



January 2023

# Waste-to-Energy – Towards a carbon neutral society



**JFE Engineering Corporation**

# JFE Engineering Outline



JFE Holdings

Revenue: 33billion USD  
Employee: 64,295

JFE Steel

JFE Engineering

JFE Shoji

Japan Marine United

Recycling and Power Generation 13%



Others 2%

Environmental Solutions 43%

Waste to energy plants, water treatment plants, etc.



Revenue(FY2021)  
**3,850** million USD  
(318 billion INR)

Group-wide

Infrastructure 21%

Bridges, port and harbor facilities, cranes, logistics systems, etc.



Energy Industries 21%

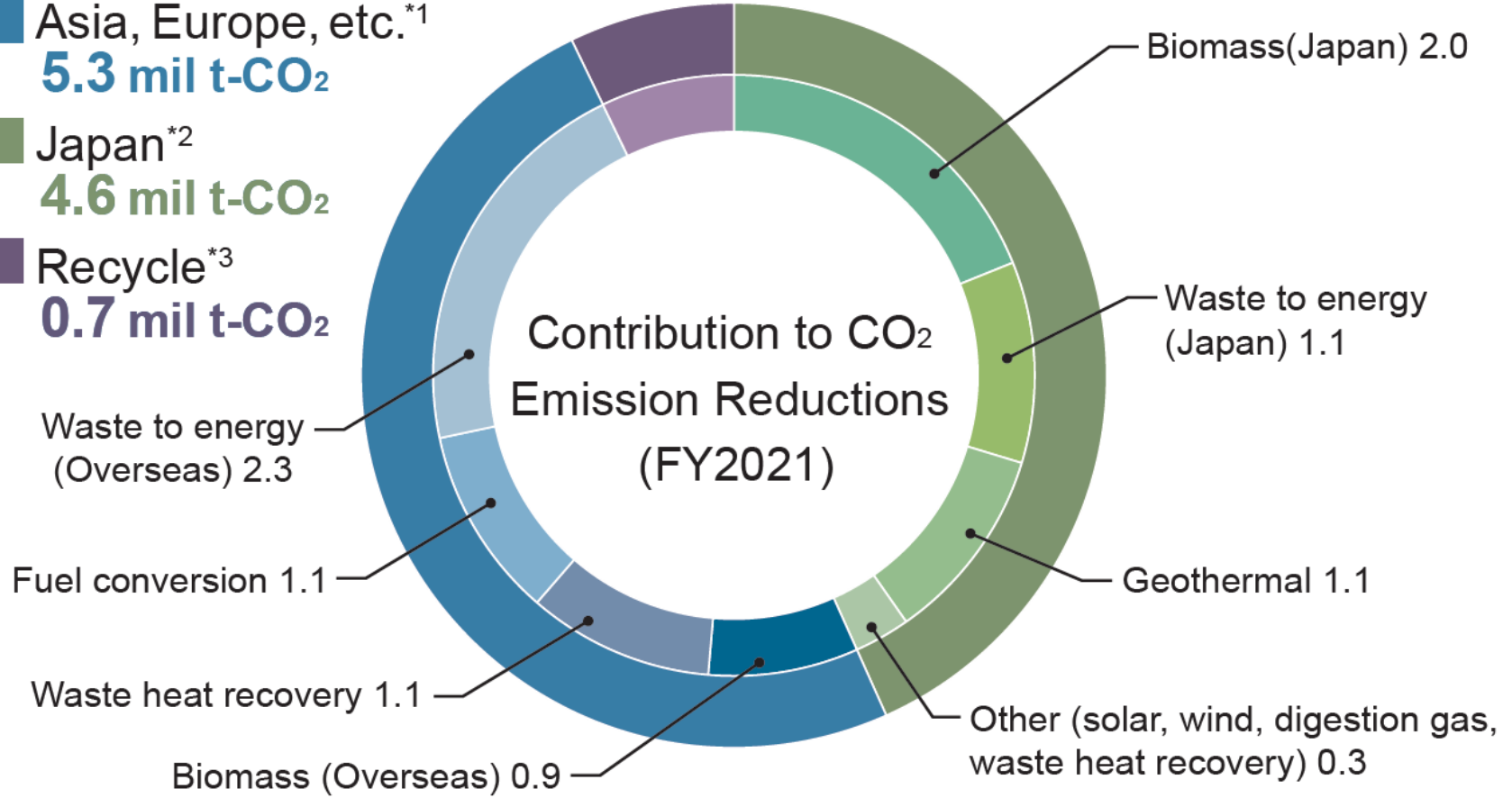
LNG bases, pipelines, renewable energy, etc.



