

Hitachi Zosen's Waste to Energy Project in Thailand

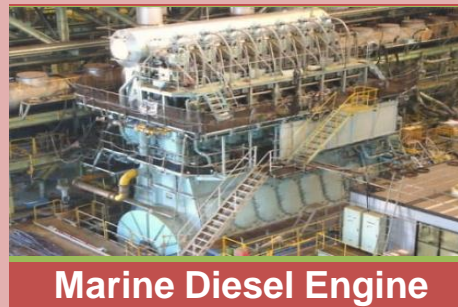
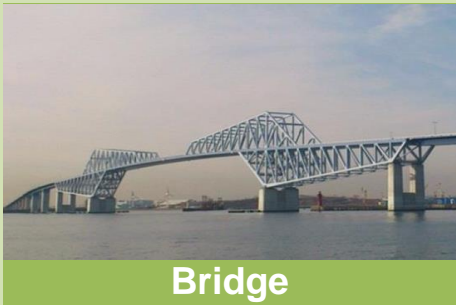
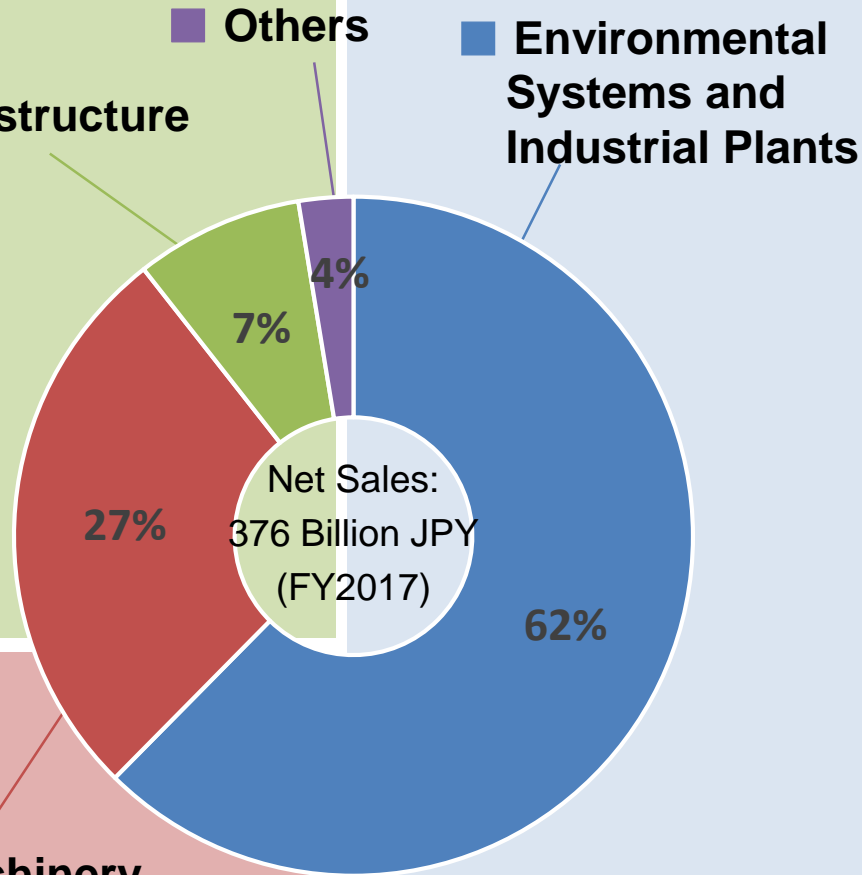
- Seminar on "Plastics in a Circular Economy" -

Date: March 7th, 2019

Venue: Amari Watergate Hotel Bangkok

1. Business Profile
2. Waste to Energy (WtE) Technology
3. WtE Reference Projects including Thailand
4. Hitachi Zosen's Advantage

