

TOTAL
SOLUTION
PROVIDER



A GLOBAL ENGINEERING COMPANY

ENGINEERING CO., LTD. **2018**

Waste-to-Energy Technologies



01

*Introduction of
DOHWA*

- + *Company Overview*
- + *Who We Are*
- + *What We Do*
- + *Where We Are*

02

*Waste
Management
Paradigm*

- + *Waste Management
Paradigm*

03

*Waste-to-Energy
Technologies*

- + *Waste-to-Energy
Technologies*
- + *Major Experience*

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01

INTRODUCTION OF DOHWA

1 COMPANY OVERVIEW

Date of Foundation

August 15, **1957**

Business Areas

Feasibility Study & Master Plan, Engineering Design, Construction Supervision, Construction Management, Project Management, EPC, O&M

Personnel

2,003 Persons (P.E 503)

Total Asset (2017)

USD 300.8 million (KRW 324.9 billion)

Total Liability (2017)

USD 85.9 million (KRW 92.8 billion)

Annual Turnover (2017)

USD 368.5 million (KRW 398.2 billion)

Project Amount Awarded (2017)

USD 495.4 million (KRW 600.3 billion)



2 WHO WE ARE

Total Solution Provider
Multidisciplinary Engineering, Procurement,
Construction Supervision, PMC, EPC, O&M

