Development of District Energy Supply Business by Introducing Co-generation

(FY2015 JCM Feasibility Study,Ministry of Environment, Japan)

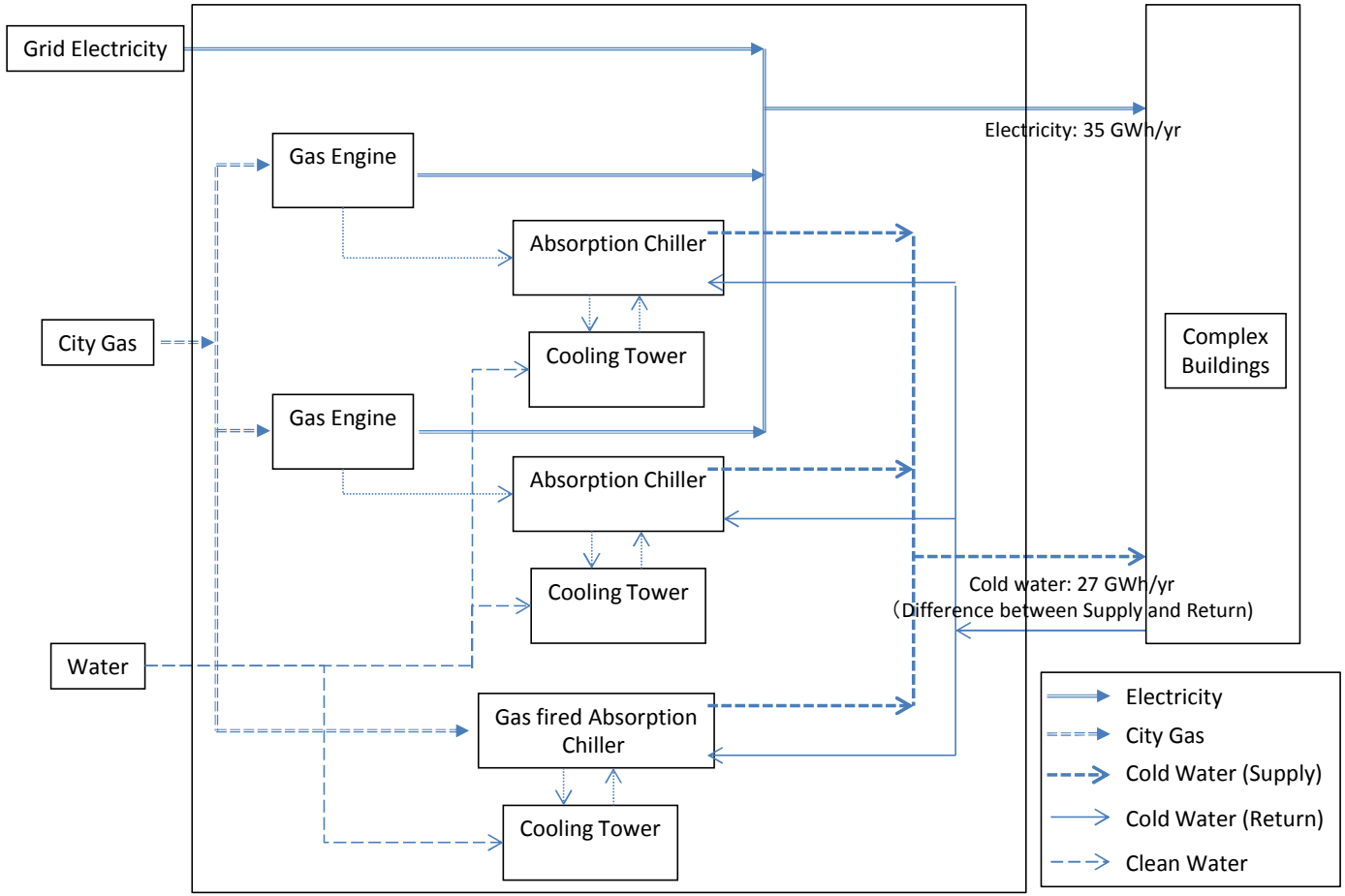
February, 2016

1. Overview of JCM FS

a. Project Location

