Hybrid Power Generation Project Using Biogas and Solar Power

Implementing Entity: Next Energy & Resources Co., Ltd.

February 22, 2016

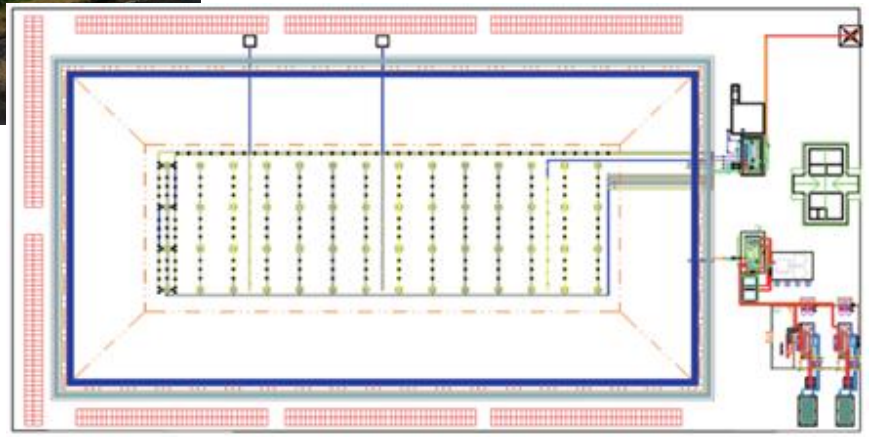
1. Overview of JCM FS

a. Project Location

Jawa Maraja Bah Jambi, Simalungun Regency, North Sumatra

b. Description of the technology

Expecting stable operation of the Biogas Plant and to maximize the power supply to the grid, through installation of 150kW Solar PV System as auxiliary generator.

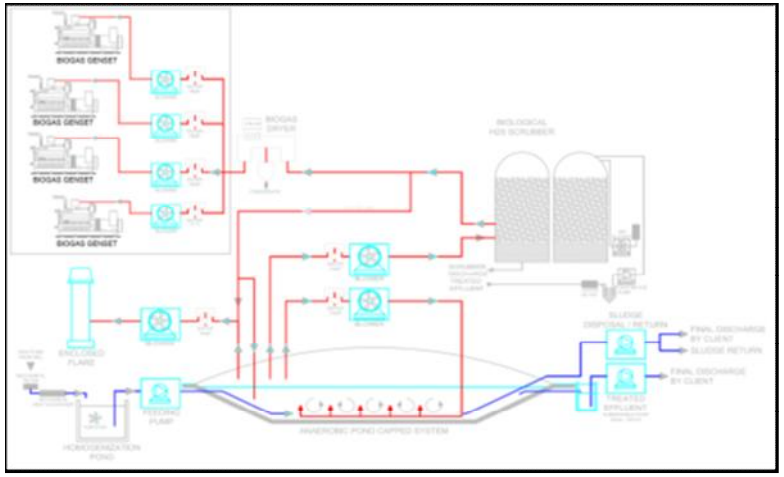


c. Indonesia partner

PT KARYA MAS ENERGI

d. Project details

- ✓ Capture lagoon-produced biogas made from POME.
- ✓ Produced biogas will be collected and distributed using blowers to biogas treatment system
- ✓ Remove H2S and water content.
- ✓ Treated biogas will be utilized to generate electricity (2MW) with biogas engine.
- ✓ Maximizing the power supply to the grid, by installing 150kW Solar PV System as auxiliary generator.



2. Reference scenario

- ✓ Biogas recovery for electricity generation is not common. As of the latest statistics, the accumulative installed capacity of biogas power plants only accounted for 10 MW, all of which is for off-grid use.
- ✓ Therefore, reference emissions are
  (1) Methane emissions from open lagoon treatment system of POME and
  (2) CO2 emissions from grid electricity displaced by renewable power generation by the proejct.

