

Sixth Regional 3R Forum in Asia and the Pacific
Parallel Roundtable 3:
Economic Opportunities through 3R - Biomass Waste



JFE

**Economic potential
of biomass utilization
- Case of Japan**

August 18th 2015

Gen TAKAHASHI
Deputy General Manager
Global Business Development
JFE Engineering Corporation

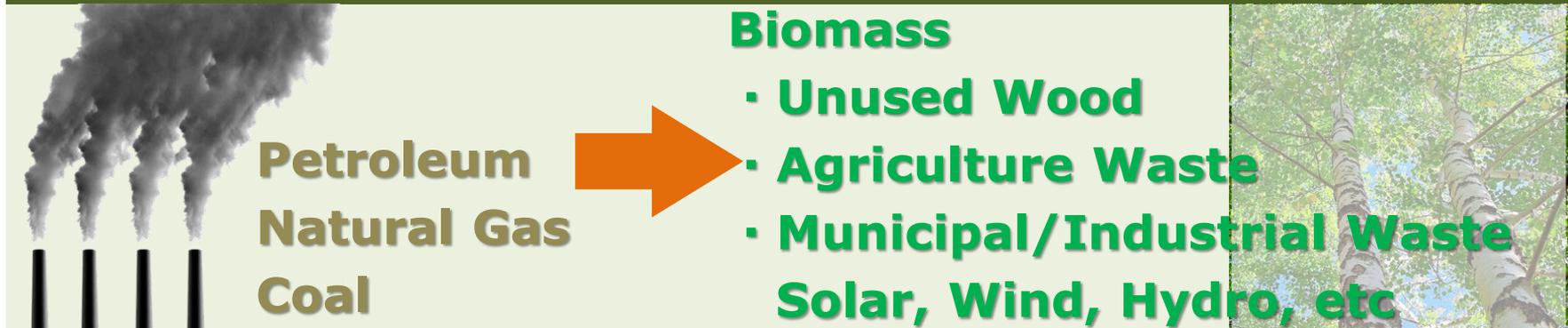
▶ **Biomass Utilization in Japan**

▶ **Case 1: Biomass Boiler**

▶ **Case 2: Sludge Digestion**



FROM BROWN ENERGY TO GREEN ENERGY



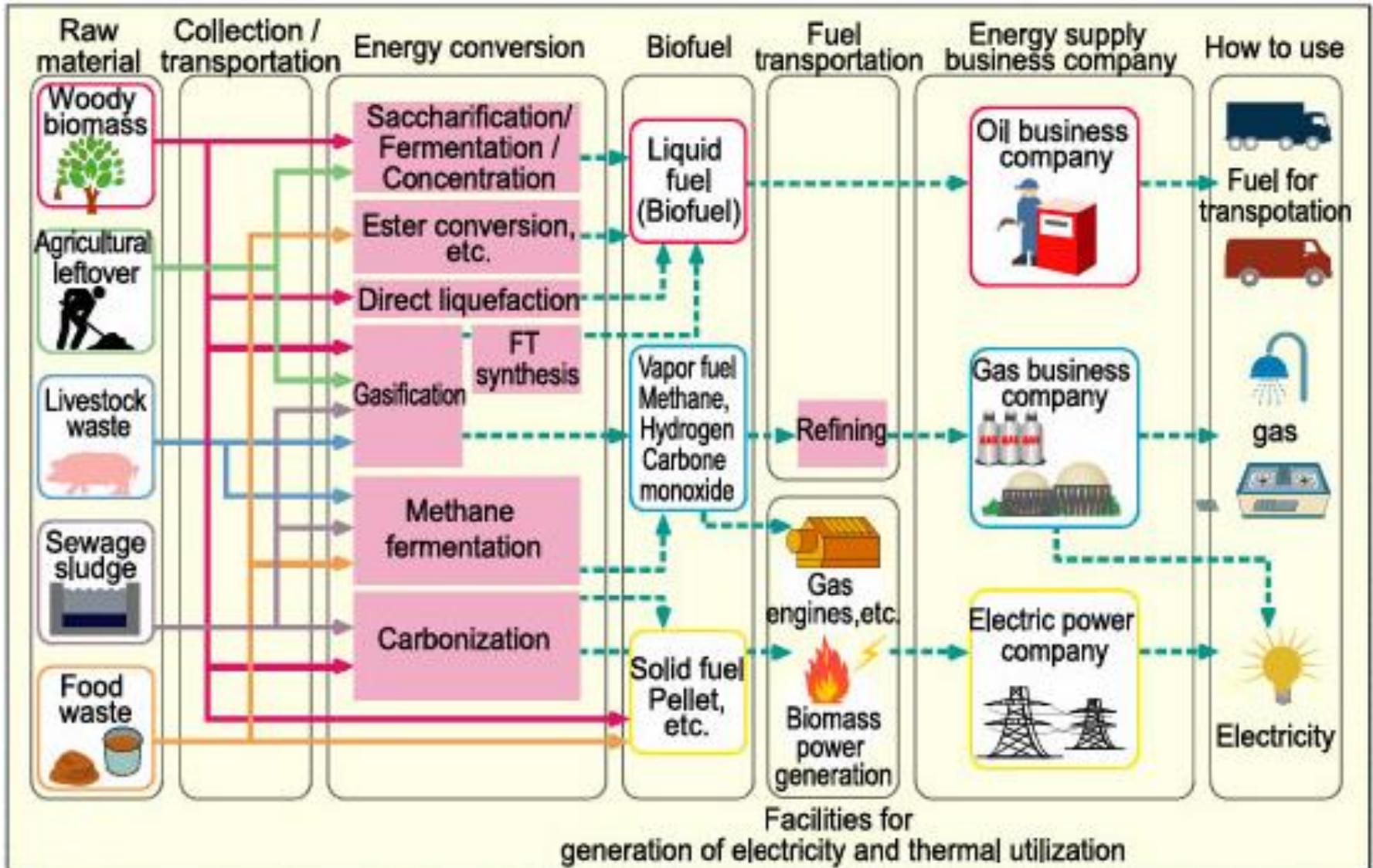
Advantages of Green Energy

- **Carbon Neutral**
- **Renewable**
- **New Industry Development in rural area**

