Promoting Bilateral Mechanisms in Asia and the Pacific
A Workshop on the Joint Crediting Mechanism

JFE

Power Generation by Waste Heat Recovery in Cement Industry

- JCM Model Projects in 2014 by MOEJ -

22 May 2015

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Global Business Development
JFE Engineering Corporation

- About JFE Engineering
- Project Summary
- Project Methodology
- Another JCM Project

Group Structure

JFE Holdings
(holding company)

Turnover: **37 billion$**

Employees: **57,200**

Fortune Global 500:
Ranked in 278

JFE Engineering

Net Sales (million $)
2,840

Employees
7,400

JFE Steel

Net Sales (million $)
26,900

Employees
42,500

JFE Shoji Trade

Net Sales (million $)
17,800

Employees
6,200

Japan Marine United

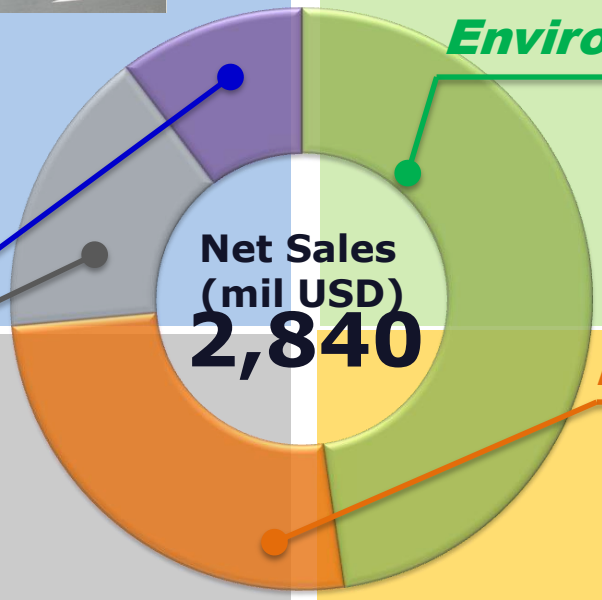
Net Sales (million $)
3,600

Employees
6,000

Business Field

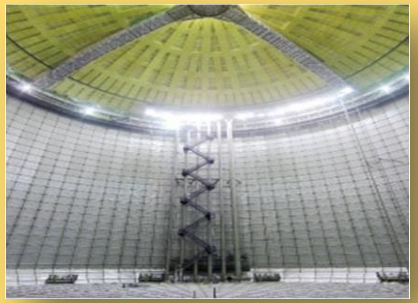
Industrial Machinery & Others

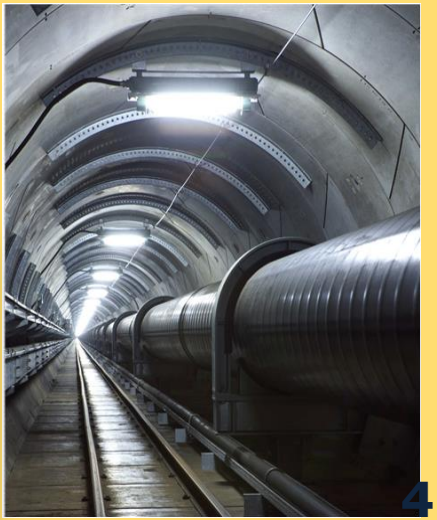
Environment



Steel Structure

Energy Plant & Pipeline





Global Network

- Head Offices / Overseas Offices
- Overseas Subsidiaries
- Overseas Affiliate

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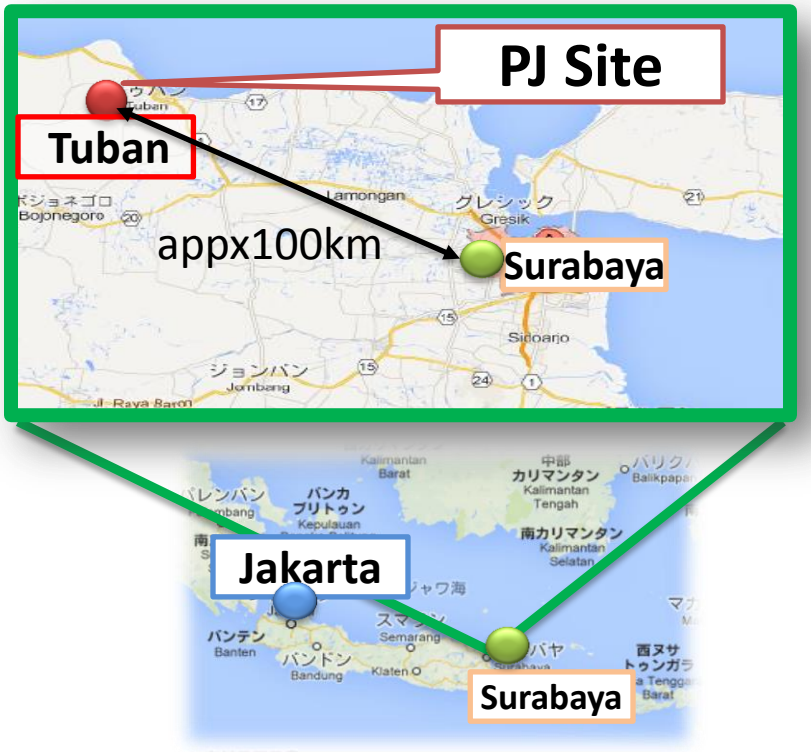
JCM Model Project Summary

