	Supervisor High Grade, DOE, MPWTMS	May 26

2	Mr. VULAGI Waisale Tuivatu	Senior Scientific Officer, DOE, MPWTMS	May 26
3	Mr. NAYAQAQA Tobia Waqanitabua	Team Leader Thermal Levuka, Generation Department, EFL Energy Fiji Limited	May 23
4	Mr. CHAND Deepak Shanil	Deputy Director, DOE, MPWTMS	May 26
5	Mr. ROKOBULI Etika Veigaravi	Team Leader Thermal Central, Generation Department, EFL	May 23
6	Mr. NACIQA Maikeli Lutunauro	Team Leader Nadarivatu, Generation Department, EFL	May 23
7	Mr. ATAMA Ratu Josese Litidamu	Team Leader Renewable Wailoa, Generation Department/Renewable EFL	May 23

Name		Title	Departure day
8	Mr. NABALARUA Isimeli	Mechanical Fitter 'A', Generation Department, EFL	May 23
9	Mr. FAIVAKIBAU Rusiate Jale	Team Leader Nadarivatu, Generation Department, EFL	May 23
10	Mr. PAL Sabitesh Ajay	System Control Engineer, System Control/System Planning & Control, EFL	May 26
11	Mr. TUAMOTO Waisea	Team Leader Generation Sigatoka, Generation Department, EFL	May 23
12	Mr. DROSE Maikeli Savou Mateibau Ramenawa	Training Officer Electrical, Training, EFL	May 26
13	Mr. WAQAIRA Maciu Kurukibulu	Team Leader Training, Human Resources, EFL	May 26

■ Photos of the training





8.11 Public relations activity

(1) Objective of public relations activity

To provide information on the significance, activities, and results of the project to C/Ps, Japanese people, and other donors in a manner that is easy to understand, active, and effective at various occasions, including the 8th Pacific Islands Leaders Meeting (PALM8) in May 2018 and the 9th Pacific Islands Leaders Meeting (PALM9) in July 2021. In addition, update PR material on project activities as necessary on websites managed by JICA for project introduction, such as “ODA Visibility website”, to publicize the project.

(2) PR materials created (deliverables)

No.	Date submitted	Media type	Overview of the PR material
1	June 2018	- DVD - YouTube(short video) https://www.youtube.com/watch?v=P9wECQBnltE	Project PR video for the 8th Pacific Islands Leaders Meeting (PALM8) - Short version (English version and Japanese version):approx.5 min - Long version (English ver. and Japanese ver.): approx.10 min
2	November 2019	JICA“ODA Visibility website (Project for Introduction of Hybrid Power Generation System in the Pacific Island Countries)” https://www.jica.go.jp/Resource/information/seminar/2019/20191129_02.html	Conducting regional trainings in Fiji
3	August 31, 2020	JICA“ODA Visibility website (Project for Introduction of Hybrid Power Generation System in the Pacific Island Countries)” https://www.jica.go.jp/Resource/fiji/office/information/event/20200831.html	Shifting on-site trainings to online trainings
4	March 24, 2021	JICA“ODA Visibility website (Project for Introduction of Hybrid Power Generation System in the Pacific Island Countries)” https://www.jica.go.jp/Resource/information/seminar/2020/20210324_01.html	Conducting the 1st Expanded regional training
5	May 2021	- DVD - YouTube(Long version)	Project PR video for PALM9

		https://www.youtube.com/watch?v=PCkA1DkxcHI	• Overview (English ver. and Japanese ver.): approx.1 min • Short version (English ver. and Japanese ver.): approx.5 min • Long version (English ver. and Japanese ver.): approx.16 min
6	September 2021	• Brochure	Green Power Island Program • Brochure (English ver. and Japanese ver.) 
7	December 9, 2021	• JICA “ODA Visibility website (Project for Introduction of Hybrid Power Generation System in the Pacific Island Countries)” https://www.jica.go.jp/Resource/information/seminar/2021/20211209_01.html	• Conducting the 2nd Regional training in Fiji
8	December 9, 2021	• JICA “ODA Visibility website (Project for Introduction of Hybrid Power Generation System in the Pacific Island Countries)” https://www.jica.go.jp/Resource/information/seminar/2022/20220428_01.html	• Expanded regional training (for 7 countries) for simultaneously achieving RE expansion and stable power supply
9	December 22, 2022	• JICA Samoa office FB https://www.facebook.com/jicasamoa	• System analysis training
10	December 28, 2022	• JICA Samoa office FB https://www.facebook.com/jicasamoa	• Survey of hydropower generation facilities • Survey of PV facilities