Advantages of Biomass Energy

- **Stable and independent from Weather/Season/Climate**

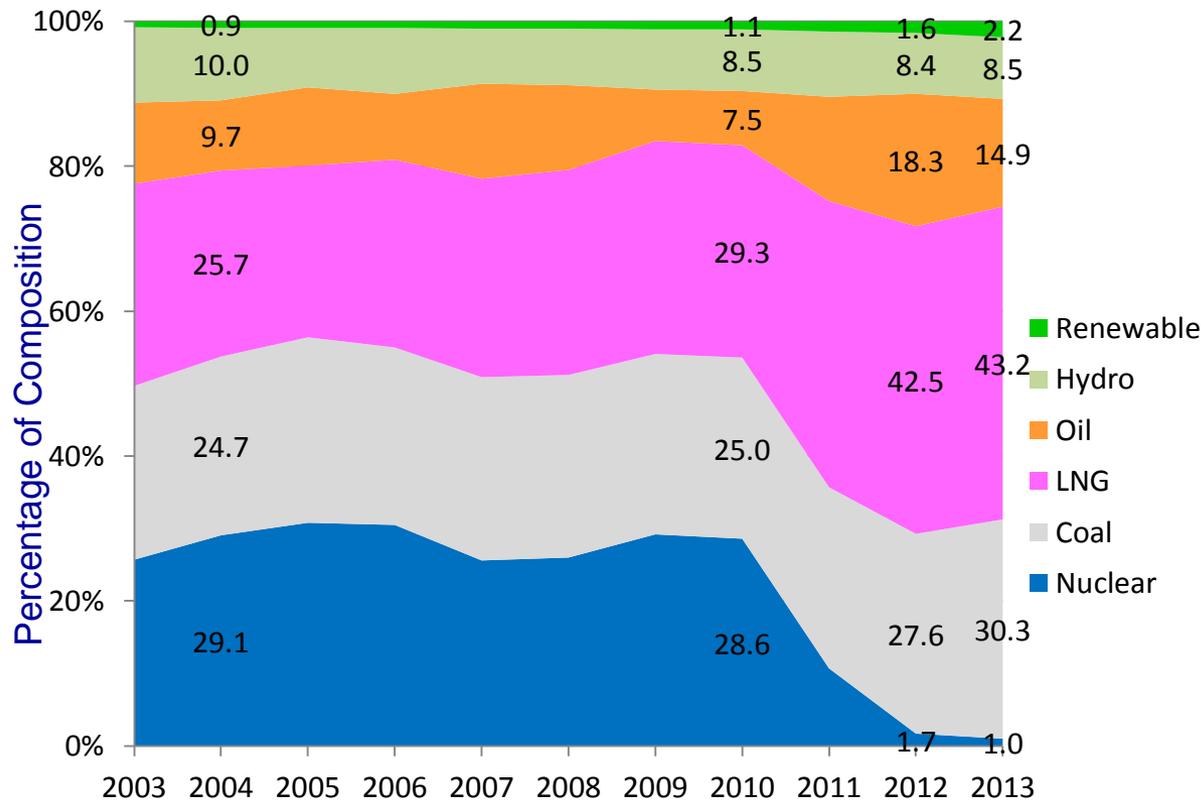
How to use Biomass



Source : <http://www.enecho.meti.go.jp/en/brochures/pdf/english2010.pdf>

Fuel Mix in Power Generation

After Discontinuation of Nuclear Power Plant Operation Japan's Fuel Mix for Electricity Production will be Reoriented, Biomass and other Renewables are Strongly Promoted.



Source : METI Web site

- Short term dependency on LNG has increased significantly
- Midterm renewables will be strongly promoted (FIT)