# Our Contribution of GHG Emission Reduction

## 10,560,000 t-CO<sub>2</sub>/y

- Asia, Europe, etc.\*<sup>1</sup>  
**5.3 mil t-CO<sub>2</sub>**
- Japan\*<sup>2</sup>  
**4.6 mil t-CO<sub>2</sub>**
- Recycle\*<sup>3</sup>  
**0.7 mil t-CO<sub>2</sub>**



\*1 Covered JFE Engineering Corporation and Standardkessel Baumgarte GmbH  
 \*2 Covered JFE Engineering Corporation  
 \*3 Covered J&T Recycling Corporation including subsidiary company

# Achieving SDGs (sustainable development goals) through our projects

## for circular economy

Recycling, Waste-to-energy, Renewable energy



## for comfortable communities

Water and sewage infrastructure, Smart agriculture, Medical equipment



## for development and prosperity

Logistics infrastructure (ports and bridges), Energy infrastructure



## for infrastructure and industry

PPP projects, Regional new power systems, Energy service provider



Is this a familiar sight?

Is this a familiar sight?



Is this a familiar sight?



**CH4 Emission**

**Pest, Odor, Fire, Water & Air Contamination**

**Global Warming**

**Pollution**

**Hazardous situations  
for the communities  
and local economies**

**Land Availability**

**Difficult to secure new  
Landfill space**





A well-rounded waste management plan includes:

- Source segregation
- Covered transportation
- Assured supply of waste
- Technology suitable to type of waste
- Long term sale of products (electricity, compost, gas etc.)
- Gate fees (tipping fees), preferential tariff, viability gap funding



# Multi-collaboration for the Global environment



500 tpd, 11.6 MWe, Commissioning 01/'24



Ministry of the Environment

JCM subsidy



Equity(55%)



Equity(45%)



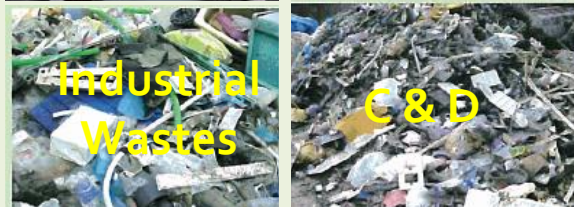
IFC Loan  
+ Finland-IFC Blended  
Finance for Climate Program