9. Summary

9.1 Ingenuity applied for project implementation and management, lessons learned, and challenges for the future

9.1.1 Fiji

(1) Organizational finance

For the 1st regional training conducted in November 2019 in Fiji, a concerning situation arose in which trainers (lecturers) working in outer island almost missed the training as it was reported from EFL that there was no budget (travel cost, etc.) available for their participation. Although it was expected that the Fiji side would allocate budget beforehand and provide travel cost because the training date was notified beforehand, the cost was borne by JICA side in the end.

Necessary expenses need to be discussed with upper management to make sure there would not be any issue.

(2) Resignation of candidate trainers

Though not limited to this project, several candidate trainers left the company during the project. Although regional training program is developed by assigning lectures to candidate trainers after carefully considering their area of strength, if they resign, additional work becomes necessary for reorganizing the program and nominating their successors. Though there must be many reasons for resigning from work, analyzing the reasons for the employees' resignations and take necessary measures to prevent them, if the work environment was identified to be the cause, would be necessary.

(3) Online-based work in response to COVID-19 outbreak

Traveling to the project sites became impossible from April 2020 onwards due to COVID-19 travel restrictions. Therefore, online trainings based on video and audio using a web meeting system (Zoom) were conducted from June 2020. Large files were shared with each C/P using a cloud server "OneDrive". Although there were several options of online meeting tools such as "Zoom", "Teams", and "Google Meet", "Zoom" was selected to prioritize the ease of use for the C/P.

While visits to the target countries were made two to three times per year before the pandemic, online training and communication can be conducted any number of times as long as the C/P's schedule allows. Although some topics are difficult to teach online, such as how to use measuring instruments, online lectures are effective for sharing knowledge. For future technical support, conducting hybrid training with both face-to-face activities on-site and online activities from Japan would be effective.

(4) Training in Japan

Training in Japan was conducted for the trainers near the project completion after all the regional trainings and expanded regional trainings. During the training in Japan, site visits to training facility and System control center of OEPC, and RE and demonstration facilities on Okinawa main island and remote

islands were conducted. In addition, site visits for observing cutting-edge technologies of Japanese manufactures in the mainland were also included. Although the training in Japan was conducted near the end of the project, if conducted before the regional trainings (soon after the beginning of the project), lectures based on the learning from the site visits could have been conducted. Conducting a training in Japan in the early phase of a project is therefore desirable.

(5) Request for assistance from PPA

For the 3rd expanded regional training, travel arrangements (purchasing plane tickets as well as making hotel and bus reservations) for the participants of the seven participant countries were entrusted to PPA (payment was made by the JICA side).

For purchasing the flight tickets, there was not any issue in particular. The tickets were cheaper by 20-30% compared with reserving with a Japanese travel agent, and the agent in Fiji (Pan Pacific Tours) handled the work well.

For hotel reservations, however, there doesn't seem to be any advantage in entrusting the work to PPA. Price negotiation between PPA and the hotel took time, and the JICA side made reservations and payment in the end because the per-night price offered to JICA Expert Team was cheaper than that offered to PPA.

Reservation for a bus was originally to be made by PPA, but could not be done in the end. Although support from PPA is indispensable for conducting regional trainings in Fiji, the kind of tasks to be entrusted to PPA should be determined by identifying the area that PPA has advantage.

(6) Training implementation structure

As there were many things to prepare for the regional training (and the expanded regional training) in Fiji, handling of these tasks was entrusted to the team leader of the Lautoka training center. However, as they were not fulfilled timely, most of them were handled by the JICA Expert Team before and during the training.

As the team leader was very busy with daily duties and unable to take on additional tasks, assigning a deputy should be considered in future technical cooperation projects.

The following are the tasks that were not fulfilled properly.

- Announcements to candidate trainers, and reporting to JICA Expert Team.
- Preparation of training participants' personal protective equipment (helmet).
- Printing and distributing training handouts.
- Management of educational equipment provided from the JICA side (PC screen was damaged).
- Preparing presentation material for the team leader's own session.
- Preparing for dining tents, etc.