Counterpart	**PT Semen Indonesia**
Site	**Tuban Plant East Jawa**
Power Generation	**28MW**
GHG Emission Reduction	**122,000t-CO2 /year**



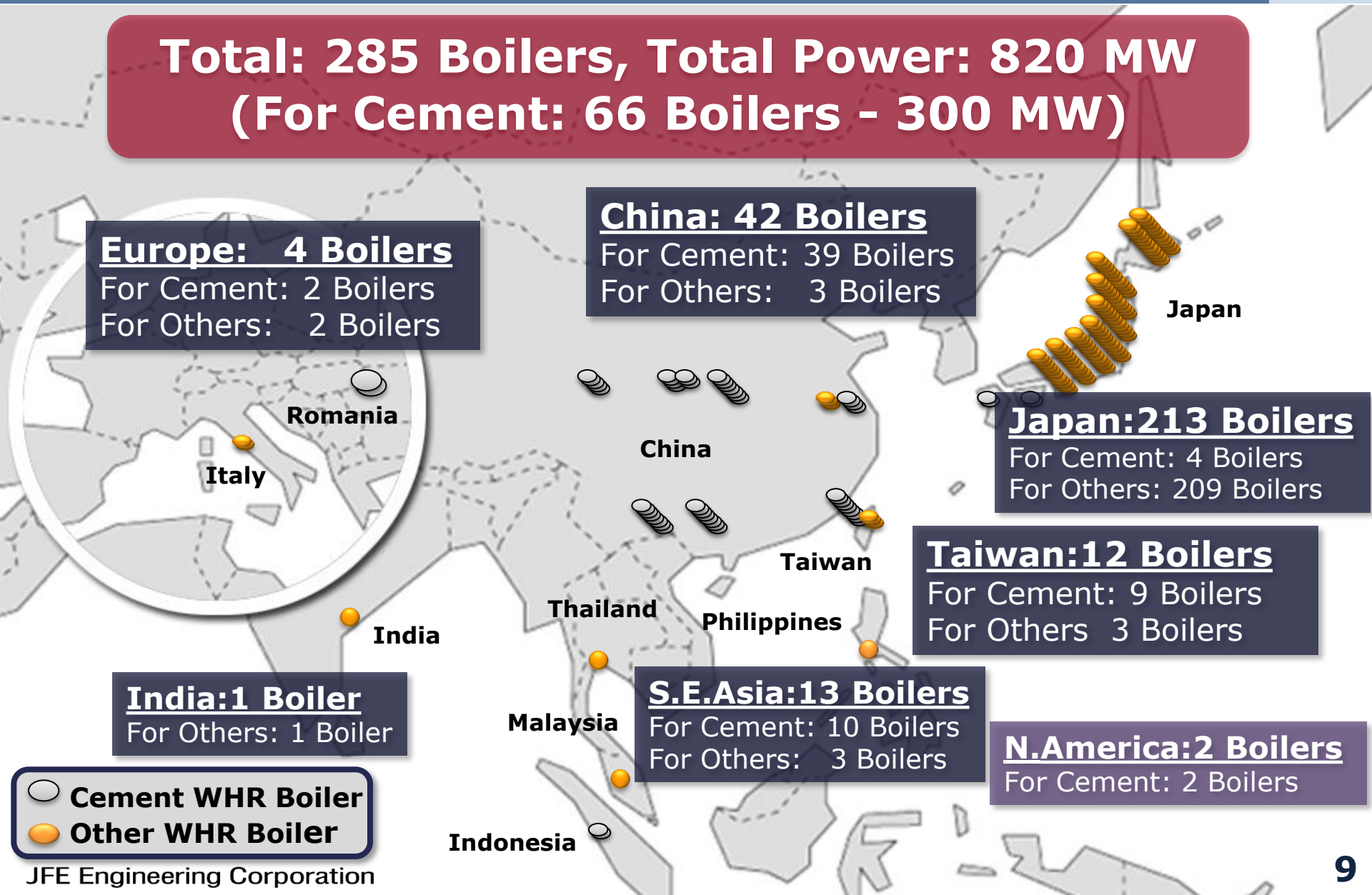
Waste Heat Recovery Benefits

Benefits

CO_2 Emission Reduction	Reduced Consumption from Grid-Connected Power Plants