# Wastes

# Pre-Treatment

# Conversion

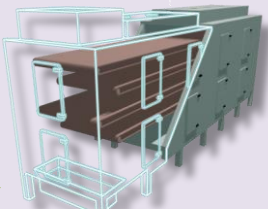
# Re-Utilization



MRF



RDF Plant



Solidification Plant



Incineration



Melting/Gasification



Digestion



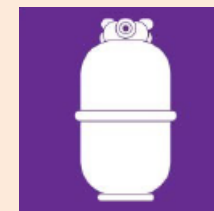
Recycling



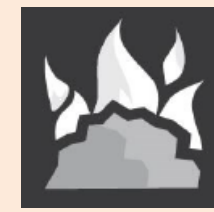
Power



Slag/Metal

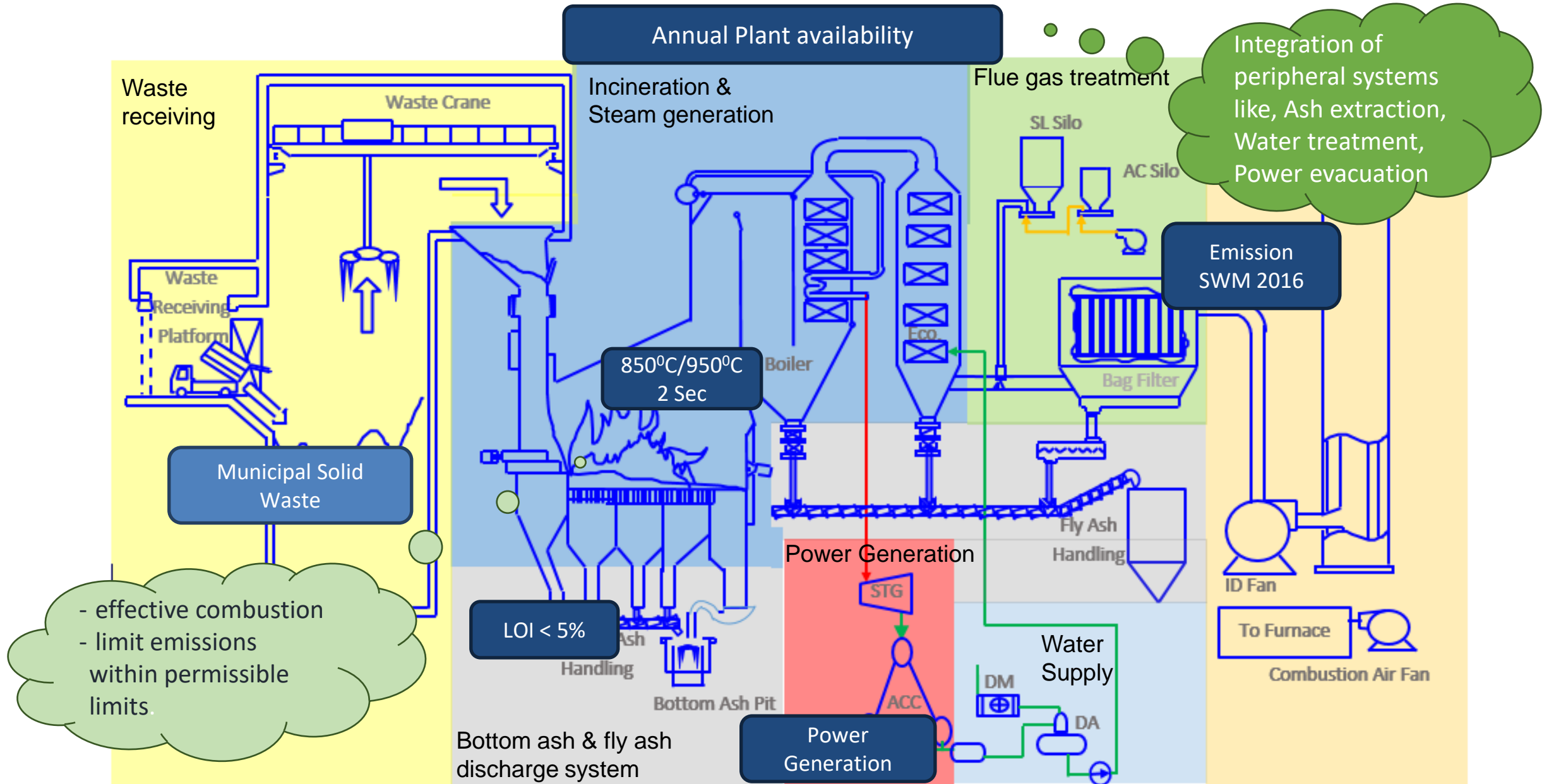