9.1.2 Tuvalu

(1) Insufficient manpower

Tuvalu is the smallest of the target countries, and the power utility of the country is also a small organization with 47 employees (including 3 engineers and 3 technicians). The employees therefore need to act according to circumstances regardless of one's scope of responsibility in DG or RE.

As a result, when trouble occurred on DG even a RE-related training was ongoing, the participants had to miss the training to support for troubleshooting. Although ensuring stable power supply is the mission of power utility, the Expert Team would like that calling core trainers for support be refrained during trainings. This is a challenge for the future.

(2) Maintenance operation

Having only a small number of employees in charge of RE for all inspection and maintenance works including those in remote islands seems to have negatively affected the OJT activities in this project (inspection planning and recording results, and recording details of inspection result etc.). Mr. Mafalu, the CEO, kindly supported manual revisions as well as sharing the progress status. It would be necessary for TEC to establish a system to ensure such follow-ups.

(3) Follow-up equipment repair after inspection

Although malfunctions of one of the project target PV facilities located at marine warehouse were identified at the beginning of the project OJT, follow-up improvement work has not been making progress even at the moment of writing. Following up on inspection results can take time, for reasons such as long time required for arranging heavy equipment, and missing of procured parts. The Expert Team therefore would like that continuous efforts be made for creating procedure or system to expedite work.

(4) Organizational capacity

As the same curriculum for technical support was used for all the target countries except Fiji, some lectures (such as the one on the algebraic method) seemed to have been difficult for some participants. Although the participants were able to participate in on-site hands-on trainings without problem, some training contents intended to improve the participants' knowledge required background knowledge in middle school mathematics. Therefore, developing a training curriculum that suits the knowledge level of the country or organization would be necessary.

(5) Change of core trainers

Though not limited to Tuvalu, several core trainers were changed during the project period. Though there were many reasons for this, such as resigning from work and studying abroad, providing materials that suit for both the continuing trainers and new trainers was a challenge for the lecturers. This is a

problem that concerns the entire organization and is therefore not something that can be resolved easily. However, some countermeasures will be necessary.

(6) Organizational finance

Although PV facility of approximately 750kW has been introduced in Tuvalu with assistance from donors, only a few are operating without problem. The reason behind this seemed to be the lack of understanding on preventive maintenance, with breakdown maintenance being the norm. Although this project stressed on the importance of periodic inspections, lack of budget often led to a long delay in dealing with the malfunctions found. Therefore, in Tuvalu, budget allocation for RE O&M in the following year needs to be made in advance. During the project, it was instructed for numerous times to RE core trainers that suspending the operation of RE facility for a long time is a significant loss of expense because DG have to be operated to compensate for the lost generation.

(7) Contribution of the CEO

Active participation of Mr. Mafalu, the CEO of TEC, greatly facilitated the implementation of the project. Ensuring his involvement for future project would contribute for the improvement of the capacity of TEC as a whole.

(8) Management of the donated equipment

As the donated equipment for PV inspection were managed by the manager, sometimes the worker in charge of inspection did not have access to them when the manager was absent. The Expert Team improved the situation by having a discussion with the manager to ensure that the worker in charge could use them when necessary. Access to the equipment should have been confirmed when the equipment was provided to ensure they were used as often as necessary.

(9) On-site hands-on training

Although the active participation in DG trainings at the TEC power plant before COVID-19 pandemic resulted in improved skills of the technicians, travel restrictions that followed for approximately two years seems to have negatively affected the training result. This suggests that for TEC, face-to-face training is more effective than online training. In addition, although JICA Expert Team responded to many requests from TEC for advice during the pandemic, it would have been more effective if the support was provided on-site with face-to-face instruction. The following are the main inquiries from TEC.

- Trouble with control air system
- Trouble with high-pressure fuel pipe
- Generator damage
- Quotation for parts

9.1.3 Kiribati

(1) Organizational structure

The C/P in Kiribati, Public Utilities Board (PUB), has a well-organized structure under Mr. James, the CEO, working together with other members namely Mr. Tenikoria the manager, Mr. Teebwatia the mechanic, and Mr. Bauro and Ms. Mary in charge of electrical. Ms. Mary especially demonstrated her dedication and willingness to improve, and is expected to take a leading role in PUB in the future.