- Central Jakarta

b. Description of the technology



Gas Engine
2,000 kW x 2 unit

Abs. Chiller
1,884 kW x 2 unit

Gas fired chiller
3,869 kW x 1 unit

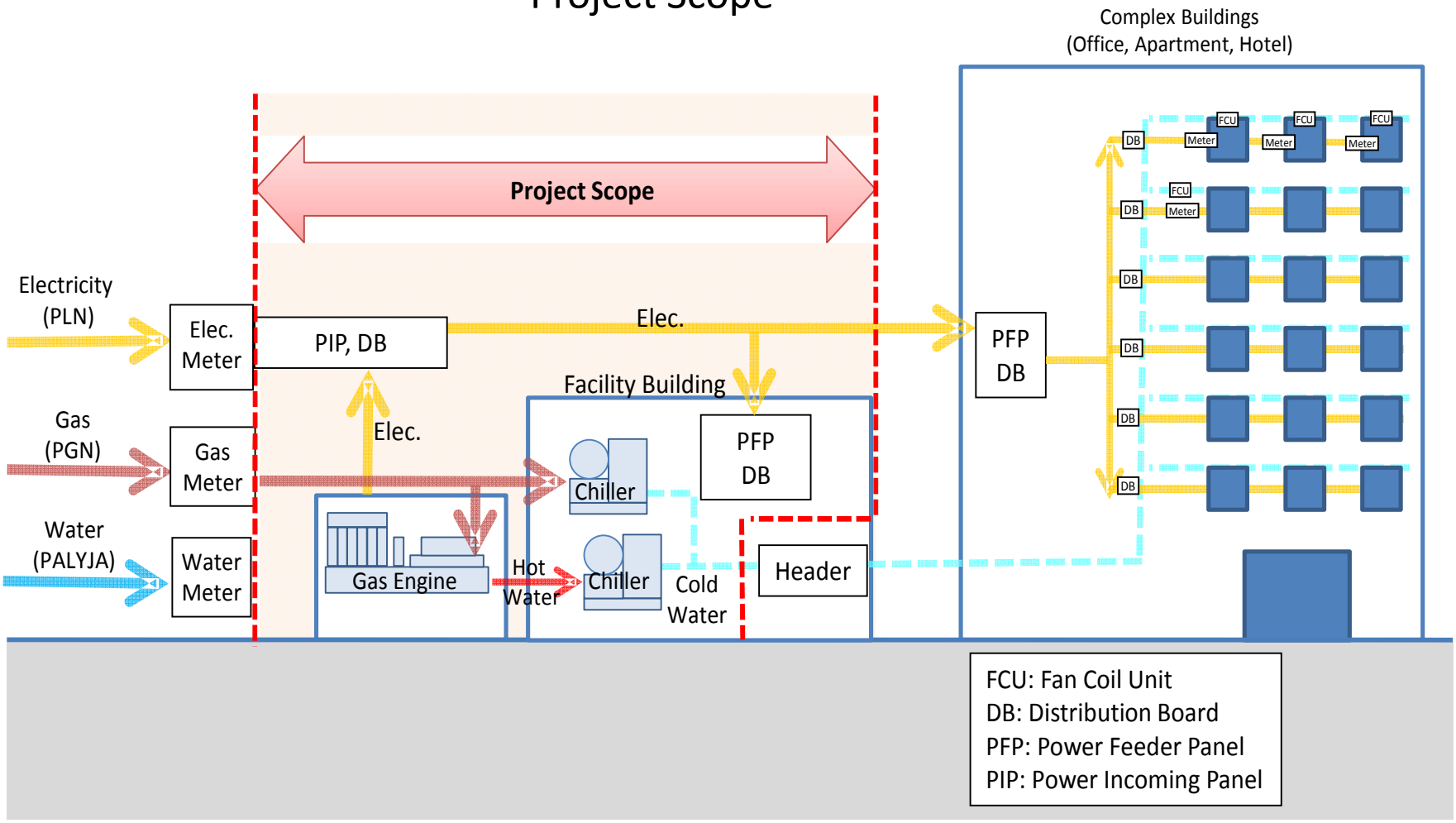
c. Indonesia Partner

- Local Real Estate Developer（A Company)