3. Monitoring methods

	Monitoring item	Measurement method
1	Concentration of COD in the wastewater flows in to the system i in period p	Monthly sampling analysis will be carried out by an external accredited laboratory in accordance to national or international standards through representative samplings. Monthly value will be recorded and annual average will be used for calculation
2	Concentration of COD in the wastewater flows out of the system i in period p	Monthly sampling analysis will be carried out by an external accredited laboratory in accordance to national or international standards through representative samplings. Monthly value will be recorded and annual average will be used for calculation
3	Volume of wastewater treated in project wastewater treatment system i in period p.	Measured continuously (at least hourly measurements are undertaken, if less, confidence /precision level of 90/10 shall be attained). The measured data will be recorded continuously and aggregated monthly for emission calculation.
4	Amount of electricity supplied to grid in period p	continuously measurement by project participant
5	Concentration of COD in the wastewater leaving the treatment system in period p	Monthly sampling analysis will be carried out by an external accredited laboratory in accordance to national or international standards through representative samplings. Monthly value will be recorded and annual average will be used for calculation
6	Amount of biogas captured by project activity in period p	Continuous measurement using an appropriate gas flow meter that includes measurements of temperature and pressure and records values in N m3. Values will be measured continuously and recorded as daily aggregates
7	Amount of biogas recovered in dry basis at normal conditions in period p	Continuous measurement using an appropriate gas flow meter that includes measurements of temperature and pressure and records values in N m3. Values will be measured continuously and recorded as daily aggregates
8	Amount of biogas flared in period p	Continuous measurement using an appropriate gas flow meter that includes measurements of temperature and pressure and records values in N m3. Values will be measured continuously and recorded as daily aggregates

4. Quantification of GHG emissions and their reductions

$$RE_p = RE_{treament,p} + RE_{elec,p}$$

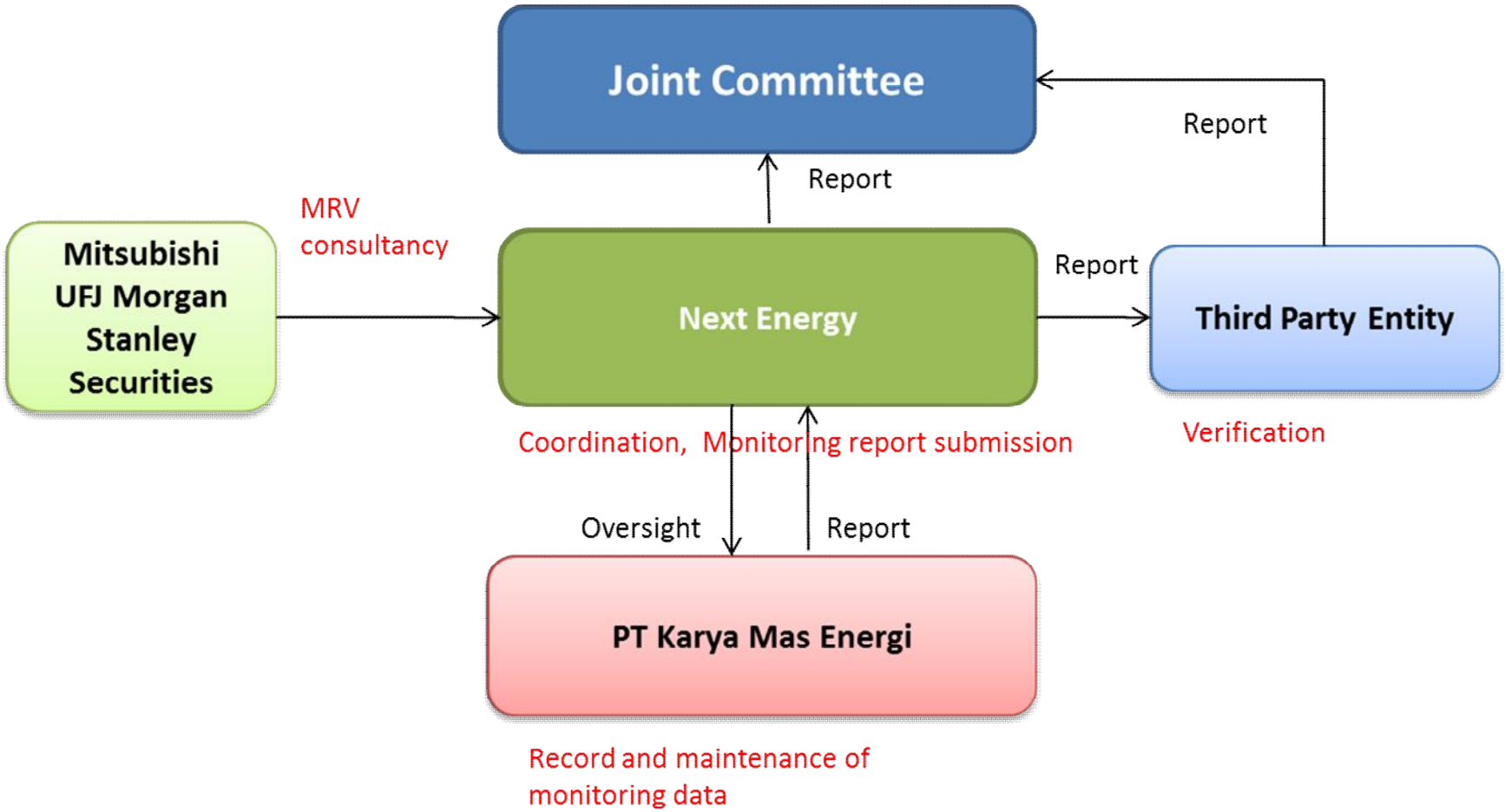
RE_p	Annual Reference emissions in period p (t CO_2e)	64,617
$RE_{treatmen}$	Reference emissions of the wastewater treatment systems affected by the project activity in period p (t CO_2e)	55,431
$RE_{elec,p}$	Reference emissions from electricity or fuel consumption in period p (t CO_2e)	9,186