Feed in Tariff for Biomass

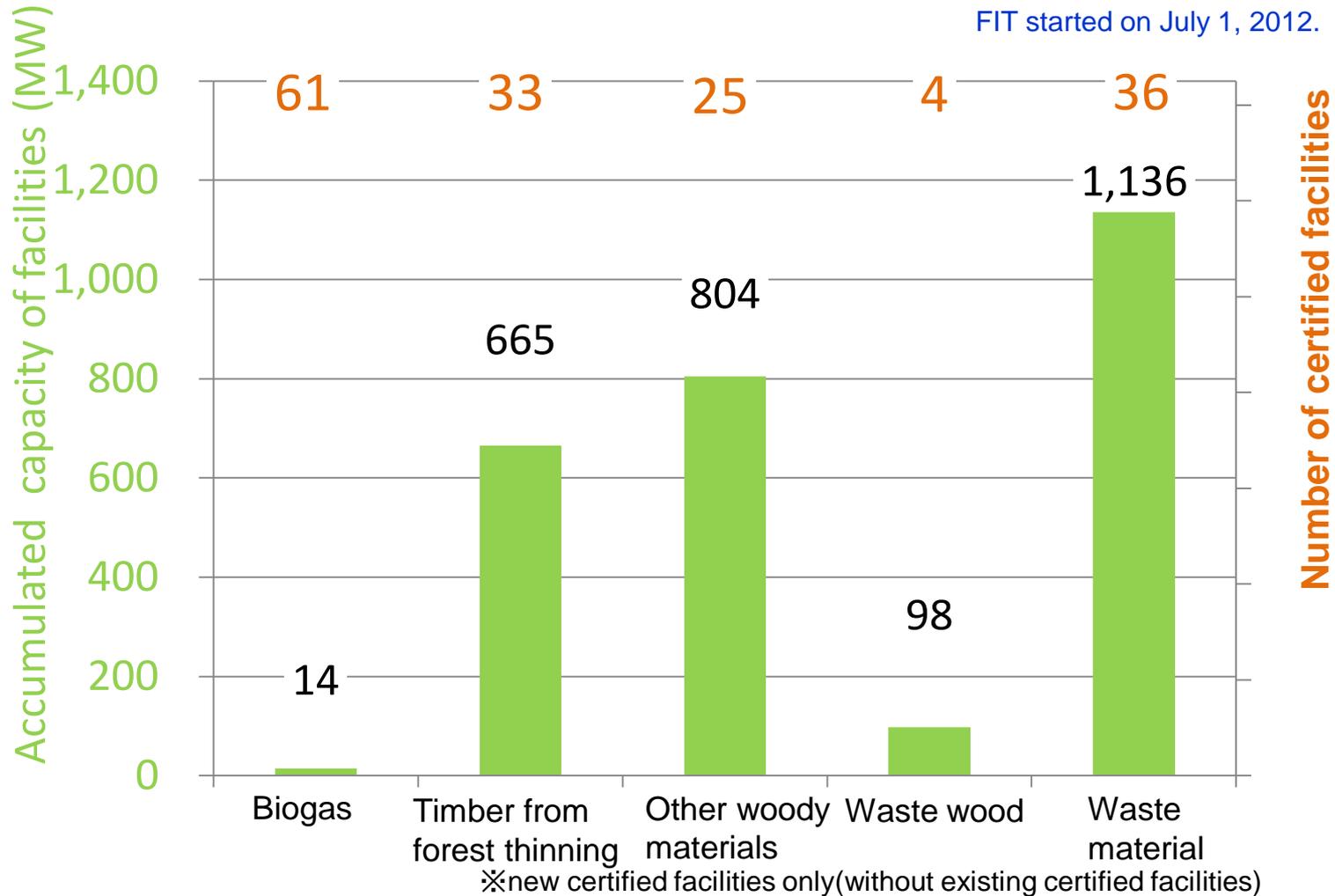
Categories		Purchase prices (/kWh, FY2015)	Purchase period
Wood (unused)	2,000 kW or more	32 yen +tax	20 years
	Less than 2,000 kW	40 yen +tax	20 years
Wood (general)		24 yen +tax	20 years
Wood (waste materials of buildings)		13 yen +tax	20 years
Waste materials		17 yen +tax	20 years
Methane fermentation		39 yen +tax	20 years

Source : Created based on
http://www.enecho.meti.go.jp/category/saving_and_new/saiene/data/kaitori/2015_fit.pdf

FIT Certified Biomass Power Plant Projects



From July 2012 to April 2014
FIT started on July 1, 2012.



Source: Agency for Natural Resources and Energy renewable energy / Status of the facility certification