Gas Fuel

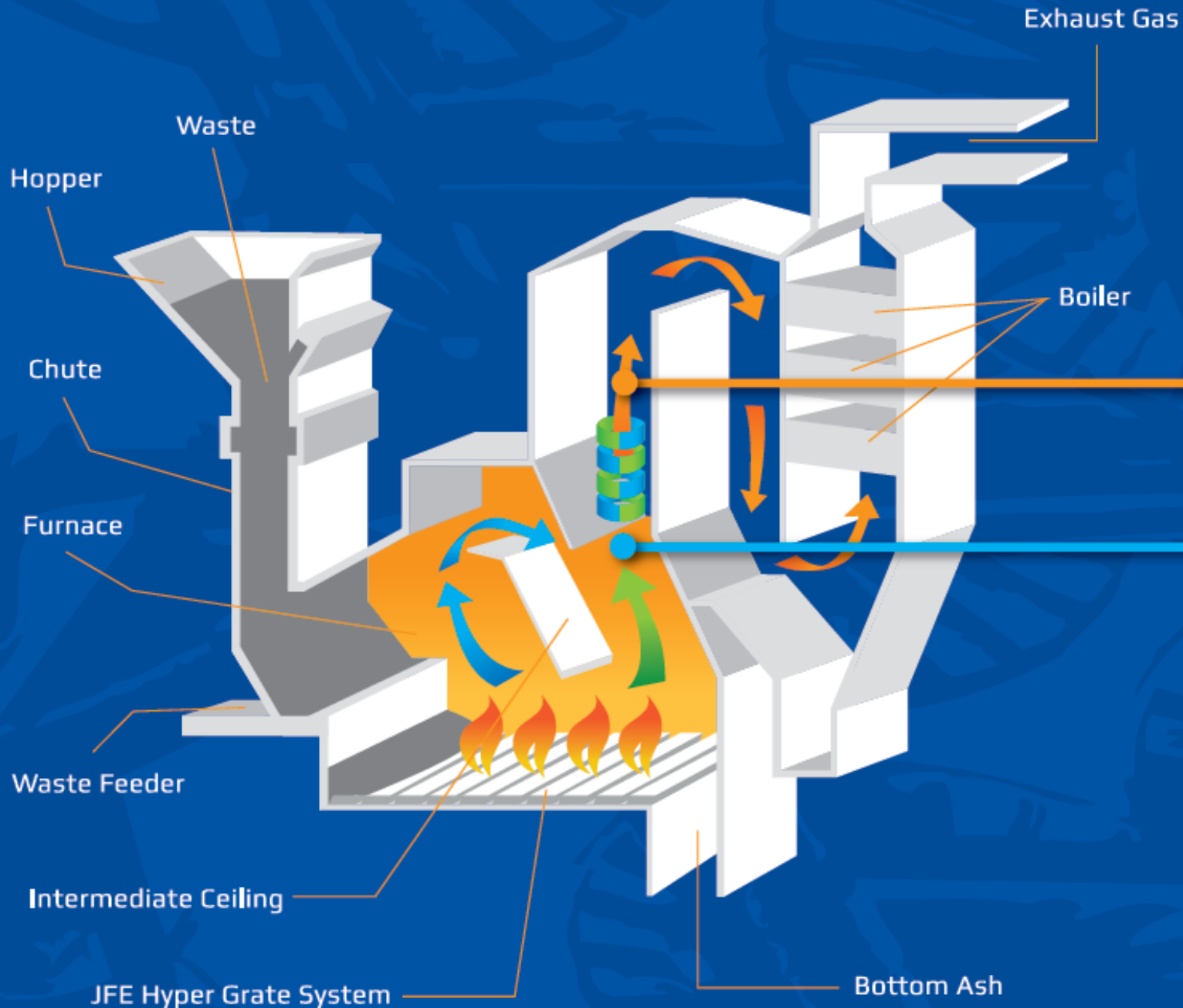


Solid Fuel

# Typical Incineration based WtE plant schematic



# Moving Grate Furnace by JFE



Efficient Combustion Achieved.

↪ ↓NO<sub>x</sub> & ↓CO ↪ ↓DXN

The combustion gas mixture caused by this collision promotes the following oxidation/reduction chemical reactions:

↪ Unburned Gas Contents :  
CO, H<sub>2</sub>, NH<sub>3</sub>

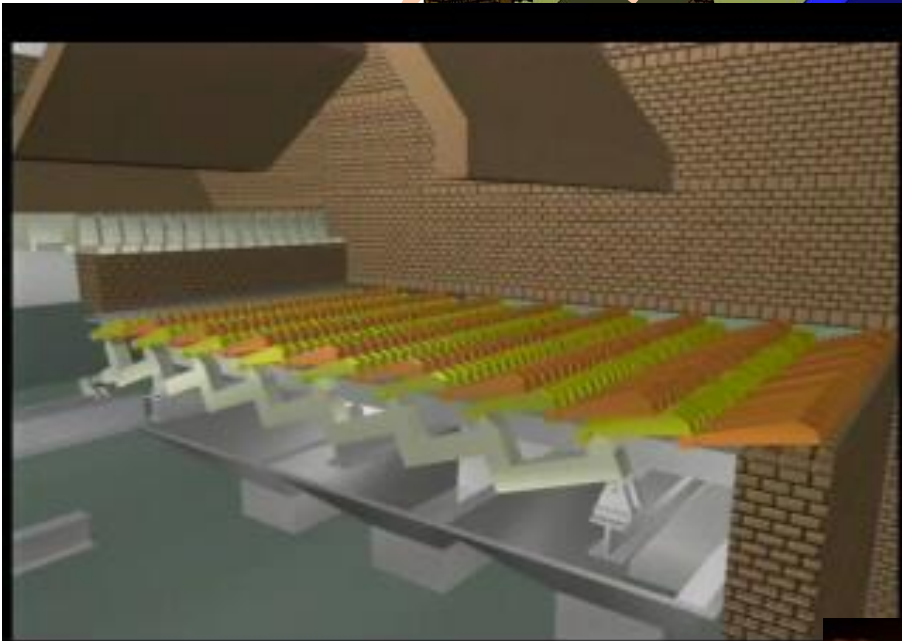
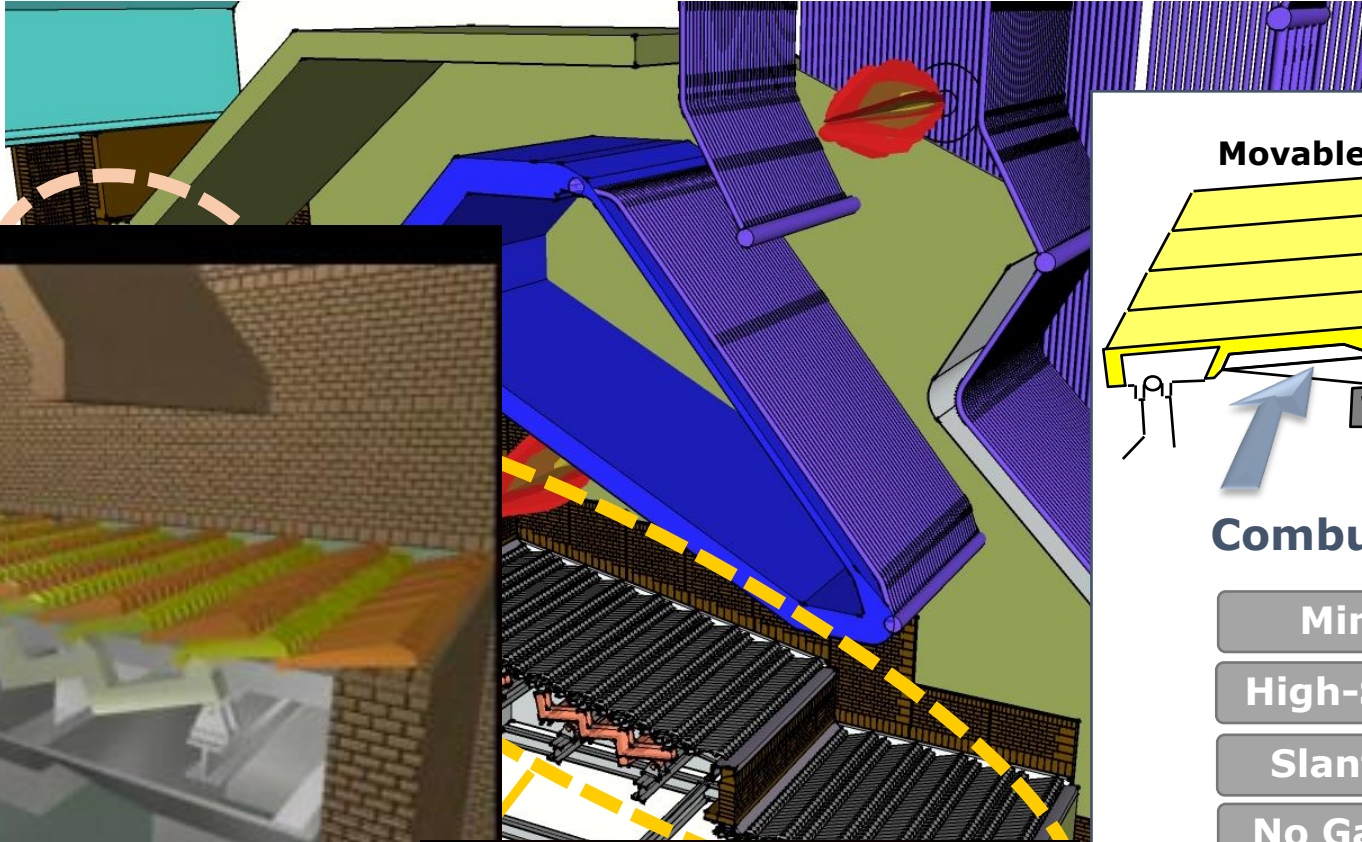
↪ Combustion Gas Contents :  