(2) DG O&M

As approximately 20 years have passed since the DGs of Bikenibeu power plant was installed, detailed maintenance was necessary. However, due to COVID-19 travel restrictions, regrettably, sufficient face-to-face training could not be provided. For DG training, on-site hands-on training seemed indispensable to obtain desired project results.

(3) PV facility O&M

PUB staff members can conduct basic PV facility operation and inspection without problem. However, it seemed that they did not have sufficient experience in developing a repair plan, including training for repair operation to deal with malfunctions and preparation for necessary equipment and tools. Current issue with a broken optic cable is a case in point. Due to the broken optic cable, information of the generation by Bonkiri PV facility has not been able to be displayed at Bikenibeu power plant. To ensure that rare issues and events can be handled, further technical training with experts needs to be provided in future JICA technical cooperation projects.

(4) Follow-up equipment repair after inspection

A solid implementation structure for inspection work is in place and inspection work has been conducted well. However, when urgent need for improvement is found at inspection, advice on temporary measures, such as using similar parts from another equipment, was often requested. The Expert Team conveyed that such measures were not recommendable as the equipment would be excluded from manufacturer's warranty. The Expert Team would like that PUB would consider making a budget plan for prior procurement of parts and storing them.

(5) Internet connection during online sessions

Due to internet connection issues, online trainings and follow-ups sometimes had to be canceled or postponed. Considering the burden for dealing with the frequent connection issues to resume sessions, measures to prevent such interruptions (improving internet connection by updating device) need to be taken.

9.1.4 FSM (Yap)

(1) RE expansion

Given the high RE penetration rate already achieved mainly by three units of wind power generation facilities (275kW×3) in Yap State, RE 100% would be possible depending on demand-supply profile. Hybrid Wizard Control System of Vernier is used in Yap, which enables DG automatic start / stop, RE output curtailment, and maintaining supply-demand balance for maximizing the use of RE. As a result, RE penetration of approximately 80% has been achieved in Yap. The Expert Team would like that the learning from this project would continue to be utilized for conducting RE O&M.

While maximizing RE resources was achieved in Yap, negative impact on the existing DG units is concerned. Unstable wind conditions have caused frequent DG automatic shut-downs, so the burden on circuit breakers and engines, as well as issues with specific fuel consumption need to be assessed. Although some degree of assessment would have been possible on site, travel restrictions due to COVID-19 pandemic made it difficult. Moving forward, technical study to assess the health of DG would be recommended for further maximizing RE.

(2) Organizational structure

The RE team of Yap is well-organized with Mr. John and Mr. Jacob playing leading roles. The Expert Team would like that the learning from this project would continue to be utilized for conducting RE O&M.

(3) Ingenious improvement on site (improved generation and PR value)

YSPSC has successfully improved PV generation and PR value by making improvements of PV facilities during panel cleaning work and cable replacement work, such as modifying outdoor cable pit (prevention for cable submerging in water). Their ingenuity applied in such improvement is noteworthy among the target countries.

The Expert Team would like that YSPSC continues facility O&M activities with inspection planning and implementation, and necessary improvements.

9.1.5 FSM (Chuuk)

(1) Change of core trainers

Mr. Francis, who was nominated as a core trainer at the beginning of the project, resigned from the company. He eventually returned in the latter half of the project and resumed his activity as core trainer. Although this applies to other countries as well, how to train a new trainer who succeeds a resigned person, and analyzing the reasons for the employees' resignations and take necessary measures to prevent them, should be considered.

(2) Core trainer nomination

Mr. Dennis, the key person of the core trainers, is a contract staff from the Philippines. He demonstrated a high level of understanding of the lectures conducted during this project, and is indispensable to take a leading role in Chuuk Public Utility Corporation (CPUC). On the other hand, it appears that CPUC is too reliant on Mr. Dennis, raising concerns on power system O&M in case of his resignation. It is therefore necessary to focus on training young employees under Mr. Dennis's guidance.

(3) RE team structure

A team structure with a clear role assigned to each member exists: Mr. Dennis and Mr. Francis organize the RE team, and Mr. Chris, Mr. Limus, and Mr. Bruno implement RE facility inspection. However, there was not a clear operational structure for the future.