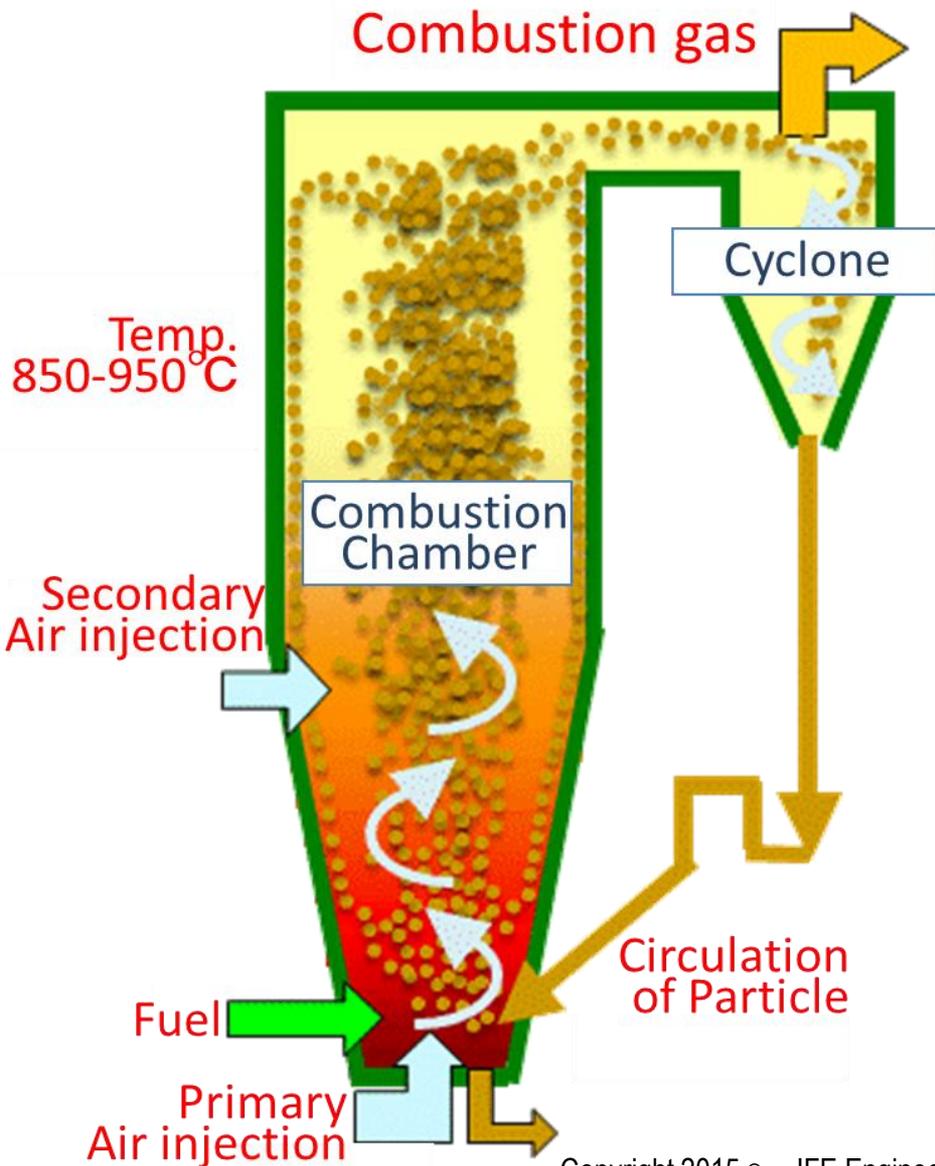
▶ **Biomass Utilization in Japan**

▶ **Case 1: Biomass Boiler**

▶ **Case 2: Sludge Digestion**



Advantages of JFE's CFB Boiler



Mechanism of Combustion

Bed material (Silica sand) is circulated together with fuel in the chamber. In the circulation, fuel and injected air are well mixed in order to realize complete combustion.

Advantages

① Great Variety of fuel

- Raw tree (high moisture) to coal (possible mix ratio 0-100%)
- Low grade coal (low ranked coal, high ash content, low melting ash)