O<sub>2</sub>, NO<sub>x</sub>, CO<sub>2</sub>



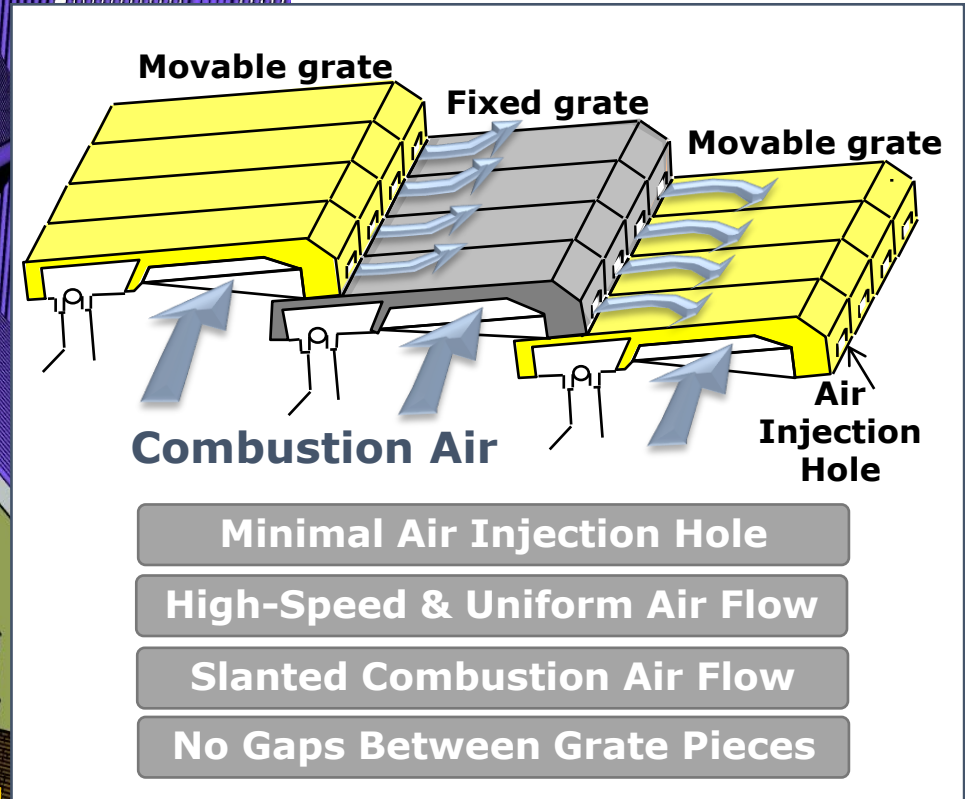
Unburned Gas Reaction :  
 $2CO + O_2 \rightarrow 2CO_2$