Total Number of Employees: 2,003

Total Number of Engineers: 1,761

MANPOWER COMPOSITION

*Junior-level
Engineer*

474

*Intermediate-
level
Engineer*

165

*High-level
Engineer*

226

*Special Grade
Engineer*

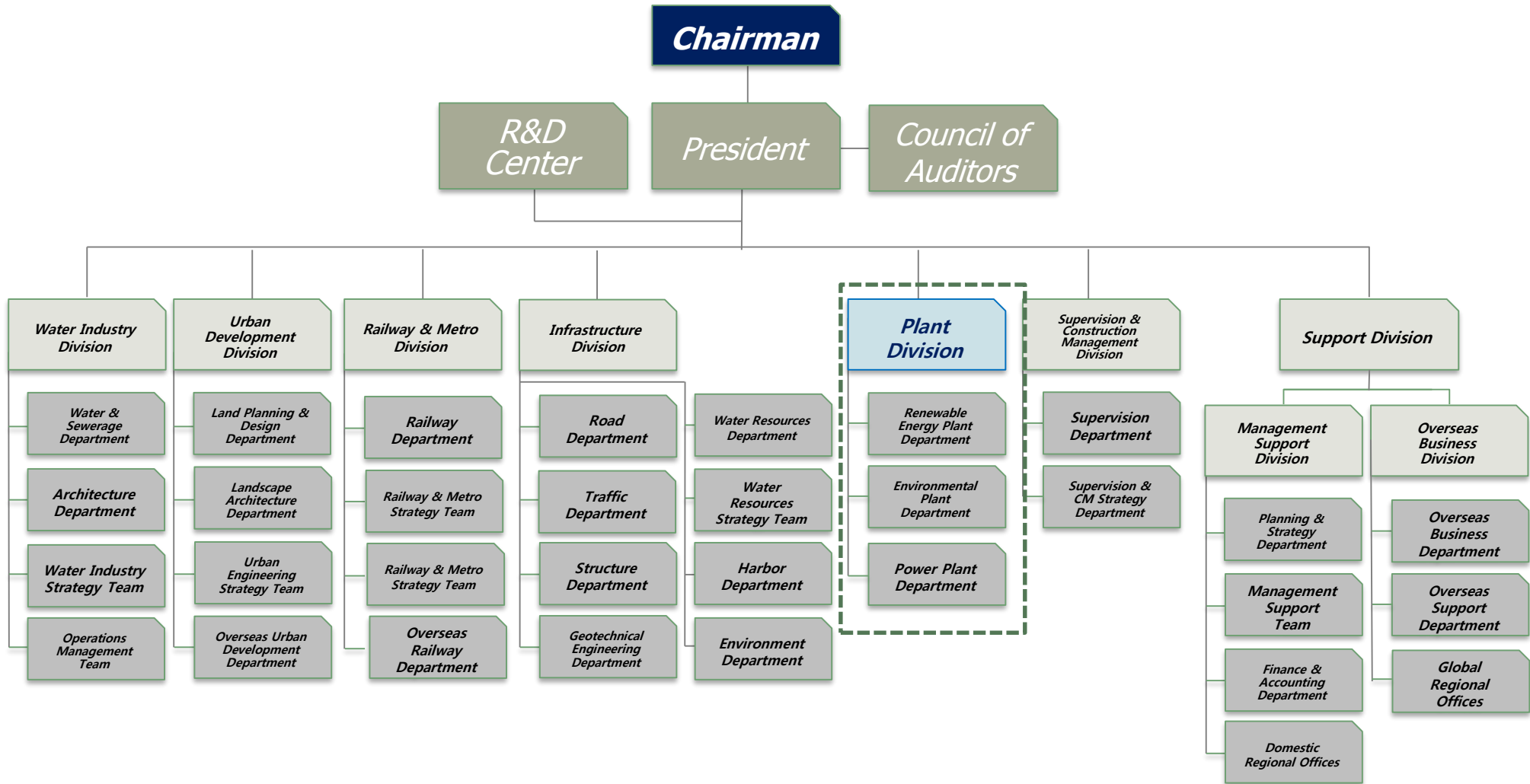
393

*Professional
Engineer*

503



2 WHO WE ARE



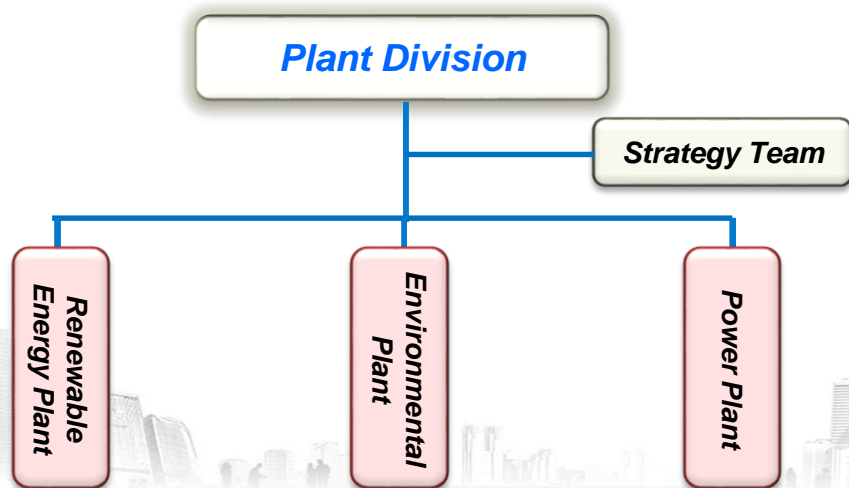
3 WHAT WE DO

Plant Division Service & Business Fields

Plant Division has 3 sub-divisions;

1. Renewable Energy Plant
2. Environmental/Waste-to-Energy Plant
3. Power Plant

The Environmental Plant Division is in charge of environmental infrastructure's (Incineration, Landfill, Biomass, Organic waste to energy plant) F/S, planning, design, construction supervision relate to CDM. With the high-tech expertise and patent rights, it is proudly recognized as a leader in environmental plant sectors.



Business Fields



| MBT & SRF (Environment plant)



| Landfill & LFG to Energy & Bioreactor



| Photovoltaic Power Plant



| Waste Incinerator

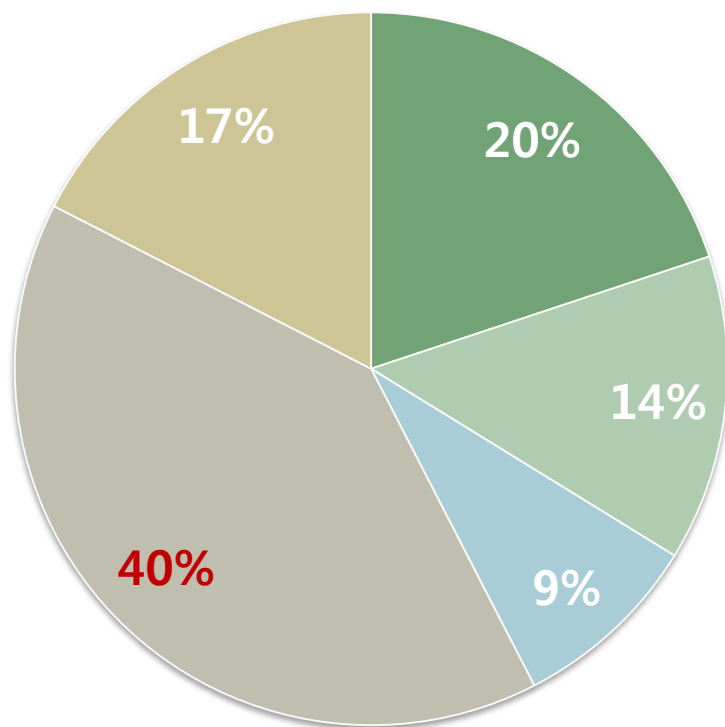


| Coal & Biomass -Fired Power Plant



| Wind Farm

Award by Sector (2017)