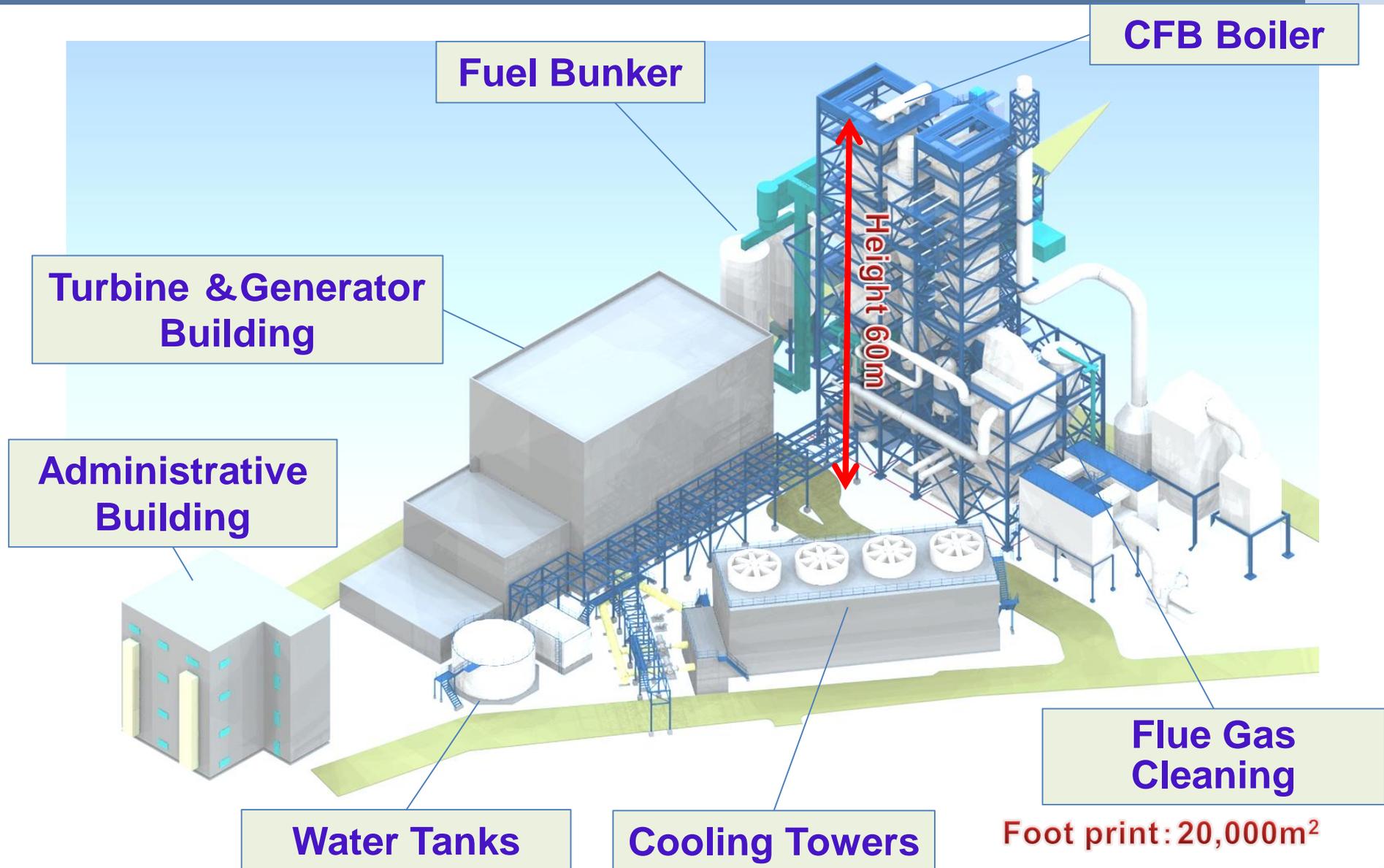
② High efficiency

- Low excess air combustion, High efficiency boiler

③ Environmental friendliness

- NO_x control
- Low temperature combustion, Hot char restoration
- SO_x control
- Desulfurization using lime stone

Design Model : 50MW CFB Boiler Power Plant



Variety of Fuel (1/3)

Fuel type	Calorific value (kcal/kg)	Remarks
	Main Origin	
Wood tip	1,800~2,000	Wood tip with very high moisture can cause incomplete combustion
	Widely available	
Wood pellet	4,000~5,000	<ul style="list-style-type: none"> ▪ The material can be easily crushed ▪ Material of pellet binder (Chlorine) can cause corrosion of the boiler tube ▪ Storage required
	South East Asia, Russia, North America, China,	
PKS (Palm Kernel Shell)	3,400	Contamination by fruits
	Indonesia, Malaysia	