1. Overview of JCM FS

d. Project Detail

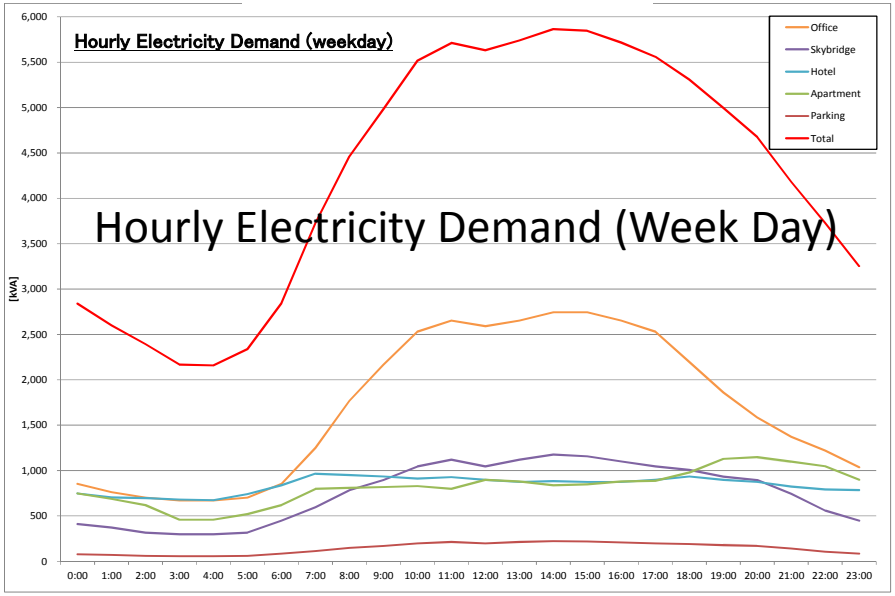
Project Scope



1. Overview of JCM FS

d. Project Detail

Electricity Demand



Heat Demand

Building/Facility	Floor Area [m^2]	Annual Demand [TJ/year]
Office	26,464	33
Sky Bridge	7,110	16
Hotel	11,880	11
Apartment	37,584	37
Total	83,038	98

Input / output condition

Item		Value
INPUT	Electricity Consumption	6.5 [GWh/year]
	Gas Consumption	6.9×10^6 [m^3/year] (73 [GWh/year])
	Water Consumption	1.4×10^5 [m^3/year]
OUTPUT	Electricity Sale	35 [GWh/year]
	Cold Heat Sale	98 [TJ/year] (27 [GWh])

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d. Project Detail

Current Situation of Electricity and Gas Supply in Jakarta

	Office Building A	Office Building B	Hotel	Commercial Building
Frequency of Blackout	Once/Month	3 to 4 times/year	Once/Month	—
	(Max two hours)	(2 hours/time)	(Mainly voltage drop)	(N.A.)
Frequency of Gas Supply Stop	Twice/year	(N.A.)	Once	Once/5 years

Gas Engine Example in Jakarta

- Plaza Indonesia is a large shopping mall in Jakarta (Started since 2009, net floor area: aprox 62,747 m2) .
- Electricity from gas engine make up 75% of total demand (as long as we know). No use for wasted heat.

- **Co-generation system is still unpopular in Jakarta especially commercial market.**
- **Spread of energy saving system also contributes to sustainable society in addition to power plant expansion.**