The Expert Team would like to recommend that the inspection schedule and record form made under this project be utilized to accumulate operational records for future staffing plan.

(4) Internet connection during online sessions

Due to internet connection issues, online trainings and follow-ups sometimes had to be canceled or postponed. Considering the burden for dealing with the frequent connection issues to resume sessions, measures to prevent such interruptions (improving internet connection by updating device) need to be taken.

9.1.6 FSM (Pohnpei)

(1) RE facility O&M

Pohnpei Utilities Corporation (PUC) has a department in charge of RE O&M with a secured annual budget, so their situation is better than other countries. Mr. Sidney, who is a leading person in the department and a core trainer, has extensive knowledge and experience, so there is no concern for RE facility O&M in Pohnpei. Moving forward, the Expert Team would like that efforts to acquire more advanced skills such as simulation analysis and grid stabilization measures to prepare for future increase in RE integration.

(2) RE team structure

The structure of the RE team clearly assigns responsibility for on-site work, including for Mr. Sidney and Mr. Julian, which was exemplary for other target countries. As there is a plan for installing a large-scale RE facility, the Expert Team would like to recommend that the inspection schedule and record form made under this project be utilized to accumulate operational records for future staffing plan.

(3) Internet connection during online sessions

Due to internet connection issues, online trainings and follow-ups sometimes had to be canceled or postponed. Considering the burden for dealing with the frequent connection issues to resume sessions,

measures to prevent such interruptions (improving internet connection by updating device) need to be taken.

(4) Documentation skills

Although the core trainers of PUC have DG maintenance skills, they have limited PC skills. Lending PC to them and provide training on the basic PC skills by PUC is necessary.

Generation manager (GM) is responsible for monthly reporting of generation data, but has been too busy to do so. Based on this, JICA Expert Team requested PUC to assign a young employee as a deputy to GM, but was not followed through.

(5) Maintenance budget

It appeared that the department in charge of budget management at PUC did not prioritize budget allocation for DG maintenance, and did not seem to recognize the importance of maintenance. As it took three years to install the fuel flow meter provided by this project, SFC monitoring could not be conducted. Similarly, Unit 4 has not been repaired for the same reasons and it is not clear when it will be done.

(6) Introduction of new generator

Introduction of new DG is planned under the support from WB, and accordingly, DG in the old power plant is planned to be decommissioned. Although the electrical board in the old power plant, which is used as the main bus, needs replacement, it has been difficult to do so as it would entail an outage of the entire power plant. If the DG C/P of PUC can get involved in the planning of the electrical board replacement (consideration for double busbar configuration, etc.), it would serve as a good opportunity for improving their knowledge.

(7) Power system management

For managing the power system in Pohnpei, data of the existing PV facility and DG power plants need to be input to existing SCADA. Though this would require a technician with extensive knowledge of SCADA system, there is no such personnel in PUC.

As there is an IPP company (VITAL) operating in Pohnpei, the power plant of PUC needs to be equipped with load dispatching function for healthy power system operation. To do so, acquiring more knowledge on SCADA system is necessary.

9.1.7 FSM (Kosrae)

(1) Communication environment

Online training was conducted due to COVID-19 travel restrictions. However, it seemed that communication environment in Kosrae was worse than in other states, especially under bad weather conditions. In addition, sometimes acoustic feedback during online lectures made it hard to hear them.

For future online sessions, the Expert Team would like that they prepare necessary equipment (camera, microphone, etc.).

Due to internet connection issues, online trainings and follow-ups sometimes had to be canceled or postponed. Considering the burden for dealing with the frequent connection issues to resume sessions, measures to prevent such interruptions (improving internet connection by updating device) need to be taken.

(2) Short staffing

Specific fuel consumption (SFC) of DG and RE performance ratio are two important indicators for this project. Although the Expert Team requested for monthly data sharing on these indicators for evaluation, the data was not shared for a long time due to lack of personnel. Visiting there was impossible due to COVID-19 travel restrictions, and reminders were sent via email and Facebook, but were not responded. The difficulty of online communication was acutely felt in such circumstances.

(3) Work implementation structure

As with other states, power plant maintenance operation is understaffed and should be strengthened. Assigning a successor for Mr. Gerardo, who is the main staff in charge for RE area but is soon to be retired, is especially necessary for ensuring that his skills will be passed on.