Variety of Fuel (2/3)

Fuel type	Calorific value (kcal/kg)	Remarks
	Main Origin	
Construction Waste 	3,000~3,800	Chlorine from material can cause corrosion of the boiler tube
	Waste management industry	
RDF (Refuse Derived Fuel) 	3,500~4,000	
	Waste management industry	
RPF (Refuse Paper & Plastic Fuel) 	5,000~6,000	
	Waste management industry	

Variety of Fuel (3/3)

Fuel type	Calorific value (kcal/kg)	Remarks
	Main Origin	
Tire tip 	8,000~9,000	Wire inside is not combustible
	Waste management industry	
Coal 	6,000~7,000	Sulfur component can cause corrosion of the boiler tube
	Widely available	
Oil coke 	7,000~8,000	Sulfur/ Vanadium component can cause corrosion of the boiler tube
	petroleum Refinery	

- ▶ **Biomass Utilization in Japan**
- ▶ **Case 1: Biomass Boiler**
- ▶ **Case 2: Sludge Digestion**



Biogas power generation : Sewage Sludge



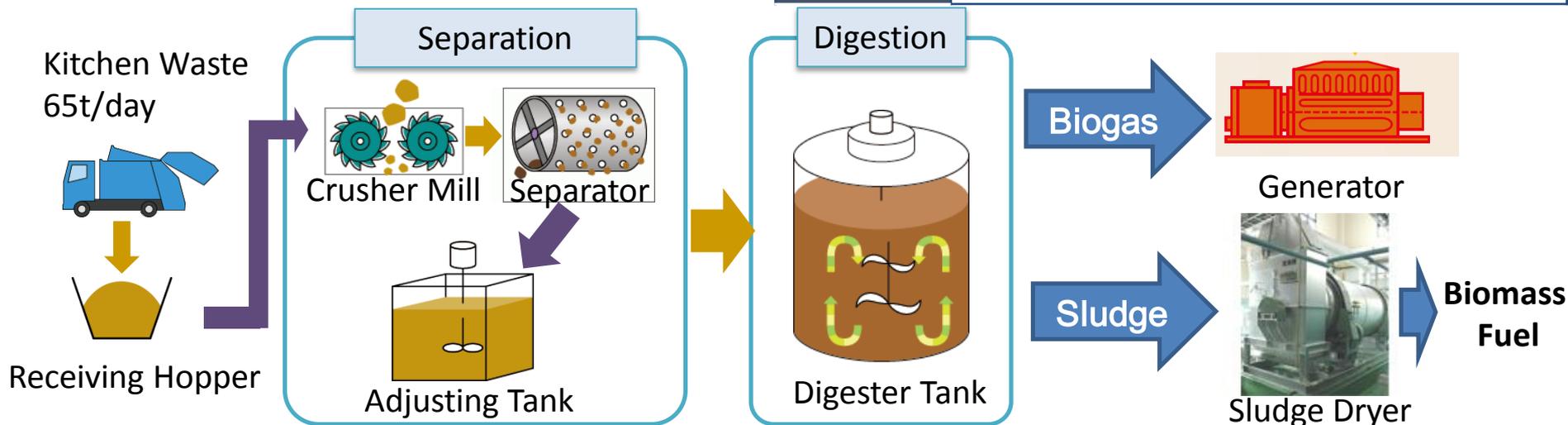
Client	Yokohama City
Type	Biogas from Sewage Sludge
Capacity	12,500 m3/day (wet sludge)
Output	4,500kW (900kW x 5)
Scheme	PPP (O&M 20 years)
Budget	JPY 8.3 Billion (VFM 8.5%)
Remarks	<ul style="list-style-type: none"> ➤ CO2 reduction(588ton/day) ➤ EPC/O&M cost reduction 8.5% (JPY 42million)