No Additional Fuel Required	Electricity Generation Using Only Waste Heat
Electricity Reserve for the Community	Available Electricity for the Communities
Savings on Production Costs	Apx. 20% substituted with Electricity by WHR

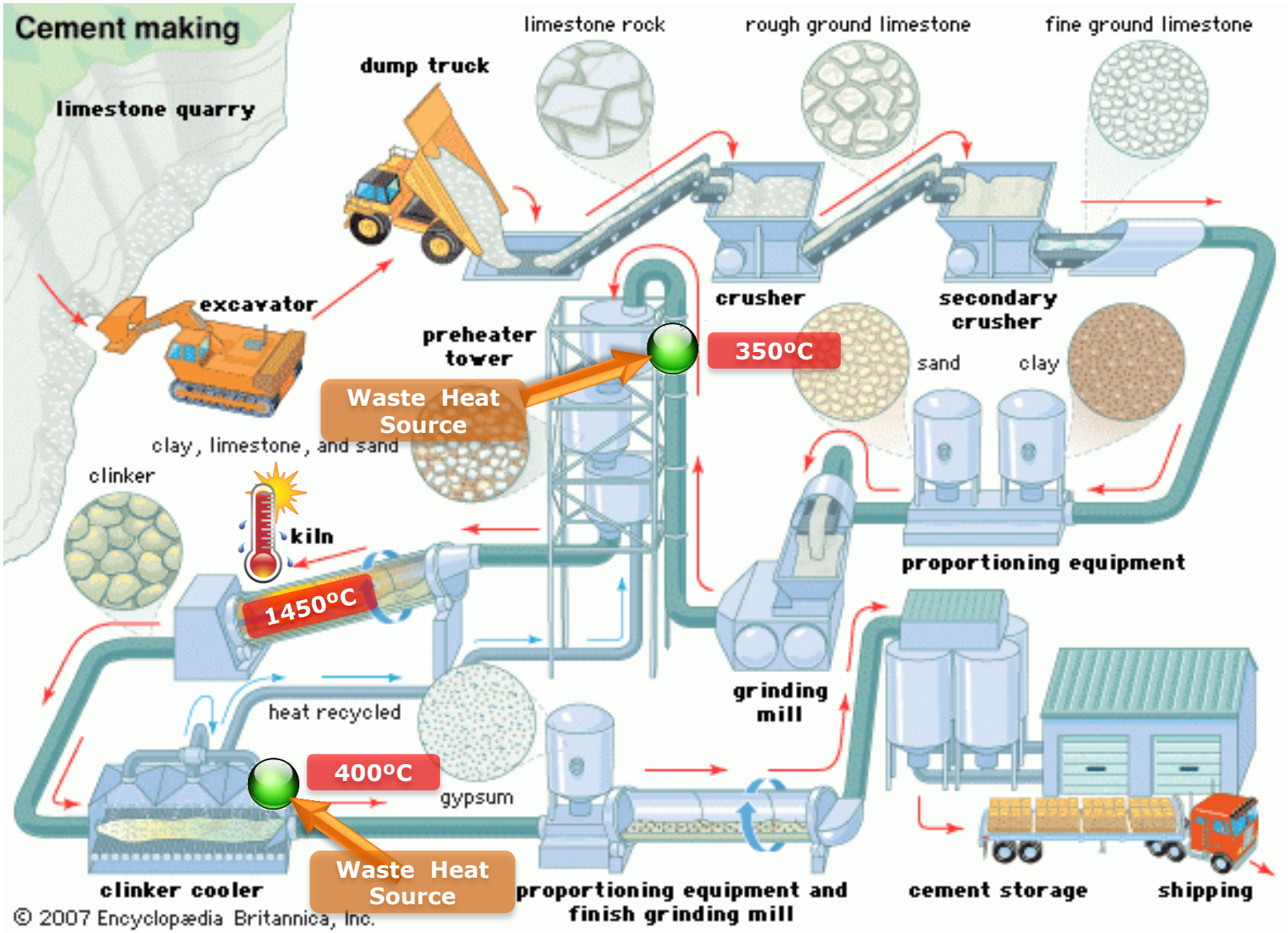
JFE's Service Record

Total: 285 Boilers, Total Power: 820 MW
(For Cement: 66 Boilers - 300 MW)