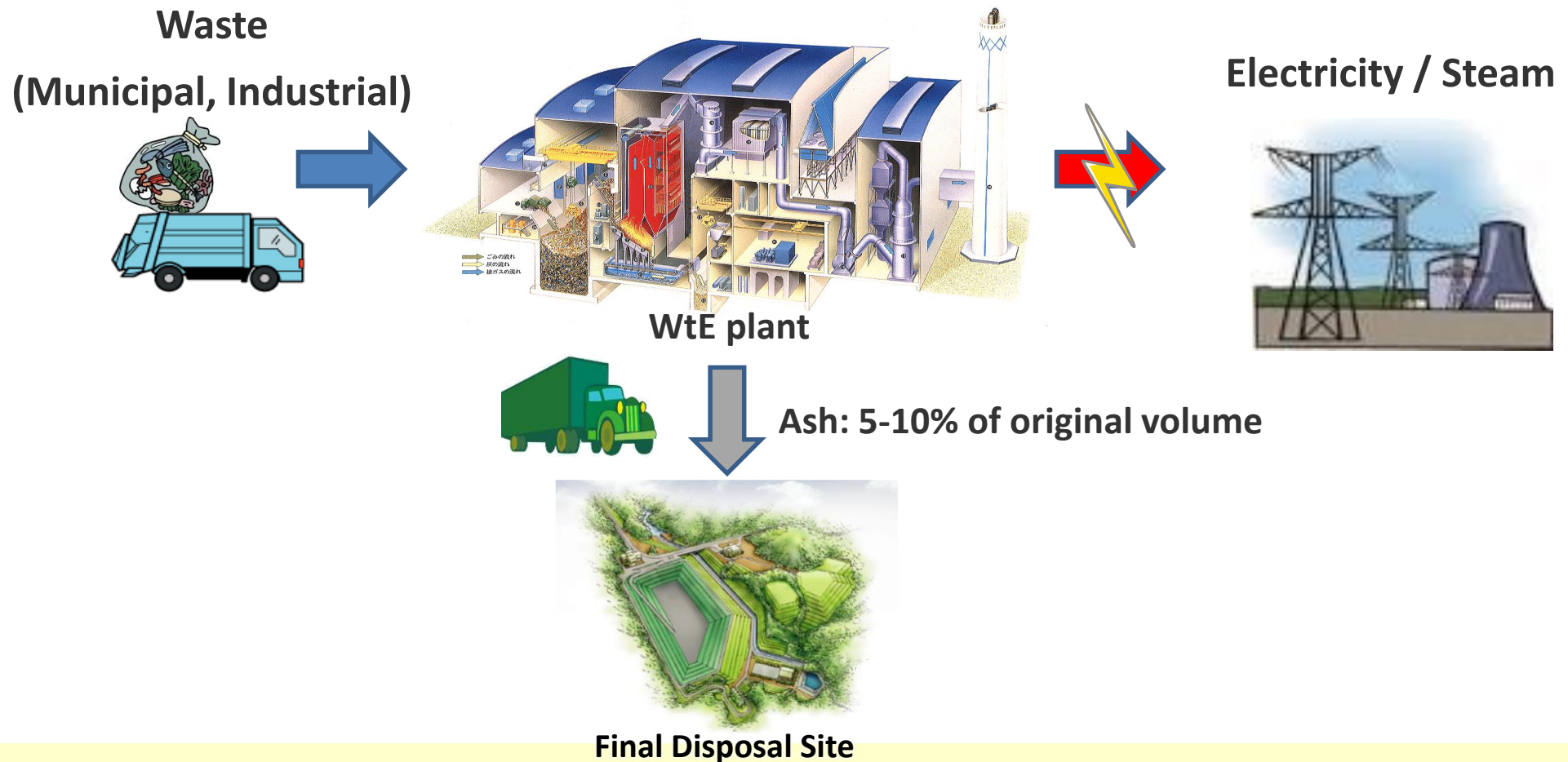
Sales Structure by Business Segment

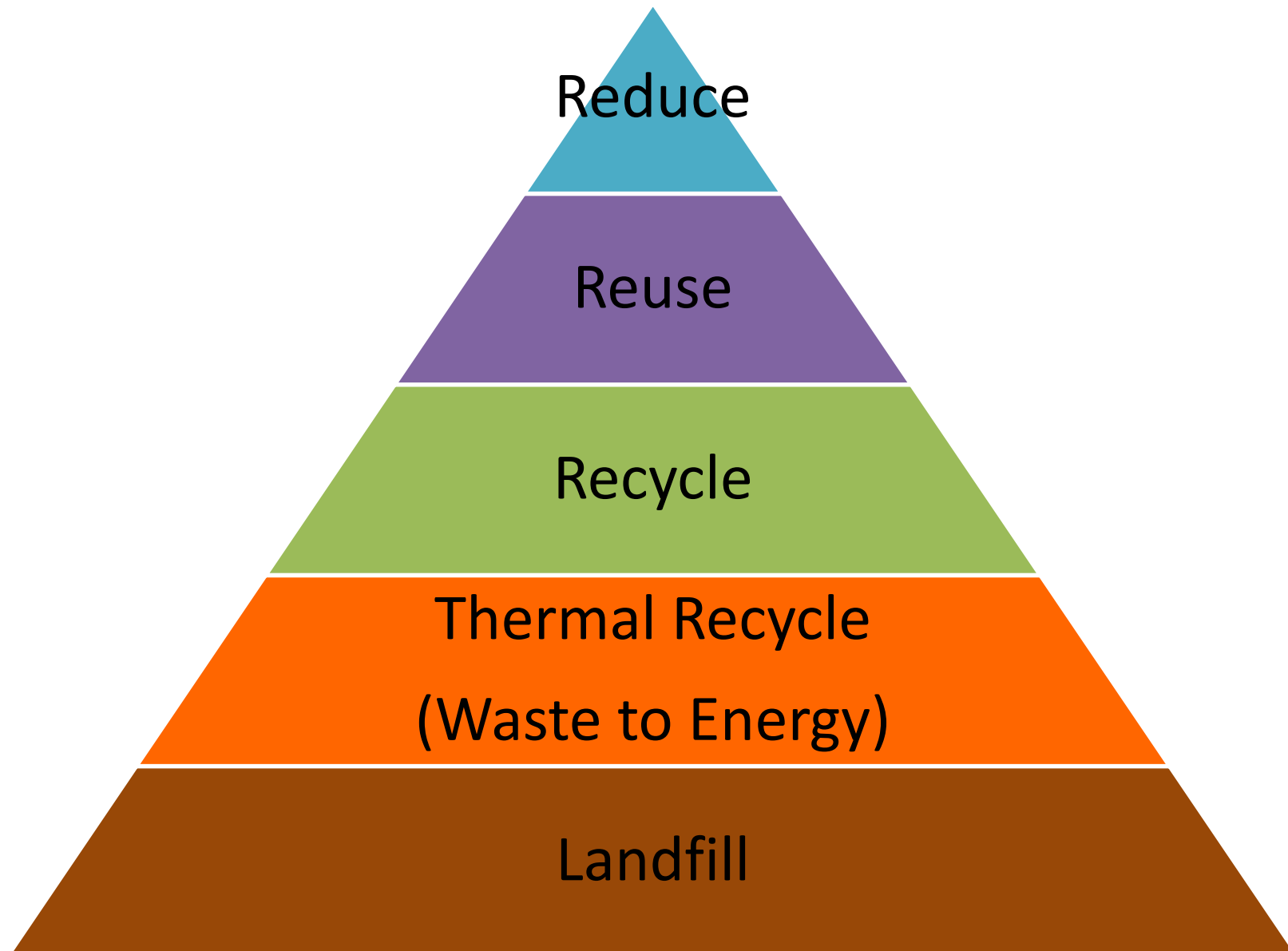


What is WtE?

