JCM seminar

Case Study of the FY2023 JCM-FS (METI Program) in the Philippines

Study of GHG Emission Reduction and Economic Feasibility by the Introduction of Combined DERs into Poultry Cooperatives in the Philippines

19, January 2024

Electric Power Development Co., Ltd. (J-POWER)

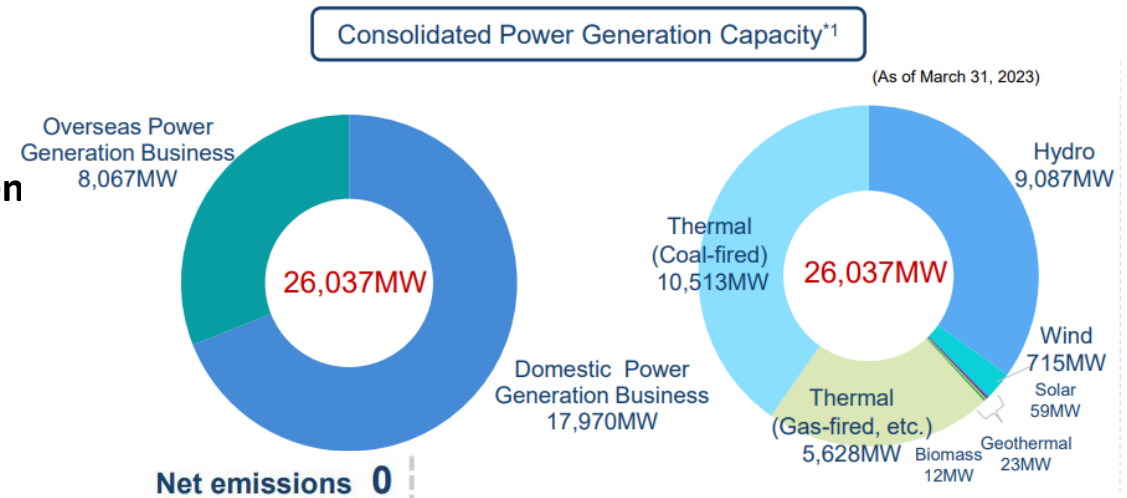
1. J-POWER Overviews

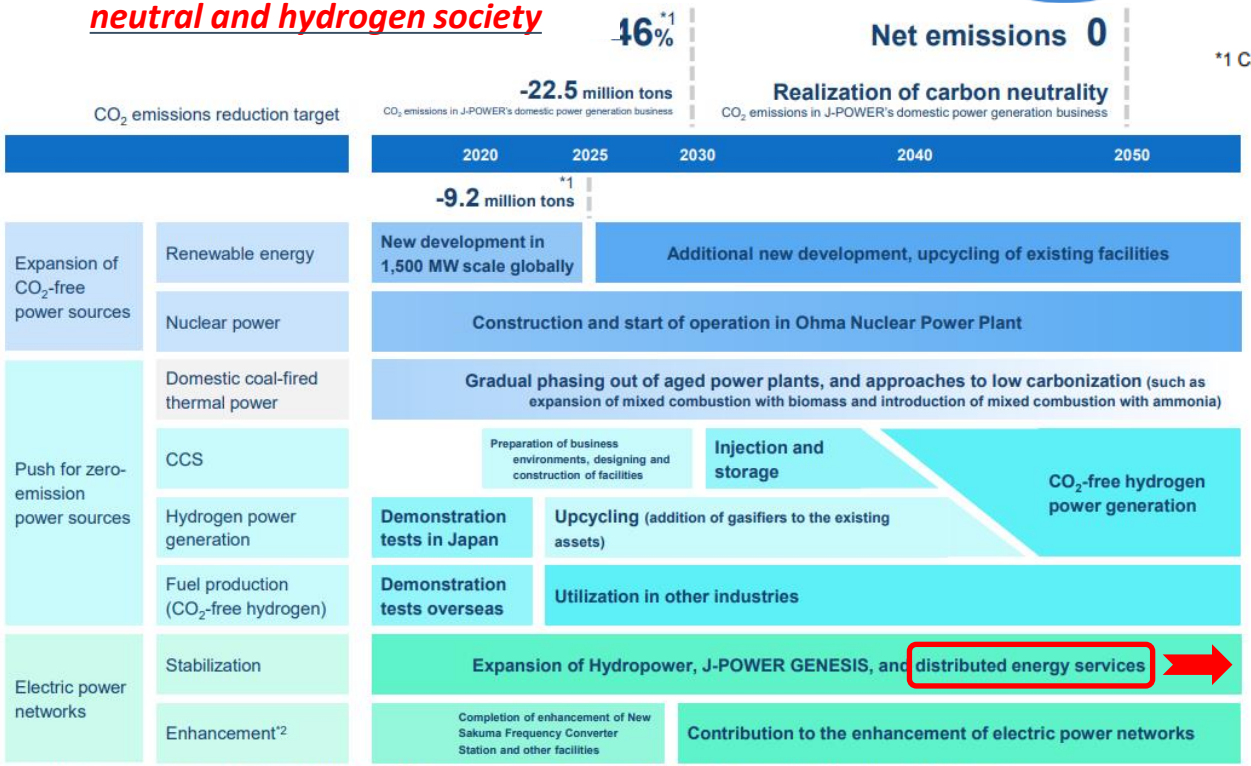
Consolidated Financial Statement [for FY2022]