■ Water: 20%

**Water Supply/Sewerage, Drainage/River/Dam/HPP*

■ Transport: 14%

**Railway/Metro, Road/Bridge/Tunnel, Harbor/Port*

■ Urban Development: 9%

■ **Plant: 40%**

**Renewable Energy, Environmental Plant, Power Plant*

■ Construction Supervision: 17%

4 WHERE WE ARE



395 overseas projects throughout in **65** countries

\$594 in millions of US dollars for overseas projects

20 regional offices cover Asia, Caucasus Region, Middle East, Africa and Americas

DOHWA Engineering, ranked 109th in ENR's July, 2017 publication of the "Top 150 Global Design Firms". In 2016, we were ranked 121th in the same list.

1. 당사는 지난해 세계 유수의 기업들과 함께 **ENR The Top 150 Global Design Firms List**(국내·외 매출액 합산 기준)에 **109 위(작년 121 위, 12 단계 상승)**로 등재되었습니다.

2. 또한, 해외 매출액에 근거한 **ENR The Top 225 International Design Firms List**에는 **105 위(작년 135 위, 30 단계 상승)**를 기록하였습니다.

* ENR (Engineering News Record)

- 1917년 4월 5일 창간
- 창간 이래 100여년 역사를 바탕으로 한 권위 있는 국제건설, 엔지니어링 분야 전문잡지
- 전 세계 건설, 엔지니어링 기업의 연간 수주, 매출 실적을 근거로 상위 업체 순위 정보 제공

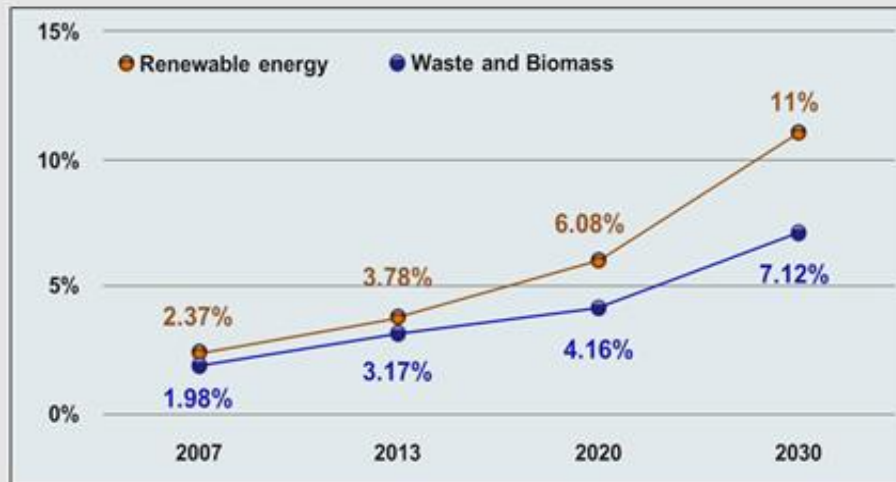
02

Waste Management Paradigm

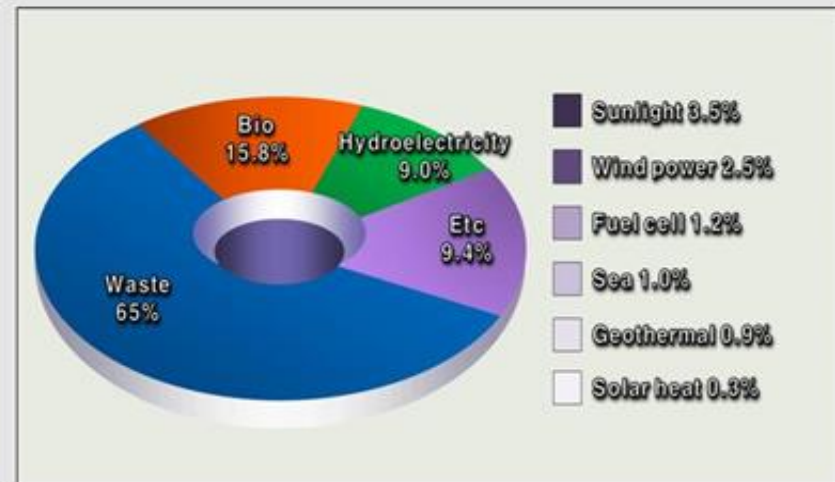
1 WASTE MANAGEMENT PARADIGM

Waste management policy in Korea

- Announcement of “Waste and Biomass Energy Action Plan”
(2009, Ministry of Environment and other six ministries)
- In order to achieve the nationwide renewable energy target of 6.08% by 2020, energy from waste-to-energy has been set to 4.16% (as much as 68% of renewable energy resources)