Waste to Energy

- Proven and reliable technology with energy recovery system
- Sanitary method in whole process including flue gas treatment
- Reduce 70-85% weight & 90-95% volume of waste to extend landfill lifetime
- 1-ton waste can generate 400-800 kWh electricity



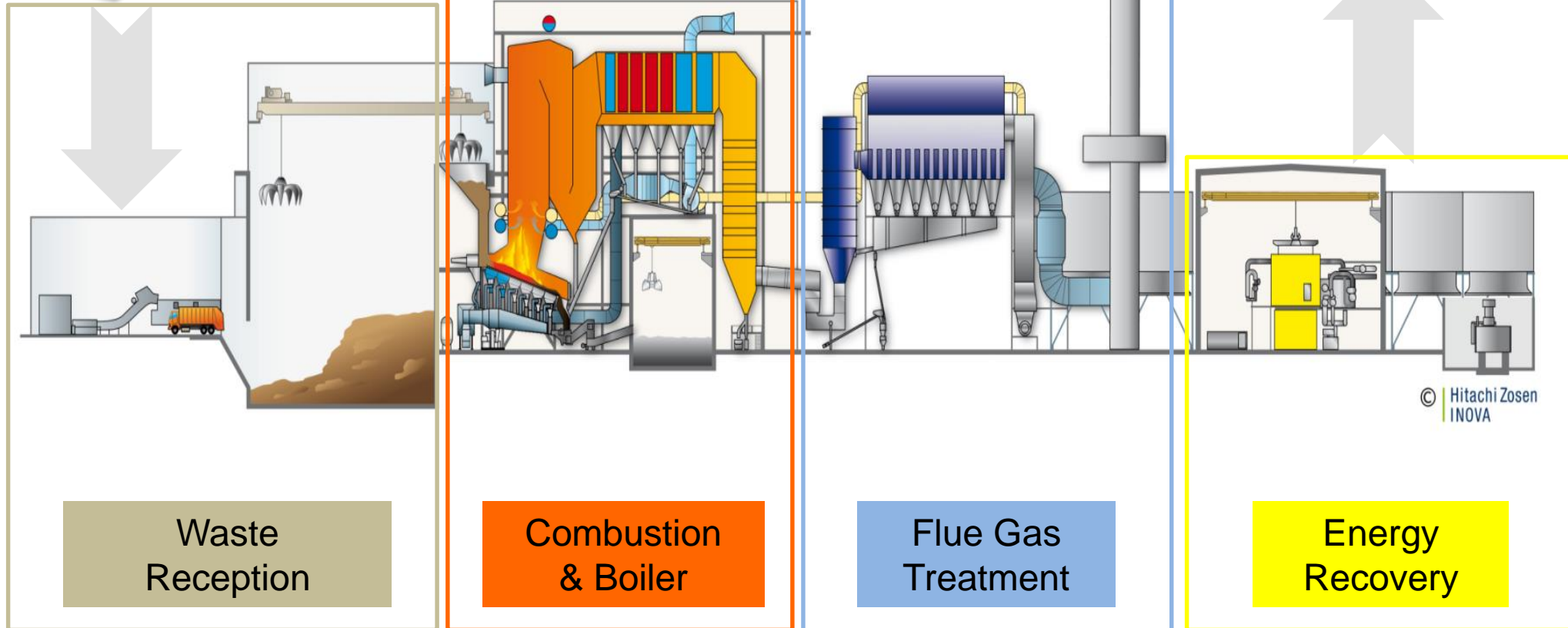
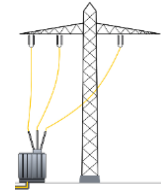


Overall Flow of Waste to Energy Plant

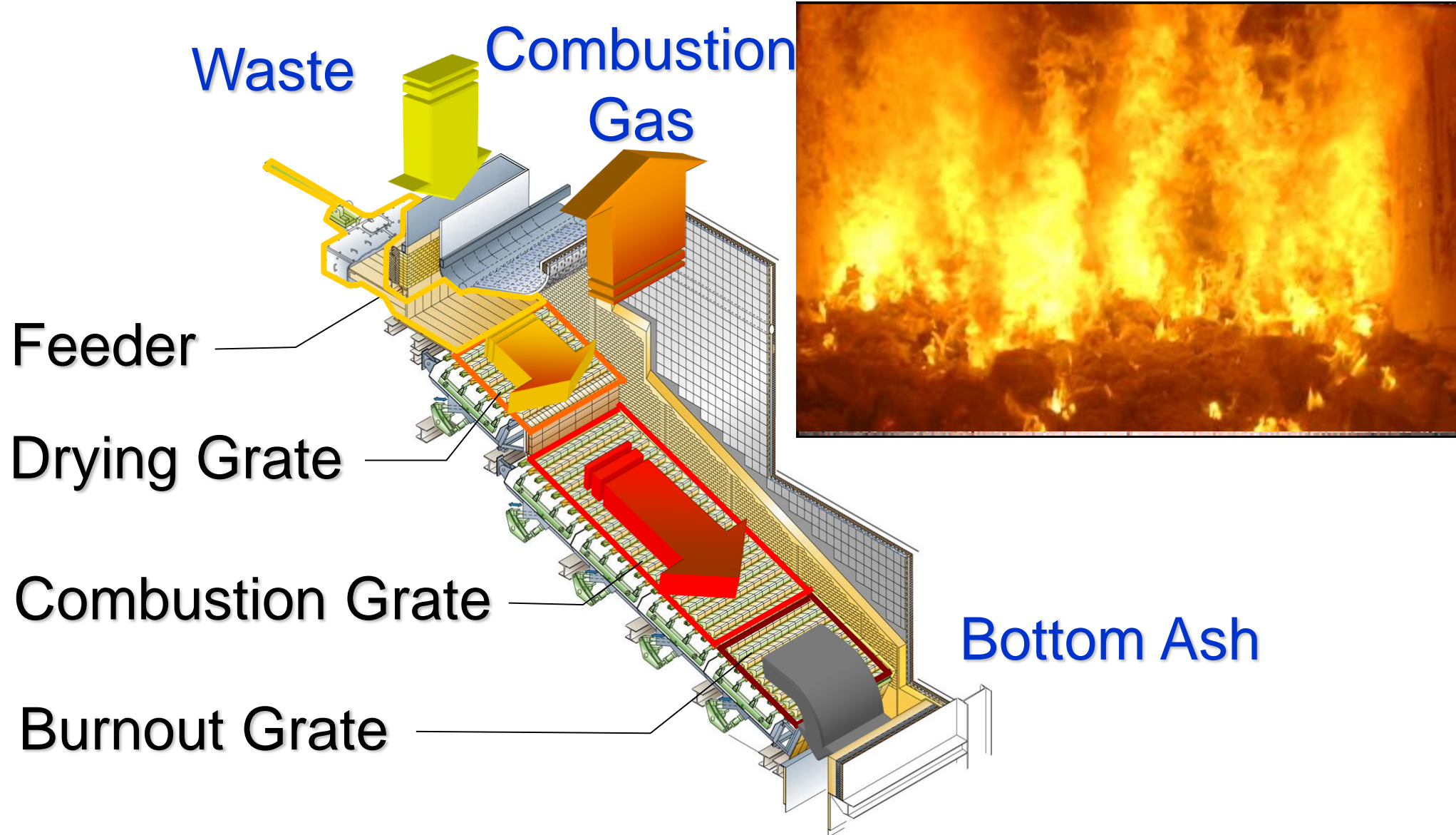
Waste
(Municipal
Solid Waste)