Although there were 3 core trainers nominated for RE O&M, only one of them (Mr. Robert) usually participated in the trainings. As lack of technicians is a concern for RE O&M, the Expert Team would like to request for strengthening of implementation structure.

(4) Record keeping of inspection schedule planning and result, and details of inspection result

For RE O&M, record keeping of inspection schedule planning and result, and details of inspection result did not take root. As these data was not submitted, it was difficult to understand the facility operating conditions. Especially during the time of travel restrictions, facility operating conditions were assessed only with PR value. In addition, from the observation of on-site inspection work after the lifting of travel restrictions, it appeared that inspection works by taking measurement and visual inspection were conducted but record keeping of the results was not practiced.

(5) Internet connection during online sessions

Due to internet connection issues, online trainings and follow-ups sometimes had to be canceled or postponed. Considering the burden for dealing with the frequent connection issues to resume sessions, measures to prevent such interruptions (improving internet connection by updating device) need to be taken.

9.1.8 RMI

(1) Organizational structure

RE O&M department of Marshall Islands Electricity Corporation (MEC) is organized under Mr. Steve, Chief Technical Officer, and other members, namely Mr. Damien the Manager, Mr. Francis the maintenance officer, and Mr. Billy the operator. However, in reality, Mr. Steve seems to be too busy to oversee the RE O&M operations. As a result, each of the team members appeared to be working on his own without the overseer. The organization of the team needs to be improved to ensure that it operates based on the role and responsibility assigned to each member and established rules.

(2) RE O&M

As on-site RE O&M are handled almost solely by Mr. Francis, the amount of work that can be implemented are limited. This resulted in delay or failing to submit inspection schedule plan, record of inspection, details of inspection result, and manual draft during the project.

Nevertheless, with his understanding of the operating conditions and experience in on-site maintenance, Mr. Francis has a thorough knowledge of operational circumstances and has made significant contributions. Urgent improvement of the internal structure to pass on his knowledge and skills is recommended.

(3) RE core trainers

This project has divided RE field in two areas, namely “RE integration” and “RE O&M”, and in general, the persons in charge work for the two areas without making clear distinctions. On the other hand, core trainers of RMI clearly distributed the area of responsibility among them, and this led to issues such as the trainers in charge of RE integration missing hands-on training of measuring instruments, etc. Although the training schedule included both contents on “RE integration” and “RE O&M” in each day, for future trainings, separate schedules for each area (scheduling by day or by AM/PM) will be necessary.

(4) DG core trainers

While four people were nominated as DG core trainers, two of them were certified in the end. The core trainers of MEC have sufficient DG maintenance skills. However, as with other target countries, they have limited PC skills for data collection, input, saving, and management. JICA Expert Team supported the OH of Unit 7 remotely at the end of 2021, nevertheless, comprehensive evaluation on the improvement of OH skills could not be made because the OH maintenance record has not been made.

In response to a request from the CTO of MEC, the Expert Team provided a document on employee performance review with clear promotion criteria. Administrative skills for supporting the management, such as PC skills and documentations skills were included as a criterion, but the document was eventually not adopted. The Expert Team believes that the MEC management needs to understand the

importance of administrative skills as an important element of power plant operation and management.

(5) Target facilities (2 sites)

This project selected two PV facilities as target sites for monitoring. Sufficient OJT for the water reservoir PV, one of the two target sites, could not be conducted because the issues and malfunctions found at the beginning (i.e., cable damage, burned box, and shutting down of PCS) could not be improved.

As for the Majuro hospital rooftop PV, the other target site, on-site inspection found that extensive cable box corrosion allowed water and small animals to enter inside the box and caused problems for operation. A stainless-steel cable box was procured and replacement work was conducted together with the core trainers, which greatly improved the condition.

The Expert Team cooperated with inspection work during on-site work, and discussed necessary improvements. Some of the issues discussed, however, still remain. For example, upgrading the PC used for storing generation data necessary for PR value calculation was recommended, but it is still under consideration according to MEC. As unavailability of the data during the project period hindered OJT, prompt action for restoration is recommended.