Combustion Gas Reaction :  
 $NO_x + NH_3 \rightarrow N_2 + H_2O$

# ■ Moving Grate Furnace by JFE

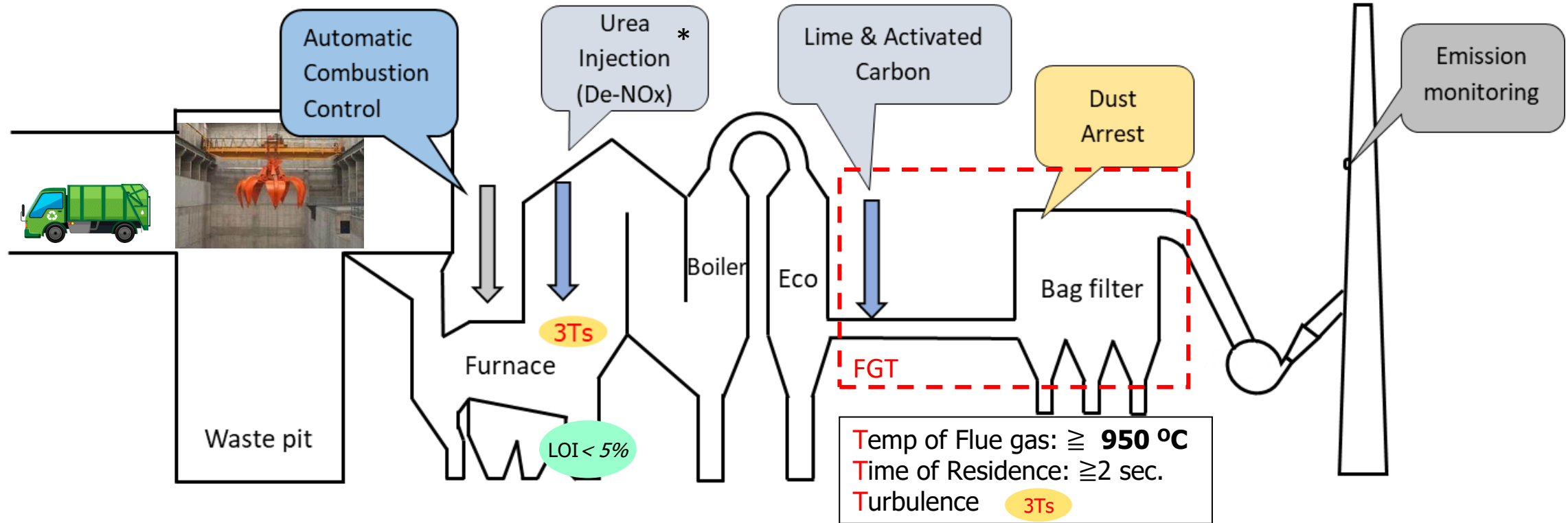


Stable Combustion



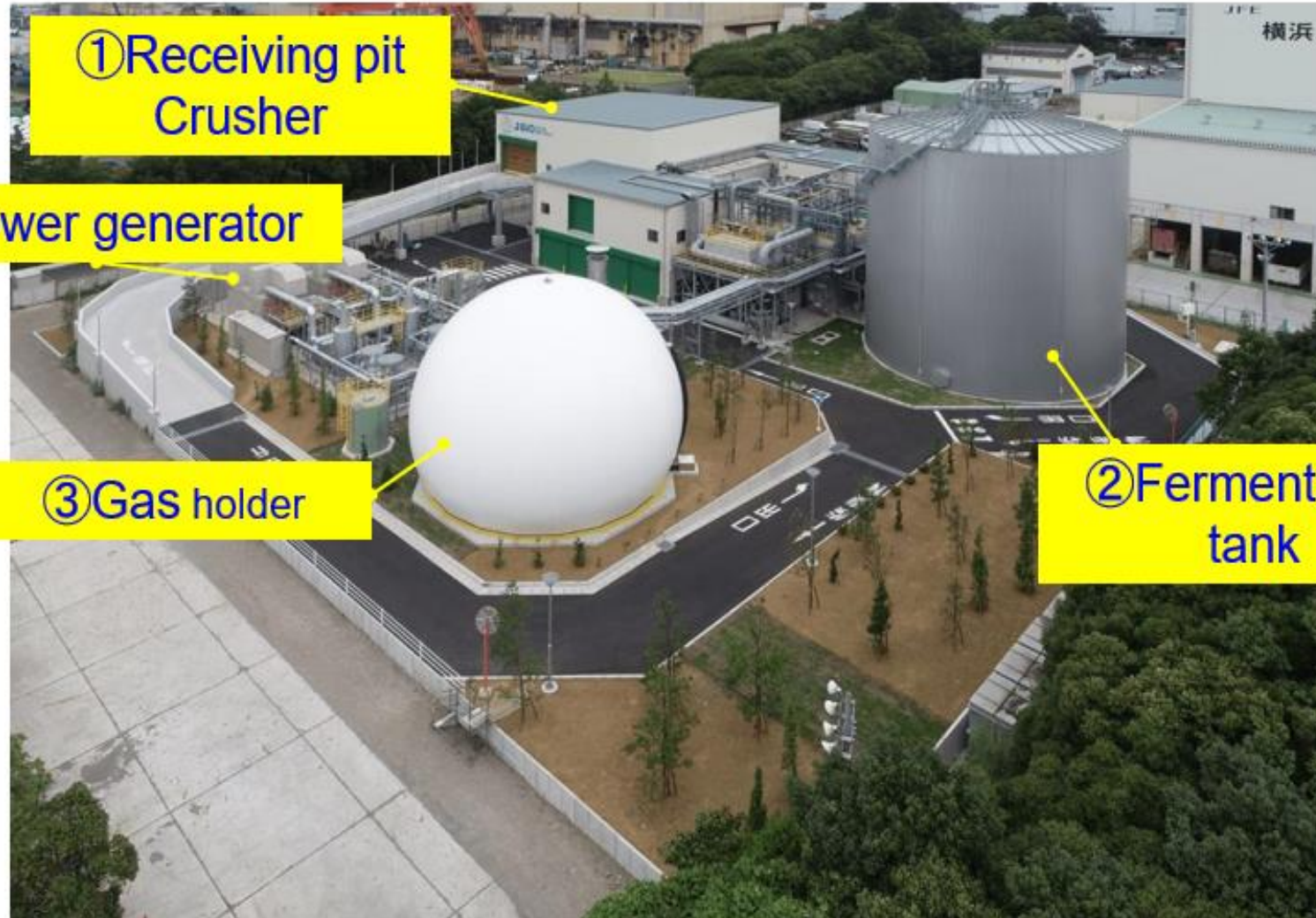
Minimal Ash Volume

# Emission control (in compliance with local laws, viz. SWM 2016)



Pollutant	Control method	Pollutant	Control method	Pollutant	Control method
CO	Combustion control	SO <sub>2</sub> , HCL	Slaked Lime injection	Heavy metals Sb + As + Pb + Cr + Co + Cu + Mn + Ni + V + their compounds	Activated Carbon & Waste Receiving Control
NO <sub>x</sub> (NO & NO <sub>2</sub> expressed as NO <sub>2</sub> )	Combustion control, SNCR (provision) *	Hg & its components	Waste Rec. Control, Activated Carbon injection		
Total Dioxins and Furans (TEQ)	Combustion Control & Activated Carbon injection	Dust	Bag filter		
HF (Hydrofluoric acid)	Combustion Control	Loss of Ignition	'Grate' design/operation		

# ■ Biomethanation



Reference installation of JFE's biomethanation facility (for food waste)

- Applicable for food waste/biodegradable waste
- Biogas can be used as a fuel
- Treat wastes that are not adaptable for incineration such as those with high water content
- CAPEX generally lower than incineration facility