Biogas power generation : Food Waste



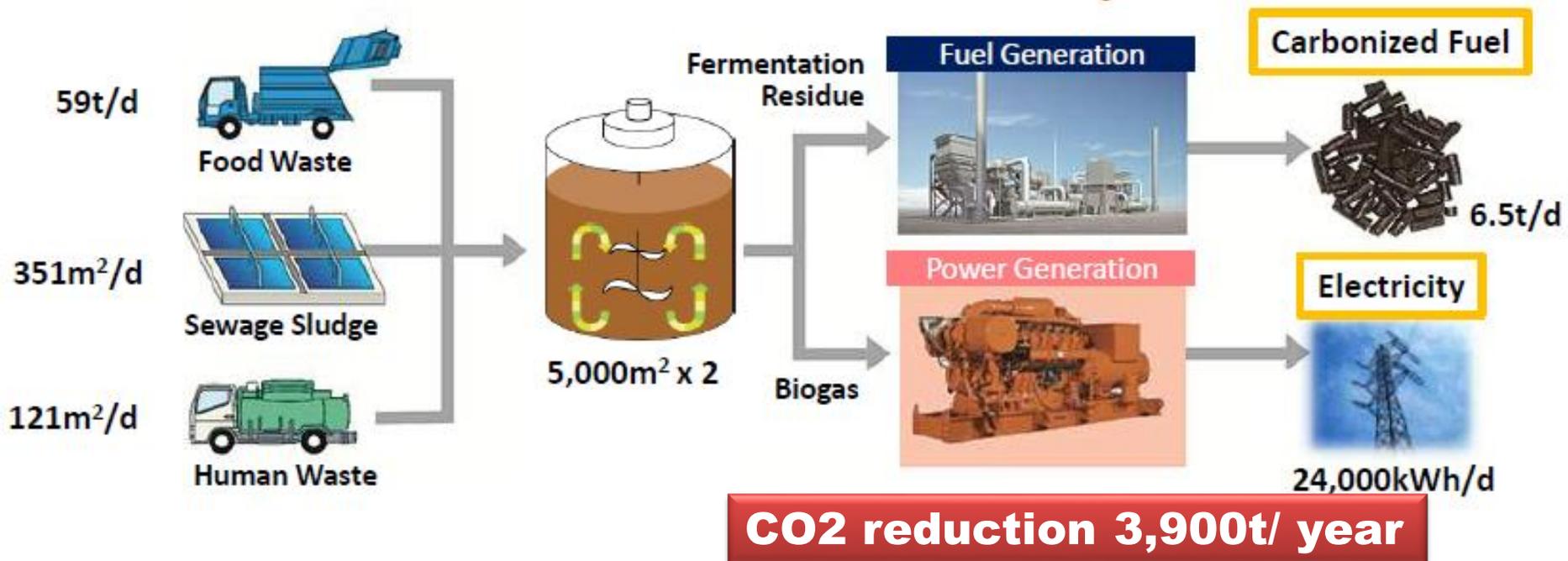
Client	Nagaoka City
Capacity	65t/day (food waste)
Scheme	BTO (Build Transfer Operate)
Period	2011/04-2028/06 (O&M 15 years)
Remarks	Electricity consumption 6MWh/day Retail electricity 6.3MWh/day CO2 reduction 2,000t/year



Biogas power generation : Mixed Organic Waste



Client	Toyohashi City, Aichi Pref.
Capacity	472m ³ /day (sewerage sludge) 59t/day (kitchen waste)
Scheme	BTO (Build Transfer Operate)
Period	O&M 20 years)



Thank you for your kind attention.



JFE Engineering Corporation (Tokyo Head Office)

Marunouchi Trust Tower North 19F,

1-8-1 Marunouchi, Chiyoda-ku, Tokyo 100-0005, JAPAN

TEL : +81-3-62120822 FAX : +81-3-62120803