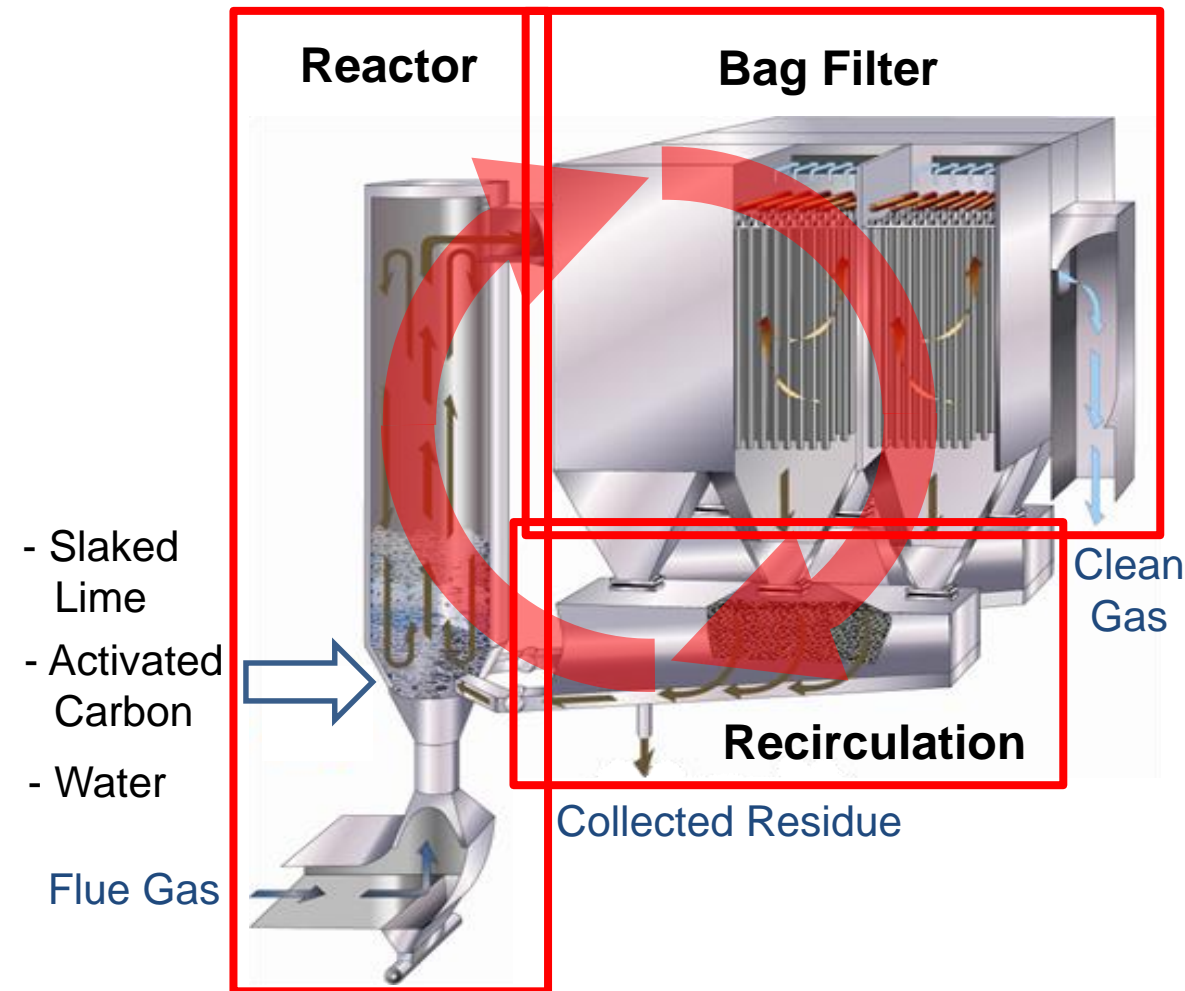


Energy
(Electricity)



Continuous Combustion with 3 Grate Steps





- | Proven technology with long industry record of success
- | Low emissions matching Thai regulation
- | 20 references complying with European standard
- | High flexibility relative to the fluctuation of flue gas
- | Minimized use of lime with water-refreshing and recirculation

Reference Projects for Waste Thermal Treatment

925

Europe
213

Asia
626

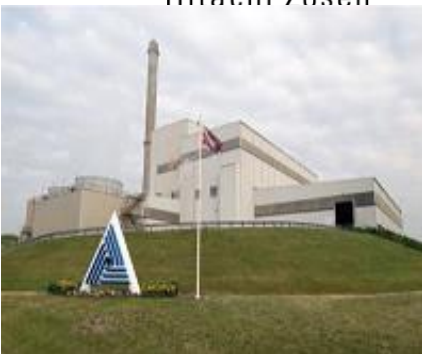
North
America
79

Africa
3

Oceania
3

South
America
1

(As of February 2019)