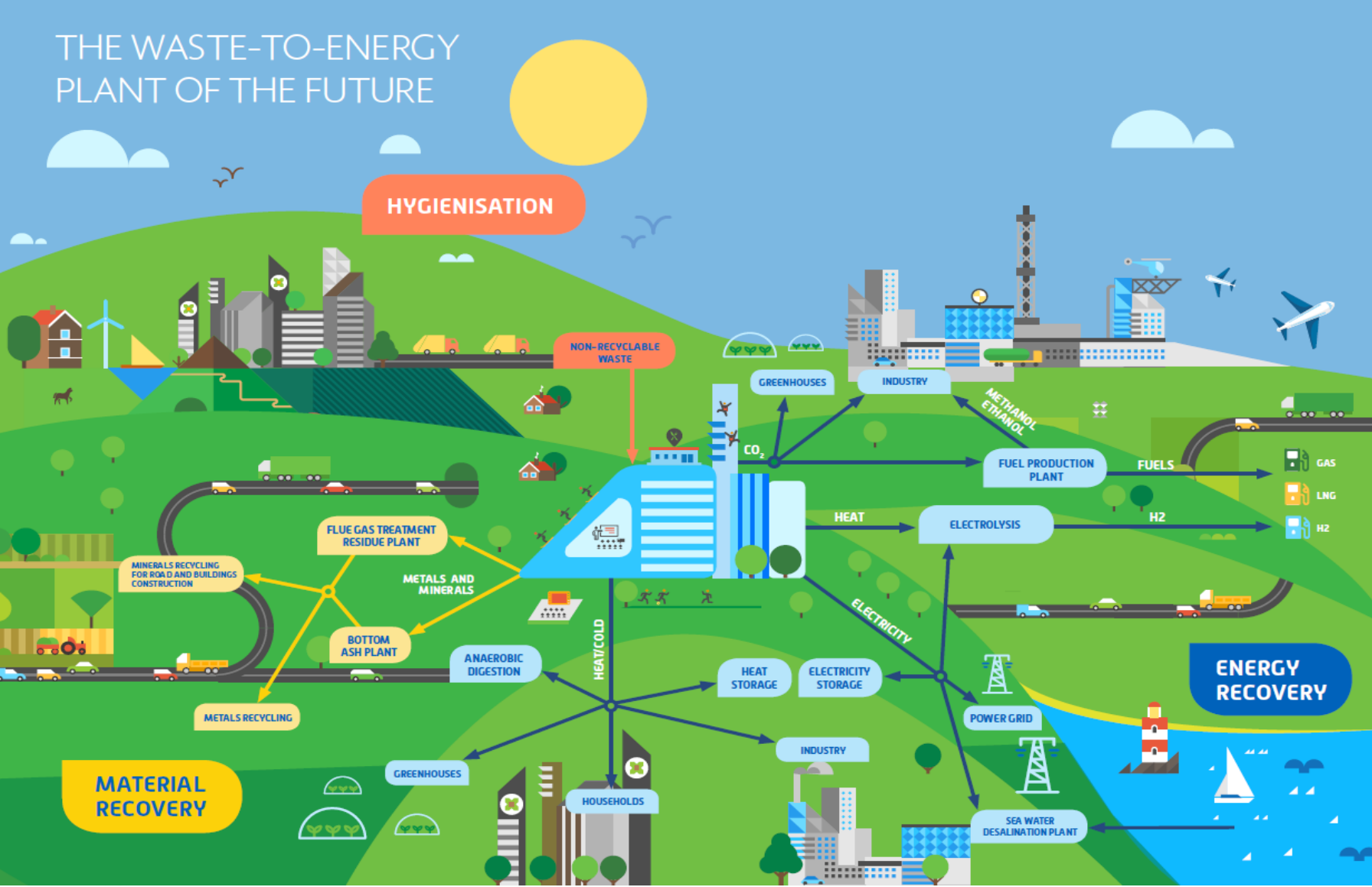
- Needs careful segregation
- Facility to treat residue after selection must also be constructed.
- Safe operation will require high-quality pre-treatment
- Long term sale of biogas to be guaranteed for project feasibility



## ■ Towards a carbon neutral society

Mandatory	Technology as per waste composition and LCV (at least 6,000 kJ/kg for WtE incineration) should be investigated.
	Bottom ash and APC residue (fly ash) can be safely treated.
	Adequate gate fees and preferential tariff for power output
Strongly advisable	Plant manufacturers have an appropriate level of expertise and suitable incinerators.
Advisable	An environmental monitoring system is in place.
	Capacity building and training is available to improve the technical skills of staff.

# THE WASTE-TO-ENERGY PLANT OF THE FUTURE



# Thank you

[https://www.jfe-eng.co.jp/en/360\\_jfe\\_engineering/](https://www.jfe-eng.co.jp/en/360_jfe_engineering/)

Copyright 2021 © JFE Engineering Corporation All Rights Reserved