Operating Revenues : 1,841.9 billion yen
Ordinary Profit : 170.7 billion yen

Roadmap [J-POWER "BLUE MISSION 2050"]

Challenging to realize a carbon-neutral and hydrogen society





*1 Compared to the actual emissions in FY2013 *2 Enhancement of the electric power networks represents part of efforts taken in J-POWER's transmission and transformation.
※CO_2 emissions reduction target criteria changed from FY 2017-2019 three-year average of the actual emissions to the actual emissions FY 2013.
Compared to the 3-year average of the actual emissions from FY2017 to FY2019, Target in FY2025: -7 million tons and Target in 2030: -44%/-20.3 million tons.

The business development of DERs stands as a key component in our roadmap.

2. FS Overviews

[Overview and Government's Initiatives towards low-carbon economy in the Philippines Energy Sector]

The target for the RE energy in the Philippines is 35% by 2030 and 50% by 2040, as outlined in the Philippines Energy Plan 2020-2040. To promote the adoption of RE energy, the following KEY Initiatives are being implemented.

1. **Renewable Portfolio Standard (RPS)** : Mandates all retail electricity suppliers to meet a specified RE energy supply ratio.
2. **Net-Metering Program** : Enables the sale of excess electricity from on-site RE sources owned by self-generators to the distribution grid, applicable up to 100kW RE generation capacity.
3. **Green Energy Option Program (GEOP)** : Empowers large-scale consumers to choose RE energy sources.
4. **Green Energy Auction Program（GEAP)** : Competitive bidding process for the selection of RE energy sources as post FIT program
5. **DER Rules** : Enables the sale of excess electricity from on-site RE sources to the distribution grid, for self-generators whose capacity is ranging from 100kW to 1MW.

[Project Overview]

Study of Distributed Energy Resources Introduction for the Cooperative, comprising 23 members

Challenges:

a. **High electricity prices due to the volatile fuel market conditions.**

b. **Power outages caused by the vulnerability of the distribution system**

Introduction

-Rooftop solar
-Battery
-Biogas generation by poultry manure

3. FS Schedule, Study Team

[Schedule]

- Selected in the FY2023 JCM Feasibility Study (Second Call)

- The study period was approximately four months, spanning from Oct 2023 to Jan 2024. Two research visits to the Philippines were conducted during the study period

Study Item	2023						2024		Note
	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	
1. Pre-contratual activities	7/24 Call for Proposals 8/18 Submission of Proposal 9/22 Offical Adoption 9/28 Provisional Contract								
2. Visit/Interviesw in the Philippines				▼ #1		▼ #2			#1: 23/Oct-1/Nov, #2: 10-15/Dec
3. Study of Related Policy and Regulation									
4. Study of PV and Battery				Preparation	incl. power consumption measurement				
5. Study of Biogas				▼ Sampling					
6. Economical Feasibility									
7. Report									

<u>Interview</u>

Poultry farm owners、DOE、DENR、ERC、PENELCO、Japanese Embassy、JETRO、JICA、Local companies/consultants

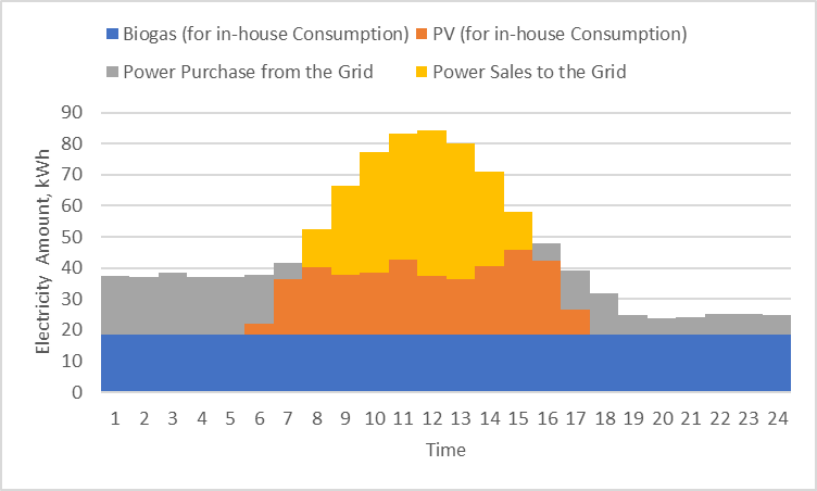
[Study Team]