1. Phetchaburi Province

End User	WPGE Phetchaburi Co., Ltd.
Incinerator Capacity	MSW 476 t/d
Power Generation	7.9 MW (Gross)
Furnace	HZI Grate
Flue Gas Cleaning	EGR + HZI Semi-dry
Energy Recovery	WHB + STG + ACC
Scope of Supply	Grate, FGC, STG, ACC



2. Nong Khai Province

End User	Nongkhainayu Co., Ltd.
Incinerator Capacity	MSW 476 t/d
Power Generation	8.0 MW (Gross)
Furnace	HZI Grate
Flue Gas Cleaning	EGR + HZI Semi-dry
Energy Recovery	WHB + STG + WCC
Scope of Supply	Grate, FGC



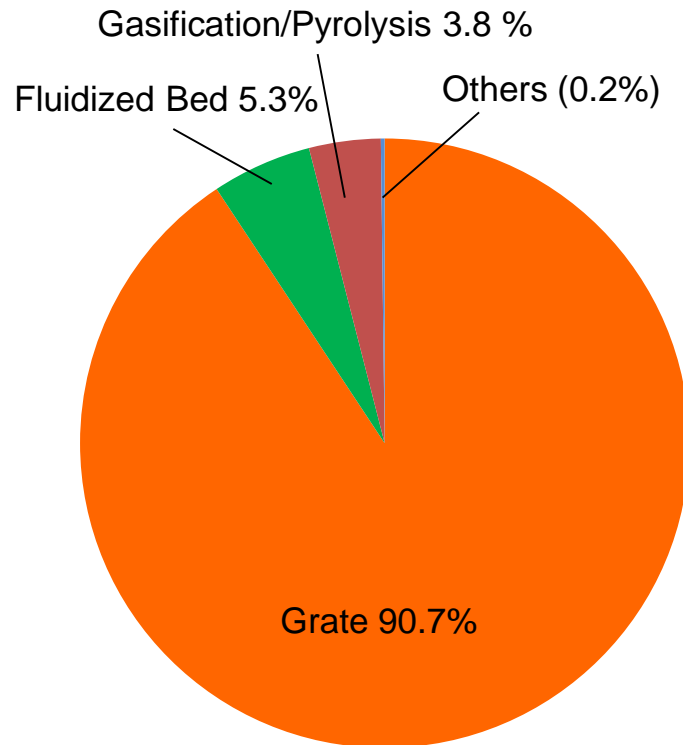
Remark)

HZI: Hitachi Zosen Inova
WHB: Waste heat boiler
WCC: Water Cooled Condenser

EGR: Exhaust Gas Recirculation
STG: Steam Turbine + Generator
ACC: Air Cooled Condenser

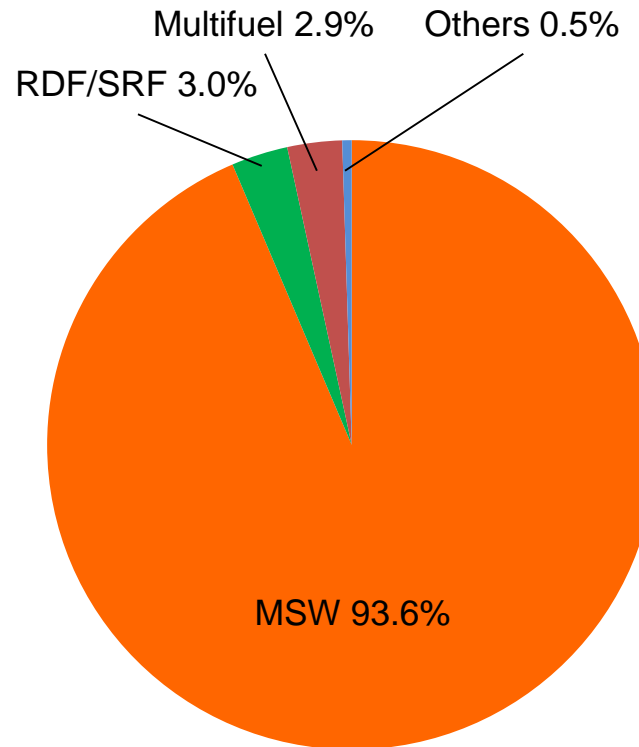
Combustion Technology

(2008-2016)

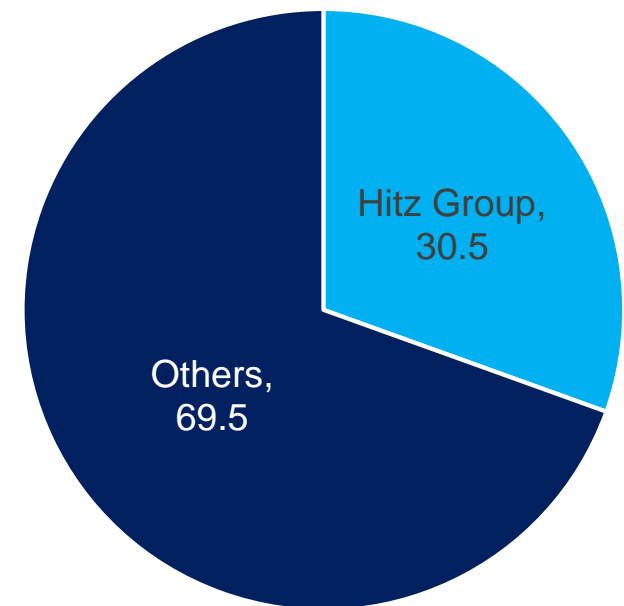


Fuel Type

(2008-2016)