1. Overview of JCM FS

d. Project Detail

Perspective of Government and State-owned Companies

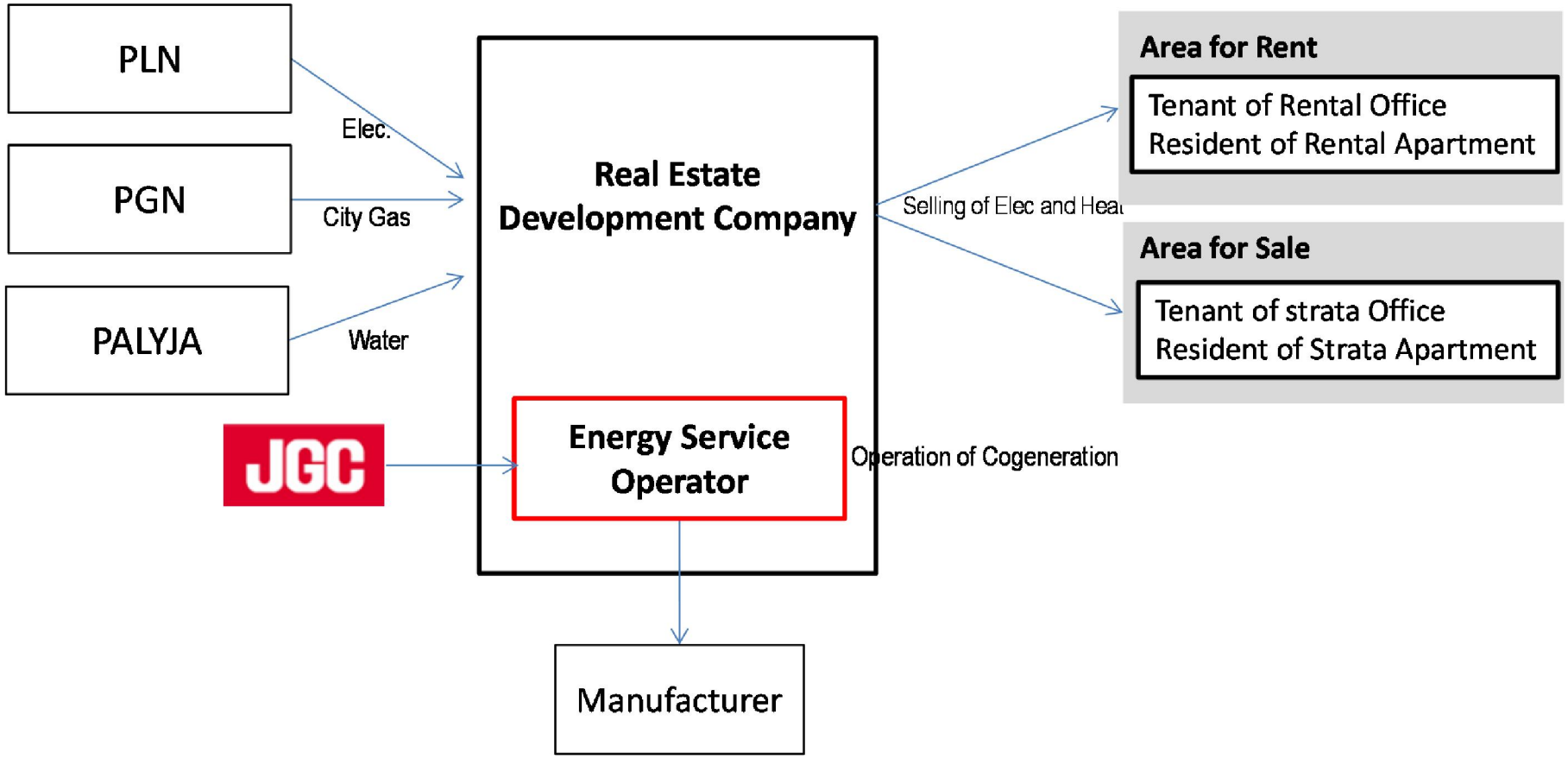
ESDM	• ESDM anticipates private sector's investment on electricity business as the electricity generation capacity is not sufficient in Indonesia. • Basically one electricity company shall be in one business area for public electricity supply under the current electricity regulation. • If current electricity company's supply is not enough, other company is able to obtain business area.
PLN	• PLN supposes the electricity capacity is sufficient in Jakarta. • Business area may be given to private company where it is difficult for PLN to supply.
PGN	• PGN is supportive for installing cogeneration system.

- **If the business area license were open to private company, more business opportunity born and energy efficient technology could be adopted.**