$$PE_p = PE_{treament,p} + PE_{discharge,p} + PE_{fugitive,p} + PE_{flare,p}$$

PE_y	Annual Project emissions in period p (t CO_2e)	6,877
$PE_{treatment,p}$	Project emissions from wastewater treatment systems affected by the project activity, and not equipped with biogas recovery in period p (t CO_2e)	6,202
$PE_{discharge,p}$	Project emissions from effluent discharged into river/sea/lake in period p (t CO2e). These emissions shall be calculated uncertainty factor of 1.12	55
$PE_{fugitive,p}$	Project emissions from biogas release in capture systems in period p (t CO2e)	620
$PE_{flare,p}$	Project emissions from flaring in period p (t CO2e)	0

	Reference emissions	Project emissions	Emissions reduction
Annual (tCO2/year)	64,617	6,877	57,739
15 year project period (tCO2/15-years)	969,255	103,155	866,085

5. MRV methods

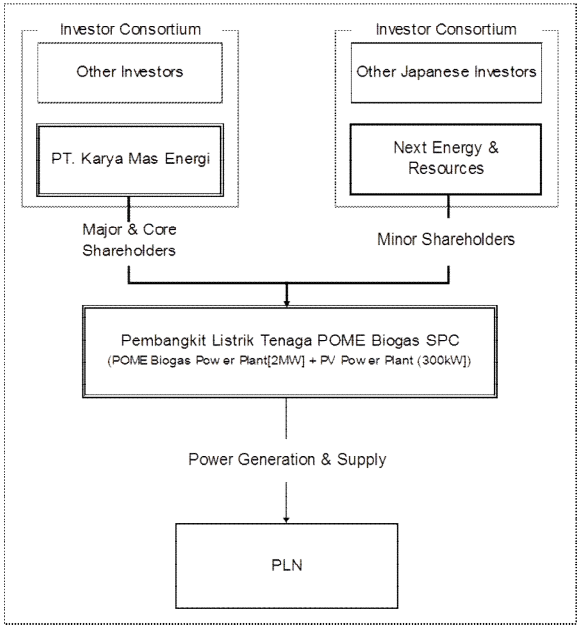


6. Capacity building plan

- ✓ We, in collaboration with Japanese engineering services provider, will keep involving the operation and maintenance, through implementation of Remote Monitoring System.
- ✓ We will also transfer its knowledge for PV Plant construction as well as necessary operation and maintenance to the Indonesian partner.
- ✓ The proposed project will greatly contribute the sustainable development of Indonesia by two ways:
  I. The treatment of wastewater from one of Indonesia's most important economic sectors by the state-of-art technology leads to reduction of not only greenhouse gas emissions but also odor and other environmental hazards.
  II. By recovering biogas for energy use, it creates renewable source of energy for grid that is currently largely dependent on fossil fuel.

7. Others

- ✓ We propose contribution from Japan, not only for the Engineering point of view, but also Financial point of view, including possible equity investment by ourselves.



- ✓ We are aiming to finalize negotiation with KME by the end of March, in order to be prepared for application of JCM subsidy in coming fiscal year.