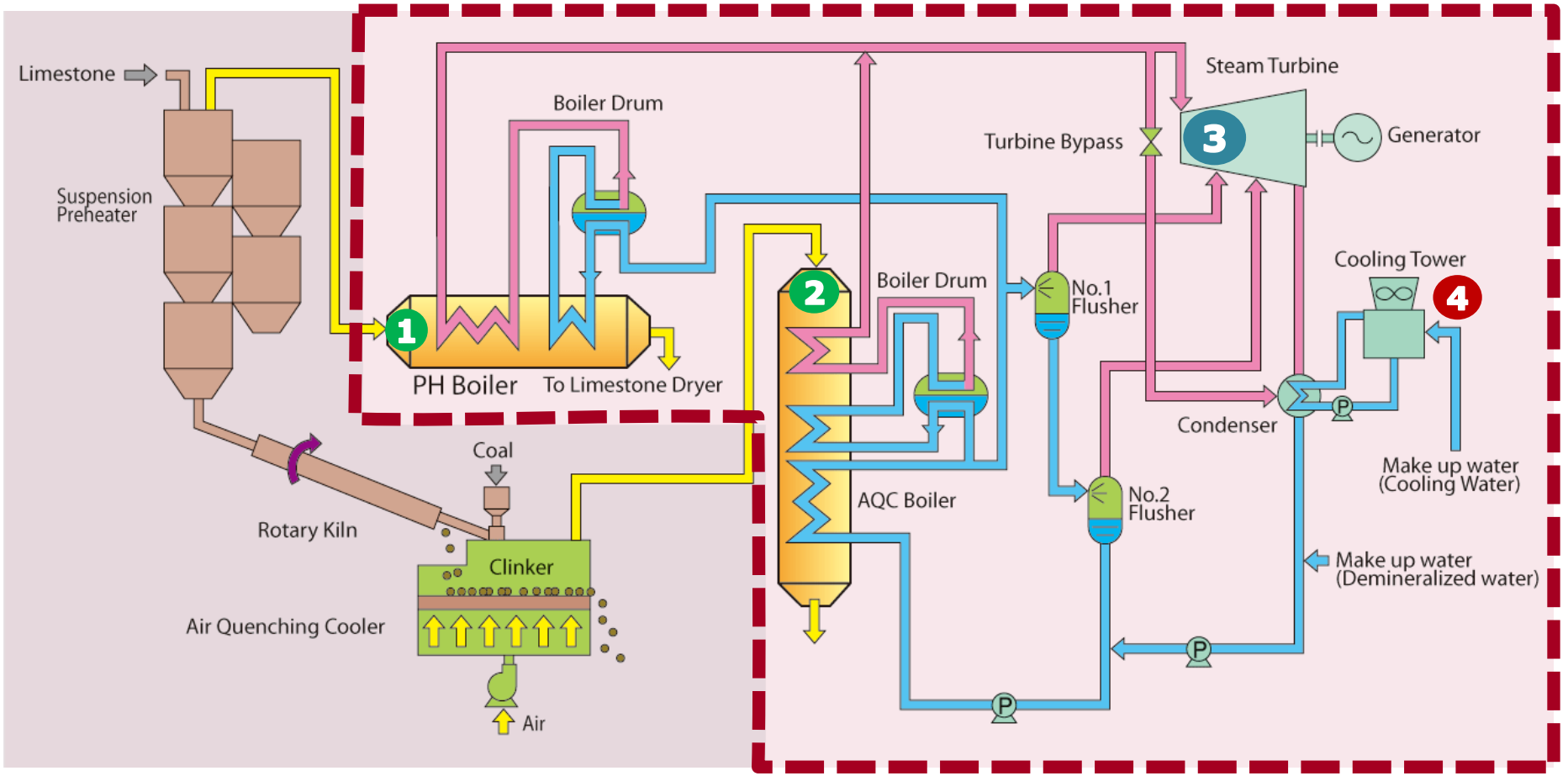


JFE Engineering Corporation

Cement Production Process



Typical System Flow

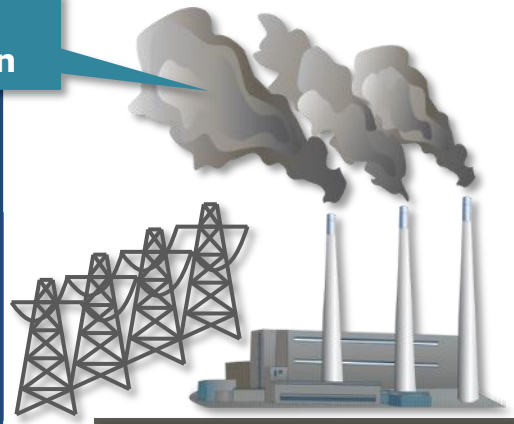


Clinker Production Process

Waste Heat Recovery System

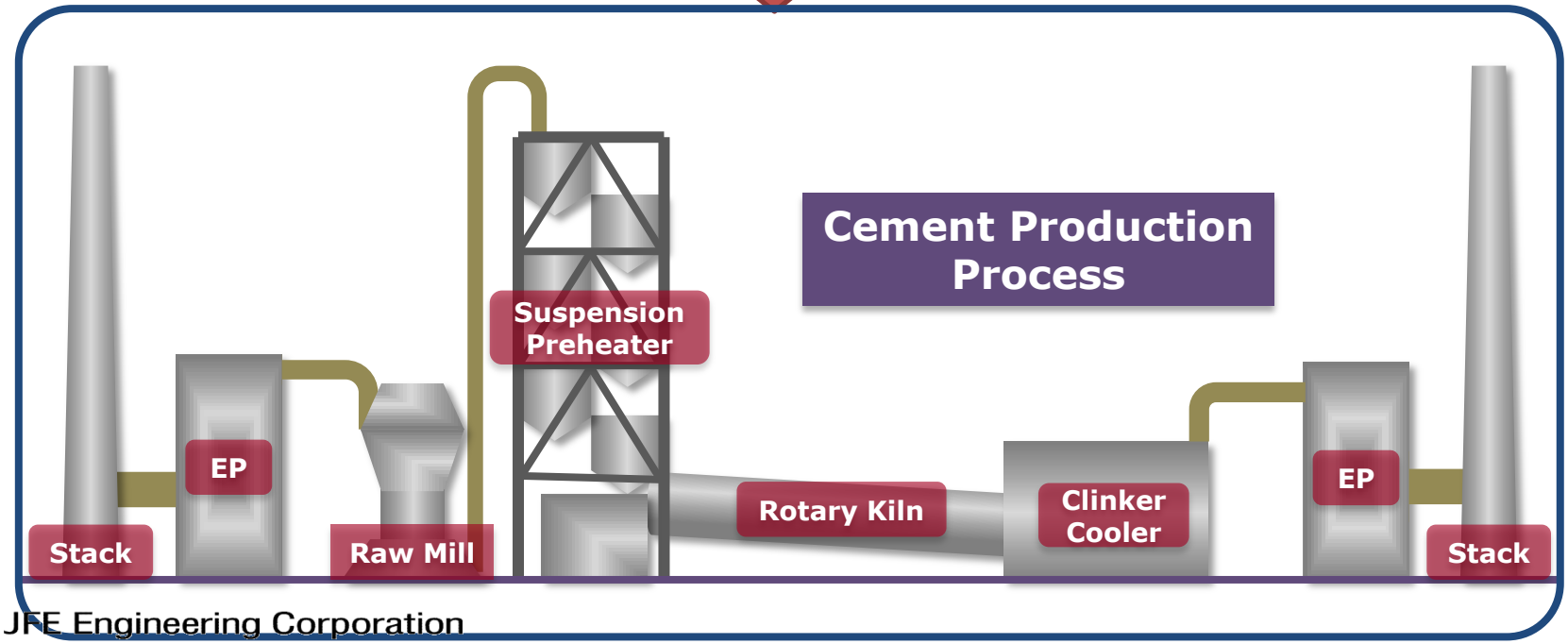
Cement Production – Baseline

CO_2 emission due to Fossil Fuel Combustion

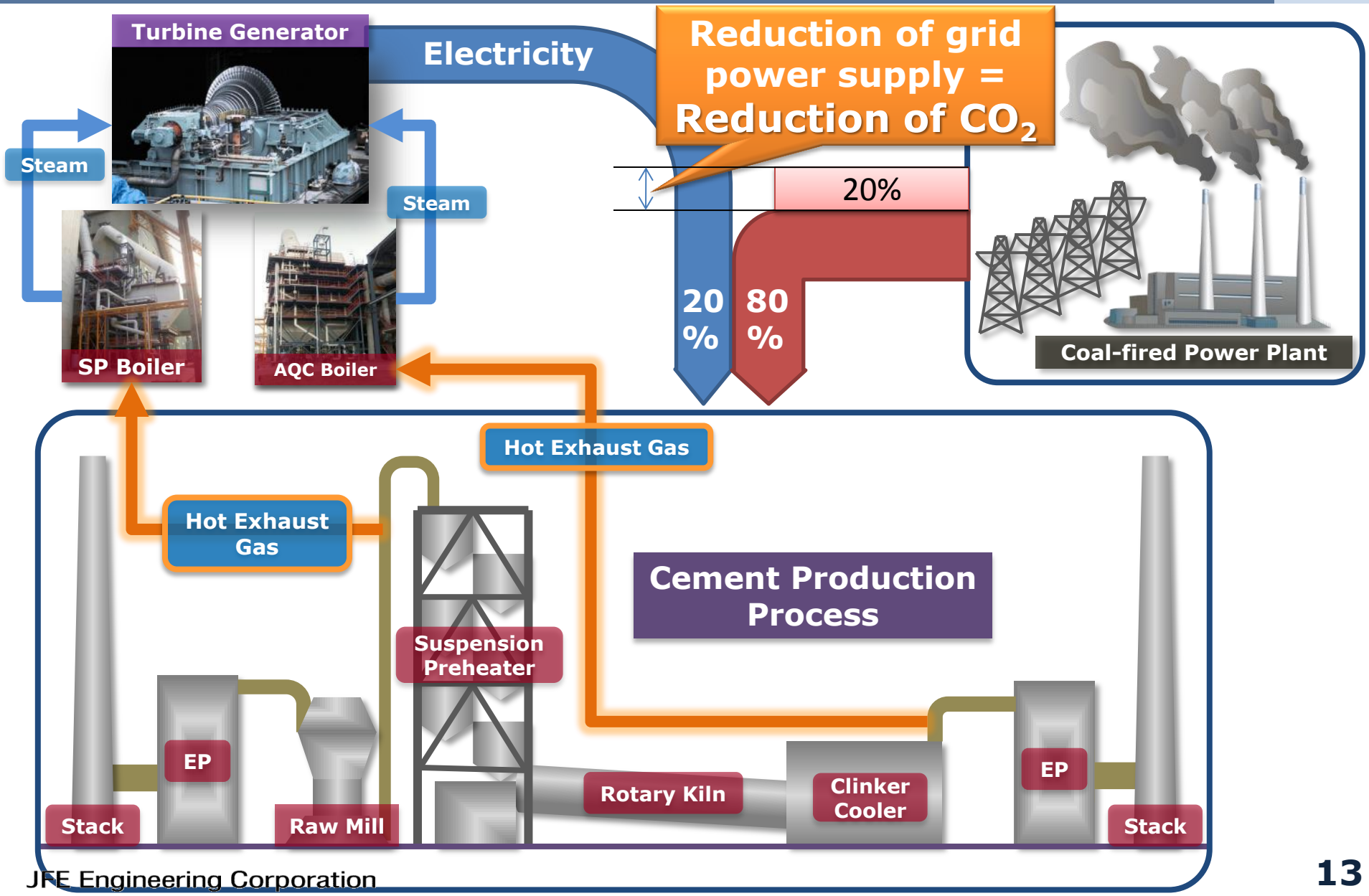


Electricity

100 %



After WHR System Installation



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Eligibility Criteria

Criterion 1	The project utilizes waste heat from **a cement production facility** by waste heat recovery system (**WHR**) to generate electricity
Criterion 2	WHR system consists of a Suspension Preheater boiler (**SP boiler**) and/or Air Quenching Cooler boiler (**AQC boiler**), **turbine generator** and **cooling tower**
Criterion 3	WHR system utilizes only waste heat and does **not** utilize **fossil fuels** as a heat source to generate steam for power generation
Criterion 4	WHR system has **not been introduced** to a corresponding **cement kiln** of the project prior to its implementation

Eligibility Criteria

Criterion 5	Cement factory where the project is implemented is **connected to a grid system** and the theoretical **maximum electricity output of the WHR system**, which is calculated by multiplying maximum electricity output of the WHR system by the maximum hours per year (24*365=8,760 hours), is **not greater than** the total amount of **the electricity imported to the cement factory** from the grid system: > During the **previous year before the validation**, if the validation of the project is conducted **before** the operation of the project, or > During the previous year before **the operation** of the project, if the validation of the project is conducted **after** the operation of the project