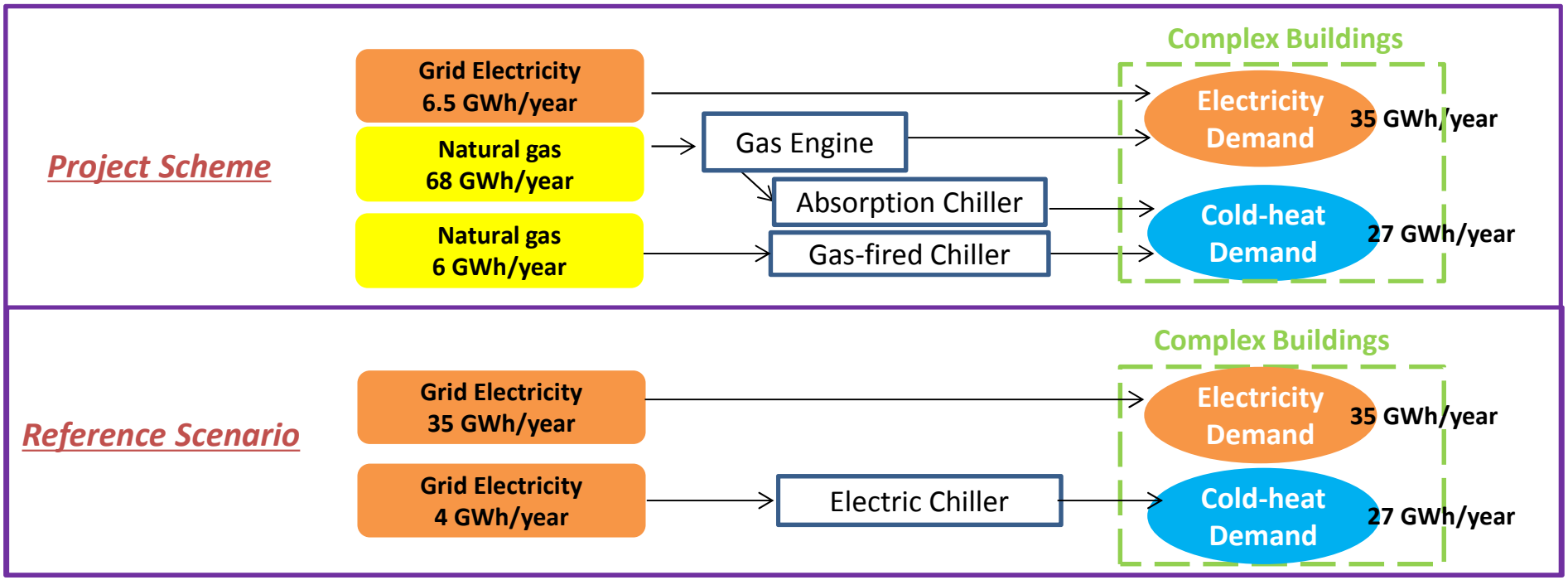
1. Overview of JCM FS

d. Project Detail

Considerable Business Scheme



2. Reference Scenario



- **Characteristics of the Project**
  - Produce electricity by gas engine, which is operated by natural gas, to supply electricity to the complex buildings
  - Produce cold-heat by absorption chiller, which is operated by waste heat out of the gas engine, to supply air-conditioning service to the complex facility
- **Reference Scenario**
  - Electricity from the national power grid
  - Cold-heat from electric chiller operated by electricity from the national power grid

3. Monitoring Methods

Double Check / Feasibility Check / Monitor Accuracy Check

Category	Check Item	Technical manager・Staff	Financial manager	Calibration Staff	Reference
Natural Gas	Supply status / Amount	○	-	○ (International standards)	Gas meter Invoices
	Price / Amount	-	○	-	Invoices
Electricity	Supply status / Amount	○	-	○ (International standards)	Electricity meter
	Price/ Amount	-	○	-	Invoices
CO2 Emissions		○	○	-	MRV report
Maintenance Cost		○ (Operation cost)	○ (maintenance cost)	-	Invoices Working records
Feasibility check		-	○	-	Reference electricity price check

4. Quantification of GHG Emissions and their reductions

- **Condition**
  - Electricity demand of the complex facility: 35 GWh/year
  - Cold-heat demand of the complex facility: 98 TJ/year
  - Natural gas consumption for gas engine: 243 TJ/year
  - Natural gas consumption for gas-fired absorption chiller: 21 TJ/year
  - Electricity received from power grid: 6.5 GWh/year

- **Reference Emission**
  - 33,313 tCO_2/year

    CO_2 emission factor of the grid: 0.843 tCO_2/MWh (Latest Emission Factor, JAMALI, Ex-ante)

    COP of centrifugal chiller: 5.94（ID_AM002 “Energy Saving by Introduction of High Efficiency Centrifugal Chiller”）