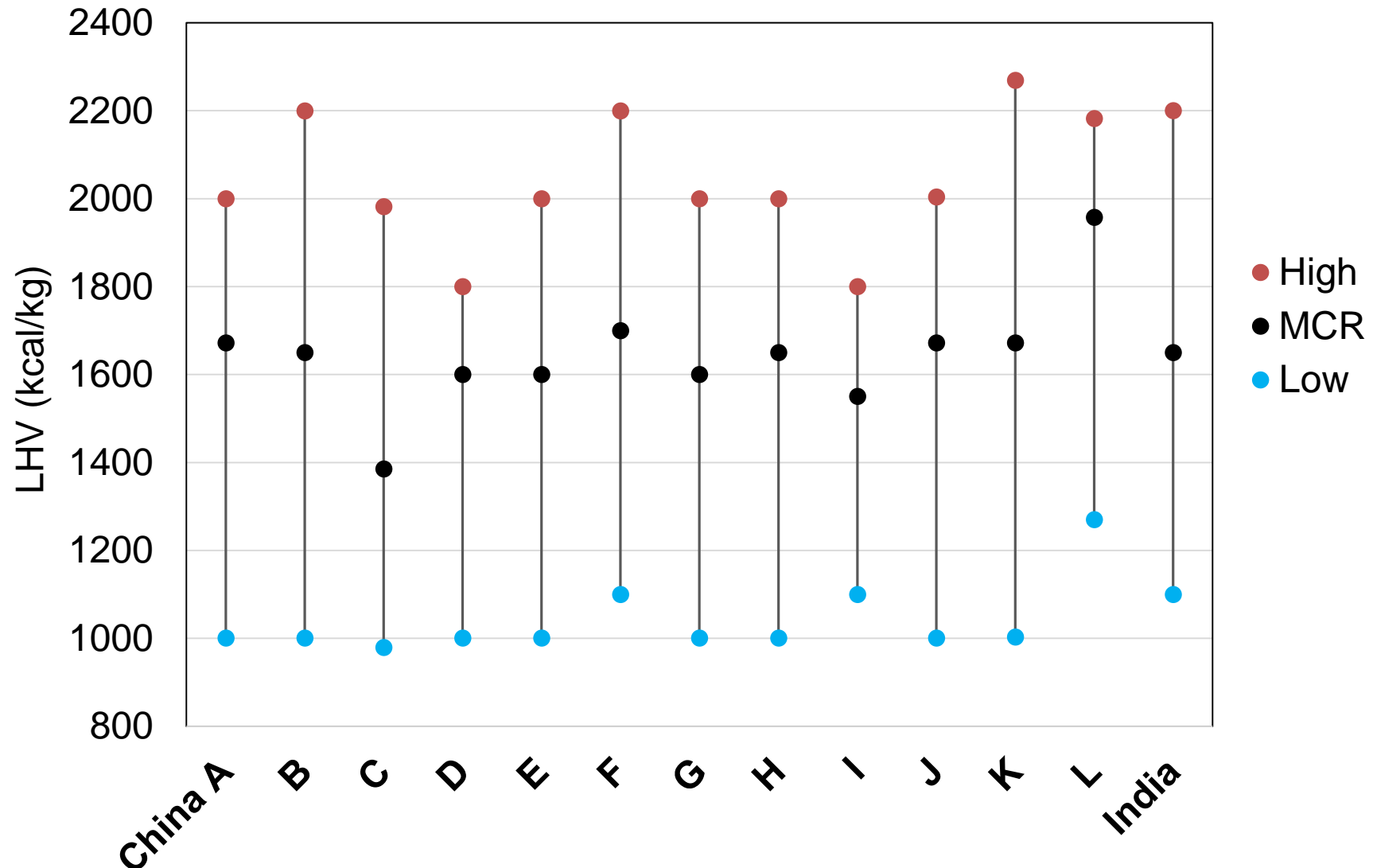
Market Share by Supplier (2015-2017)



(Reported by A. Vaccani & Partner AG)

□ MSW direct combustion with Hitz Grate technology is the best and most proven solution.

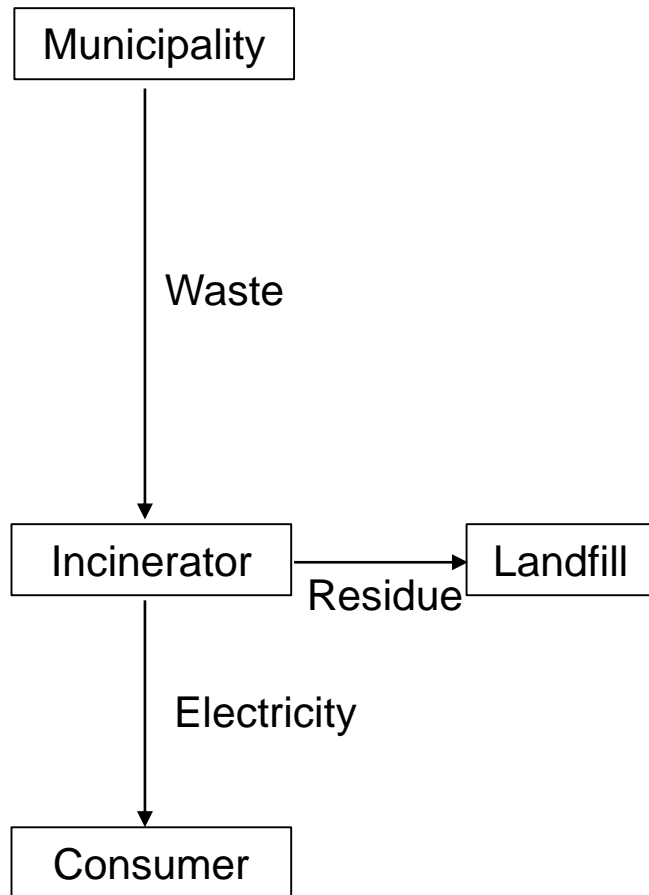
Waste LHV of Reference Projects in China & India