J-POWER (5 members) and a local sub-contractor

4. FS Output

[RE sources introductions - Case Study of a Poultry Farm]

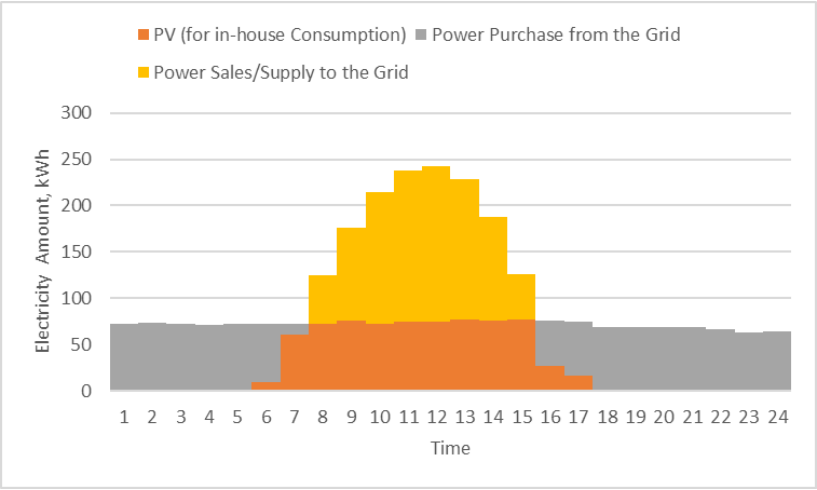
Case 1：Solar 80kW + Biogas 20kW、Net-Metering Program



Actual power consumption at five representative poultry farms was measured over one month. Based on the actual data, scenario study has been conducted with various assumptions below:

- **Various combination of energy sources (solar, storage, biogas)**
- **Output scales**
- **Applicable gov't programs (Net-Metering or DER)**

Case 2：Solar 300kW、DER rule



4. FS Output

[Calculation of CO2 Emission Reductions - Case Study of a Poultry Farm]

Applying various methodologies to quantify the reduction in CO2 emissions (ER_p). The fundamental approach involves subtracting the project CO2 emission (PE_p =0) from the reference CO2 emissions (RE_p).

$$ER_p = RE_p - PE_p$$

	Methodology 1 (JCM_PH_AM002、existing)	Methodology 2 (to be newly developed)
Formula	$ER_p = RE_p - PE_p$ $RE_p = \sum_i (EG_{i,p} \times EF_{RE,i})$ $PE_p = 0$	$ER_p = RE_p - PE_p$ $RE_p = NEG_p \times EF_{RE,elec}$ $NEG_p = EG_p - EC_{aux,p}$ $EC_{aux,p} = RPC_{aux} \times 24(hours/day) \times D_p$ $PE_p = \sum_i ((FC_{PJ\_onsite,i,p} + FC_{PJ\_t,i,p}) \times NCV_{PJ,i} \times EF_{PJ,i})$
Abbreviation	$EG_{i,p}$: Quantity of electricity generated by the project solar PV system i during period p [MWh/p] $EF_{RE,i}$: Reference CO2 emission factor for the project solar PV system I [tCO2/MWh]	NEG_p: Net amount of electricity generated by the biogas power generation during the period p [MWh/p] $EG_{RE,elec}$: CO2 emission factor for the national grid [tCO2/MWh] EGp: Amount of electricity generated by the biogas power generation during the period p [MWh/p] $EC_{aux,p}$: Amount of electricity consumed by the auxiliary equipment of the biogas power generation during the period p [MWh/p] RPC_{aux}: Total rated power consumption of the auxiliary equipment of the biogas power generation [MW] D_p: Number of operating days during the period p [day/p]

	Csse 1 (Solar 80kW + Biogas 20kW)	Case 2 (Solar 300kW)
Annual CO2 Emission Reductions (1st yest)	138.2 t-CO2*	212.0 t-CO2*

*The values are listed in the Final Report