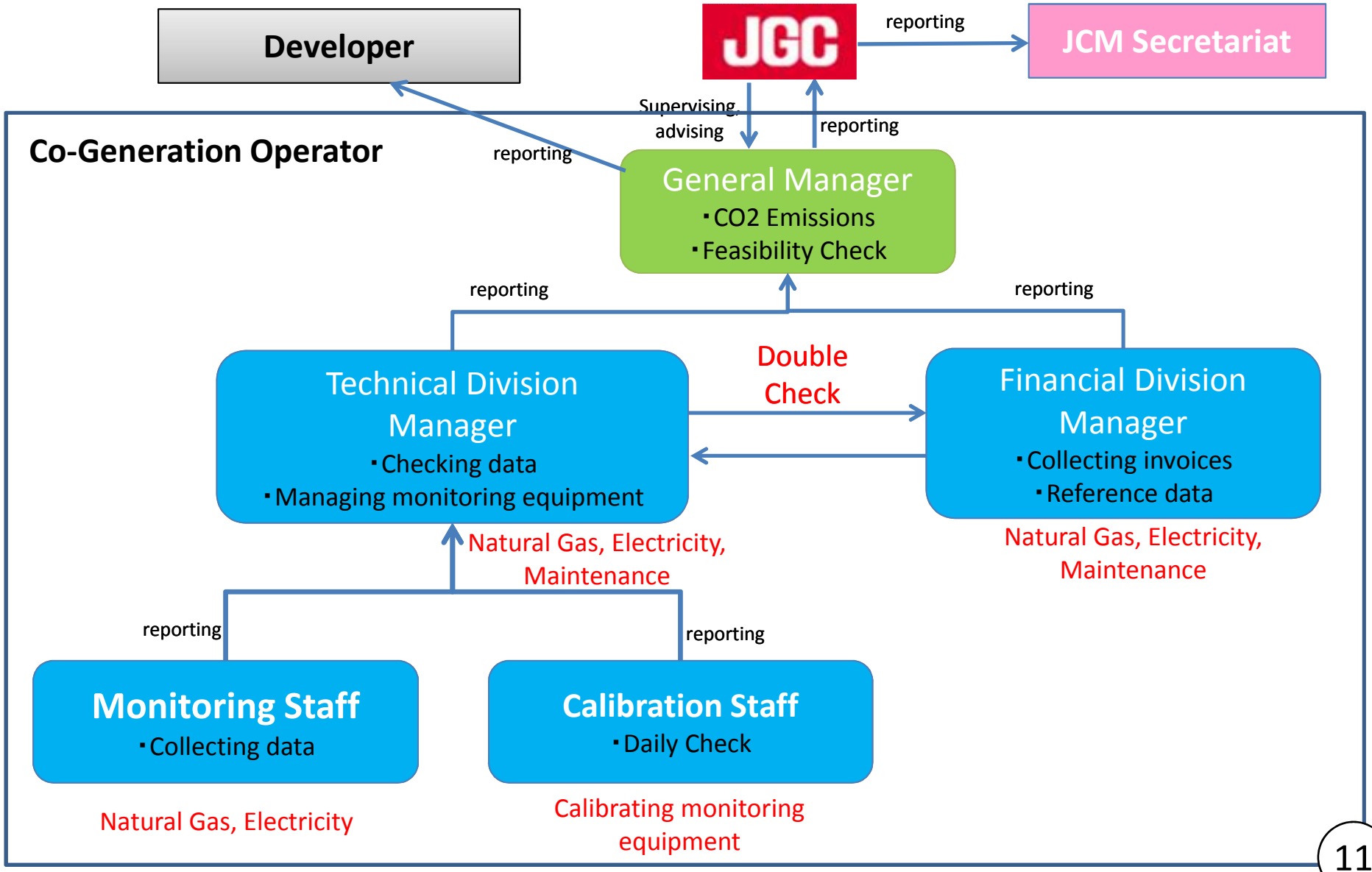
- **Project Emission**
  - 20,321 tCO_2/year

    CO_2 emission factor of the grid: 0.843 tCO_2/MWh (Latest Emission Factor, JAMALI, Ex-ante)

    CO_2 emission factor of natural gas: 56.1 t CO_2/TJ（2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 2 Energy）

- **GHG Emission Reductions**
  - GHG Emission Reductions = Reference Emission – Project Emission
  - = 33,313 tCO_2/year – 20,321 tCO_2/year = 12,992 tCO_2/year

5. MRV Methods



6. Capacity Building Plan / 7. Others

6. Capacity Building Plan

- Co-generation system design and Operation knowhow will transferred.

7. Others

Investment

Category	Cost
Equipment [billion Rp]	64
Building [billion Rp]	5
Total [billion Rp]	69

Condition

Corporate Income Tax: 25%
Depreciation Period (20 yrs for building, 16 yrs for facilities)
Exchange Rate: Rp. 13,333/US$、Rp. 110/JPY
Operation Period: 17 years (2 yrs for construction, 15 yrs for operation)

Pay Back periods

11 years

If are there any opportunity adopting co-generation system in Indonesia, please contact to JGC !