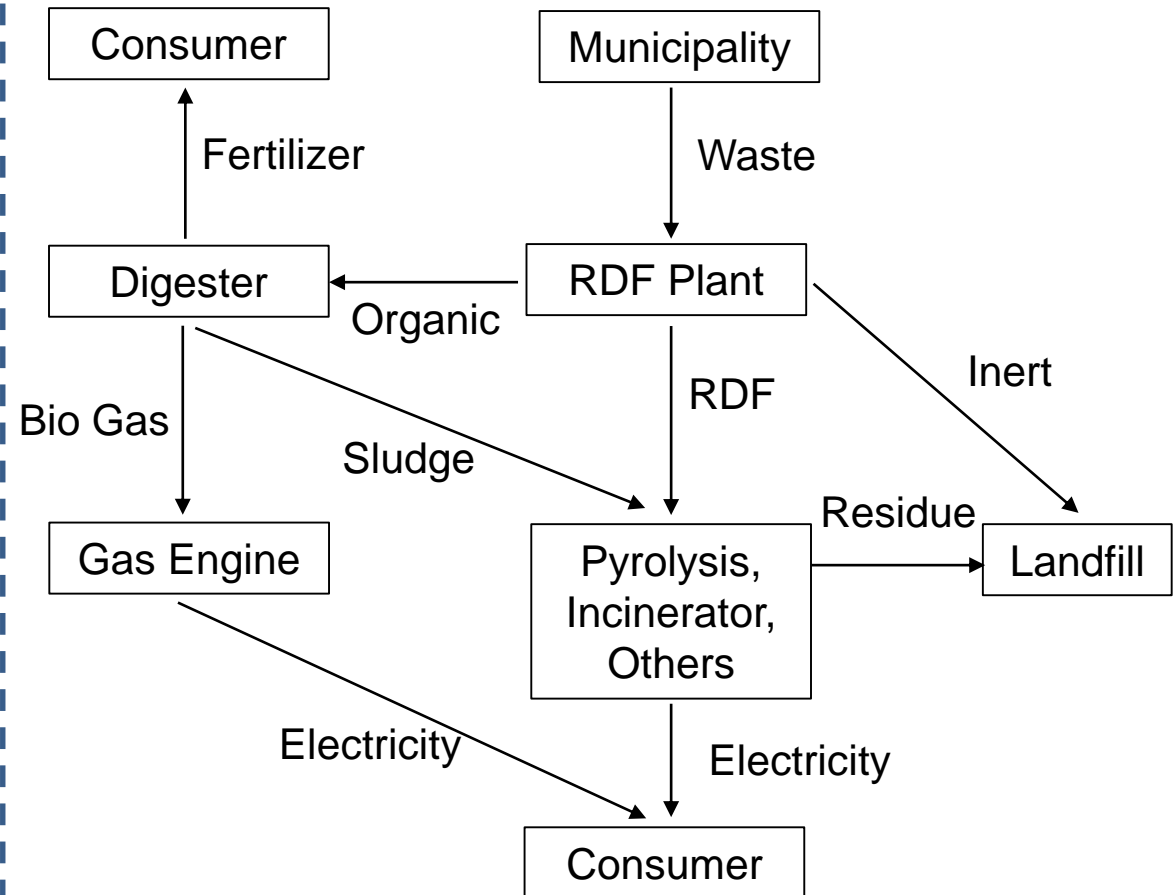
□ Waste LHV in Thailand is in the range of Hitachi Zosen's reference projects in China & India.