9.1.9 Common for all the target countries

(1) Provision of recorded data

There were occasions during online lectures when trainers could not attend the session due to urgent business, or unstable internet connection. In such cases, recorded data was provided to the C/P via OneDrive. Similarly, recorded data was shared when they requested it for reviewing lecture content. Provision of recorded data is therefore helpful when lectures are conducted online.

(2) C/P nomination requirement for technical cooperation project

Throughout the project period, some core trainers did not seem to understand the training content well, or were not very cooperative on fulfilling the requests from the Expert Team. This seems to be because there were few young technicians nominated for core trainers. In addition, senior core trainers were reportedly very busy with their daily duties and could not spare the time for this project. For nominating core trainers in future technical cooperation projects, although it is important to prioritize the wish of the target counties, taking sufficient time to assess the basic knowledge, skill, and workload of the nominated core trainers by the Expert Team will be necessary.

(3) Challenge of online OJT (especially RE O&M)

Online communication was useful for sharing documents and movies as well as discussion. However, taking a video of facility conditions on-site, and assessing facility conditions with the video was quite a challenge (this seems to be common for any facility).

Giving advice online is challenging as opposed to on-site, as various information that would be available on site, such as odor around PV facility, equipment temperature, noise, three-dimensional appearance, cannot be obtained.

Online communication should therefore be regarded as supplementary to on-site activity. Supporting for manual revision online was also difficult and collaborative work on site is essential.

9.2 Conclusion and recommendations

This project, which started in 2017, selected five countries as the target countries of this region-wide technical cooperation project, and conducted various activities. Although collaborative relationship among the target countries was hard to nurture at the beginning of the project (first phase: 2017-2019) with main activities being capacity building of each country and hands-on practice for the provided equipment, in the latter half of the project (second phase: 2019-2023) when regional trainings in Fiji began, it started to develop, by mutually sharing issues, challenges, and solutions for increasing RE deployment and DG O&M. Region-wide project was therefore more effective than technical cooperation projects with only one target country. The following are the conclusions for both field.

1) Preparatory planning

This project was able to share the experience, skills, and know-how that OEPC cultivated in remote island region for increasing RE penetration with the target countries, and received favorable reviews, which was arguably a significant achievement. The algebraic method for identifying the maximum RE capacity to be deployed, and HOMER software for optimization study seemed to have been especially useful for them.

2) Device selection

As there are various kinds of RE facilities, including not only PV, but also wind, hydro, and biomass, selecting devices that most suit the country is necessary. While most of the target countries intend to increase RE penetration with PV (Yap state proceeded with deployment of wind power generation), PV generates electricity only in the daytime and has low capacity factor of approximately 13%. It is the Expert Team's belief that this project successfully conveyed that increasing RE penetration should be achieved by deploying PV in combination with other RE devices such as wind, hydro, and biomass.

3) Inspection and maintenance

Although PV facilities used to be regarded as maintenance-free in Japan, inspection and maintenance, at the minimum of periodic inspection of once in four years, has become mandatory since the introduction of Feed-in-tariff scheme. Many of the target countries had not conducted PV maintenance at the beginning of this project, and malfunctions were often left unnoticed until the Expert Team visited the site. At the time of project completion, however, the importance and necessity of maintenance

activity was well understood, and consultations were made with the Expert Team to deal with malfunctions (RMI), suggesting that the Expert Team was able to contribute for the improvement of inspection and maintenance activities in the target countries. The Expert Team also believes that providing measuring instruments needed for maintenance also greatly contributed for the improvement of their skills.

4) Monitoring system

Determining if a RE facility is operating soundly requires at least the data on generation (kWh). Collecting data on solar insolation in addition to generation data would be helpful, as it enables the comparison of the theoretical output with measured data. Although malfunction of monitoring system was found in some target countries (such as RMI), improvement measures have not been taken, perhaps due to budgetary constraints. The importance of monitoring was conveyed repeatedly, but some countries have not followed through. Continued support on this point therefore seems to be necessary.

5) Human resource development

This project has conducted various activities to improve the technique, skill, and knowledge of the core trainers nominated from the key persons in the JCC meetings. Although improvements were arguably made in the capacity of many core trainers, there was also an issue of some trainers leaving the position in the middle of the project due to their resignation from work, studying abroad, etc. Human resource development and passing on skills are challenges for Japan as well, and discussion on taking measures to reduce turnover rate and passing on skills would be necessary for the Pacific Island Countries in the future.