Calculation of Reference Emissions

		A	B	C	D	E(A*B*C*D)
Quantity of Electricity Generation		Generation Capacity (MW)	Operating day per year (days/y)	Time (hrs/day)	Operating Rate	Electricity (MWh)
	Dry Season	28	182.5	24	0.85	104,244
	Rainy Season	22	182.5	24	0.85	81,906
The quantity of electricity consumption		2.4	365	24	1	21,024
The quantity of net electricity generation by the WHR system which replaced grid electricity import						165,126

$$RE_y = EG_y * EF_{grid}$$

$$= 165,126\ MWh/y * 0.741\ tCO_2e/MWh$$

$$= \mathbf{122,358\ tCO_2e/y}$$

Reference Emissions

Reference

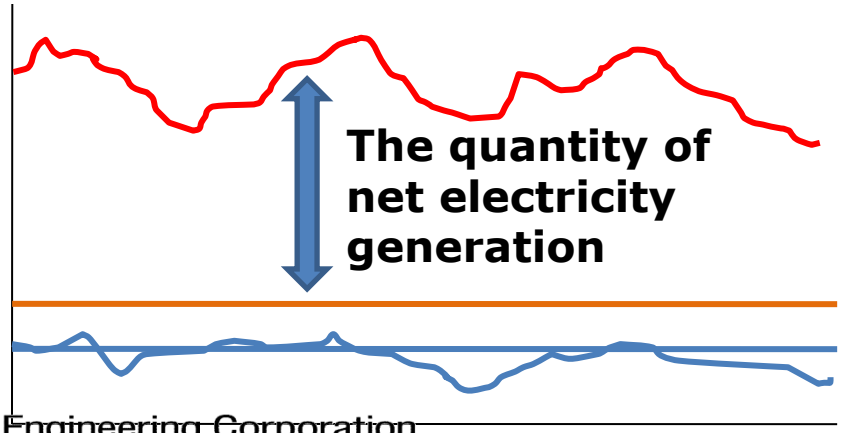
Reference is the situation where WHR system has not been introduced. Diffusion rate of WHR system is very low in Indonesian Cement Industry

1 plant installed / 25 plants total

Conservativeness

Electricity consumption of WHR system is calculated by the theoretically maximum load of auxiliary equipment

=> Rated capacity of installed equipment (EG_{CAP}) related to WHR system and max. hours/period



The quantity of gross electricity generation by waste heat

$EG_{AUX,y}$:2.4MW(EG_{CAP})*24h/d*365days

1.9MW(Designed capacity)*24h/d*365days

Reference Emissions

$RE_y = EG_y * EF_{grid}$

RE_y: Reference emissions
EG_y: The quantity of net electricity generation
EF_{grid}: CO_2 emission factor for an Indonesian regional grid system

Determination of EG_y

$EG_y = EG_{GEN} - EG_{AUX}$

EG_{GEN}: The quantity of gross electricity generation by waste heat
EG_{AUX}: The quantity of electricity consumption by WHR system

Determination of EG_{AUX}

$EG_{AUX} = EG_{CAP} * 24 * 365$

EG_{CAP}: The total maximum rated capacity of equipments of WHR system

Emission Reductions

Emission Reductions
= Reference Emissions

Replacement of Grid Electricity Generation

- **Calculation of reference/project emissions**
  Emissions to be calculated in the methodology are those replaced by power generation of WHR system

- **Emission Reductions**
  = Reference Emissions – Project Emissions

- **No additional fuel**
  Project Emissions = 0

Data and parameters fixed *ex ante*

- **EF_{grid} : CO_2 emission factor**

National Committee on Clean Development Mechanism Indonesian DNA for CDM, Updates on Emission Factors of Electricity Interconnection System(2011)

- **EG_{CAP} : Total max. rated capacity of equipments of the WHR system which consumes electricity**

Rated capacity of all installed equipments of the WHR system which consumes electricity

Monitoring

- **$EG_{GEN,y}$: Quantity of gross electricity generation**

Watt meter log data are saved:

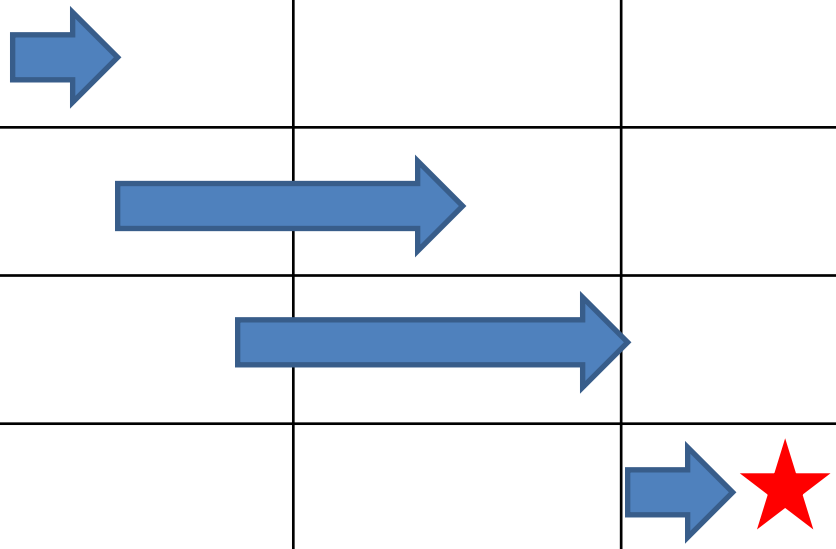
every one minute

in both electronic data in a server and on printed paper

Project Schedule

Power Generation will start in the beginning of April 2016

	2013	2014	2015	2016
Design				
Equipment				
Construction				
Commissioning				



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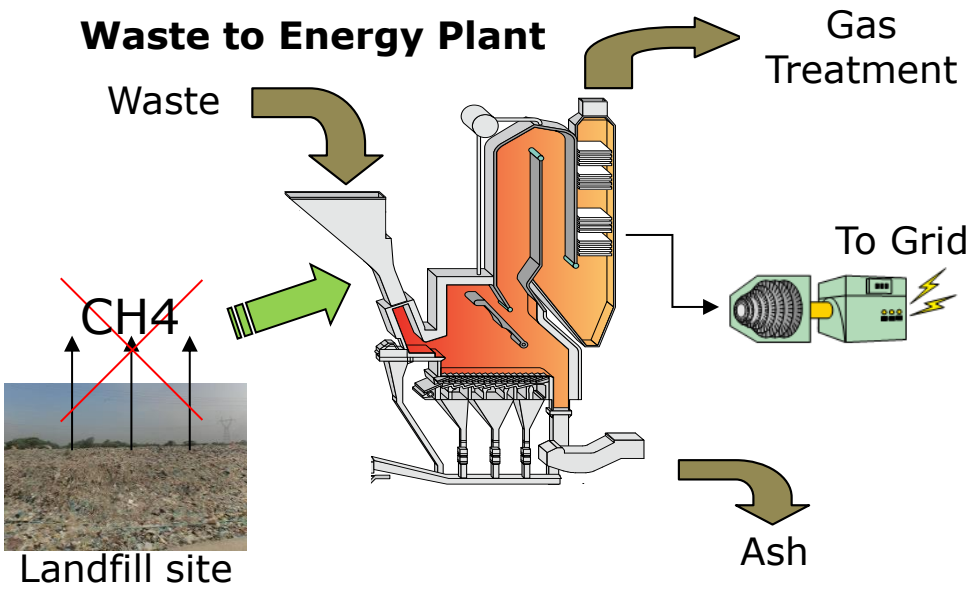
Another JCM Project by JFE

Introduction of Waste to Energy Plant in Yangon City
- JCM Feasibility Study in 2014 by MOEJ -



*Image

Eligibility Criteria

Criterion 1	The project newly installs an incinerator, waste heat recovery boiler, exhaust gas treatment equipment and turbine generator.
Criterion 2	The project incinerates fresh municipal solid waste and generates electricity from steam produced in a boiler which uses heat of incineration.
Criterion 3	The project facility is constructed within the municipality where waste to be incinerated by the project is generated.
Criterion 4	The fraction of energy generated by auxiliary fossil fuels in a construction design document is planned to be not more than 50 % of the total energy generated in the incinerator during normal operation.
Criterion 5	Electricity generated is exported to a grid or used for displacing captive fossil fuel fired power generator.
Criterion 6	Emissions of NO2 and CO at the stack of incinerator are designed to be less than or equal to the following levels: NO2 (230mg/m3@11%O2) and CO (42mg/m3@11%O2)

GHG emission reductions

GHG emission reductions	**4,663**
Reference emissions	**12,073**
(CH4 emissions from landfill site)	7,496
(CO2 emissions from electricity)	4,576
Project emissions	**7,409**
(CO2 emissions from waste incineration)	4,913
(N2O emissions from waste incineration)	369
(CO2 emissions from electricity)	2,102
(CO2 emissions from fossil fuel consumption)	26

tCO2e

Thank you for your kind attention.

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