Direct Combustion VS RDF-Based Treatment

Direct Combustion



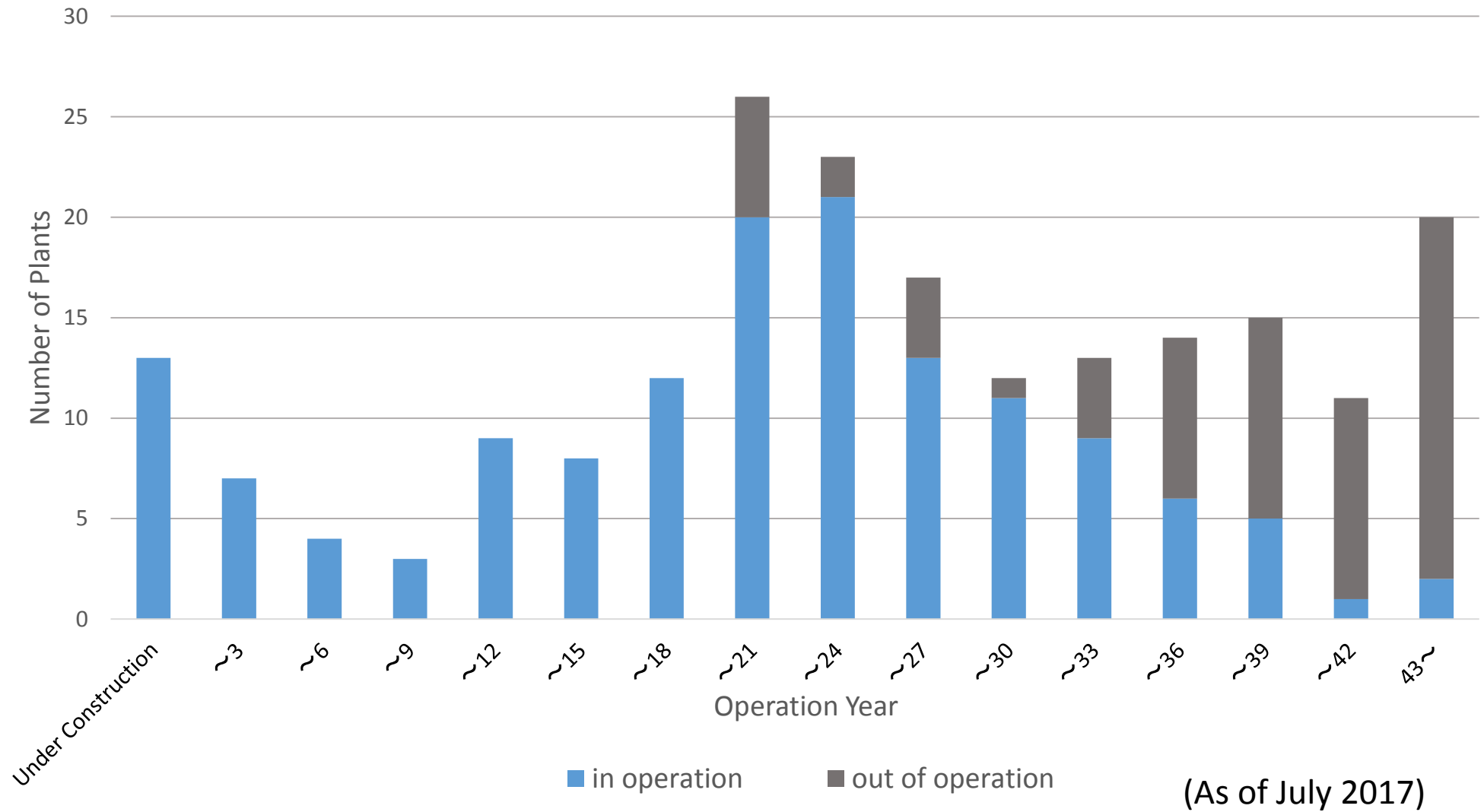
RDF-Based Treatment



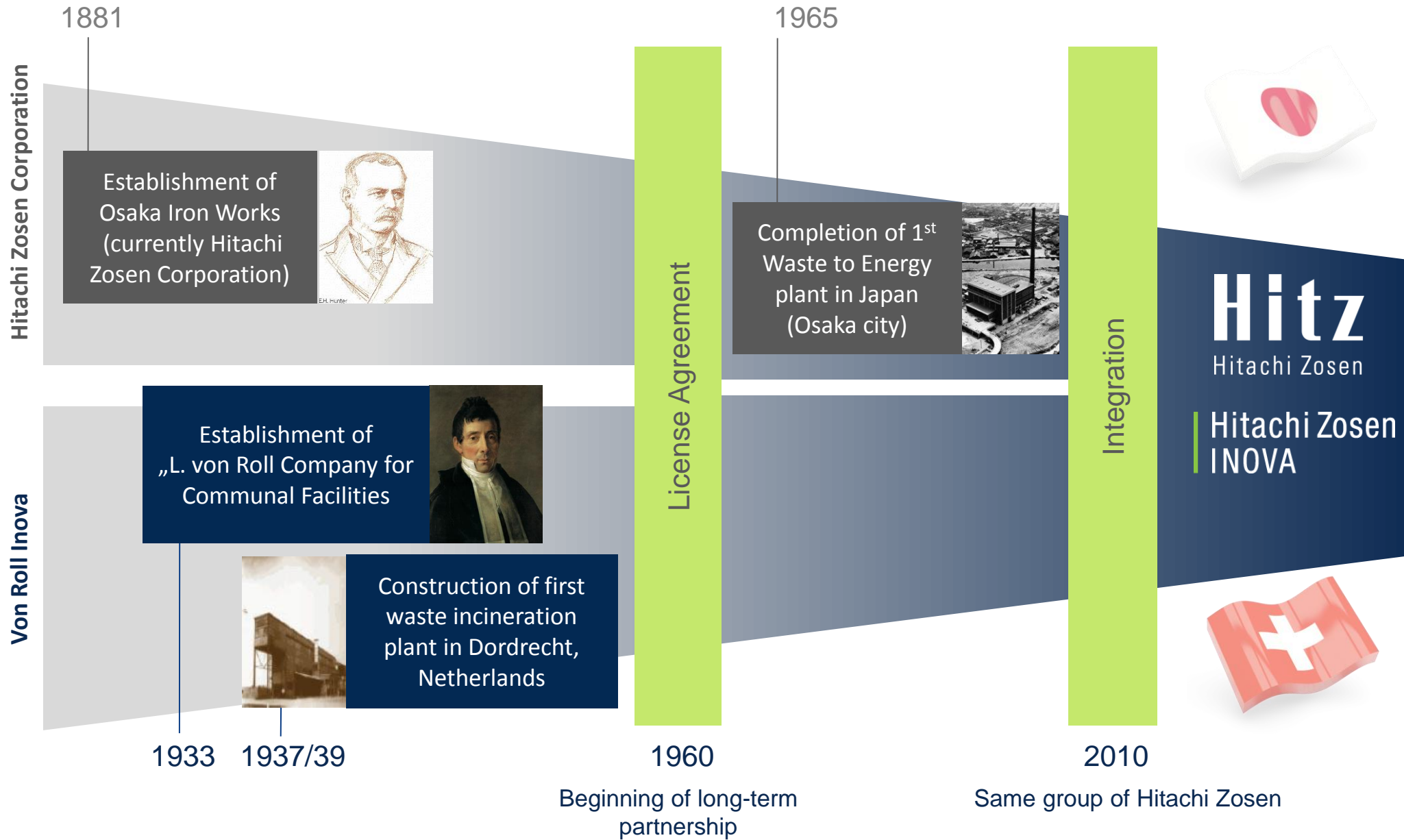
If you compare 2 systems:

- ❑ Which is simpler?
- ❑ Which OPEX & CAPEX is cheaper?
- ❑ Which operation is more stable?
- ❑ Which income is more stable?

Plant Operation Period in Japan



History for Waste to Energy Business



More than 80-Year Experience in Waste to Energy Business

Why Hitachi Zosen's Grate WtE was selected?

- | Proven technology by 925 references in the world
- | Grate designed to burn wet MSW without pre-treatment
(Some technologies need pre-treatment. How to treat rejected materials?)
- | Advanced flue gas cleaning to comply Thai emission standard
(Hitachi Zosen has references which have complied European standard.)
- | Stable operation in spite of fluctuation of waste quality & quantity
(Continuous treatment with high quality technology is the most important for municipality: sanitary environment, for investor: sustainable PPP scheme.)
- | 80 years experience including Engineering, Procurement, Construction, Maintenance, Operation, International market
(Hitachi Zosen can produce best service in all circumstances related to WtE.)

Thank you for your attention!

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