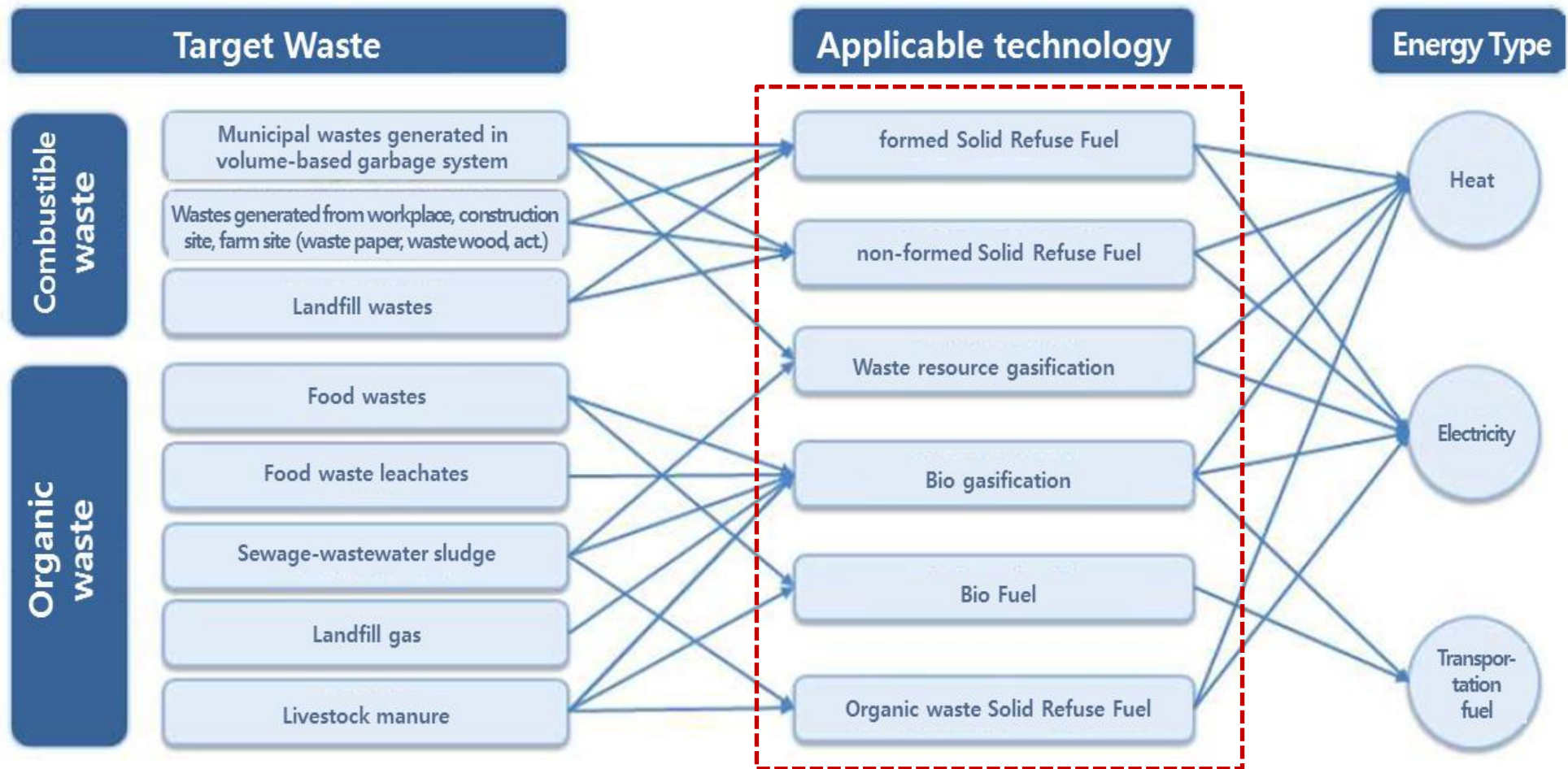


[Target distribution rates for renewable energy, waste and biomass]



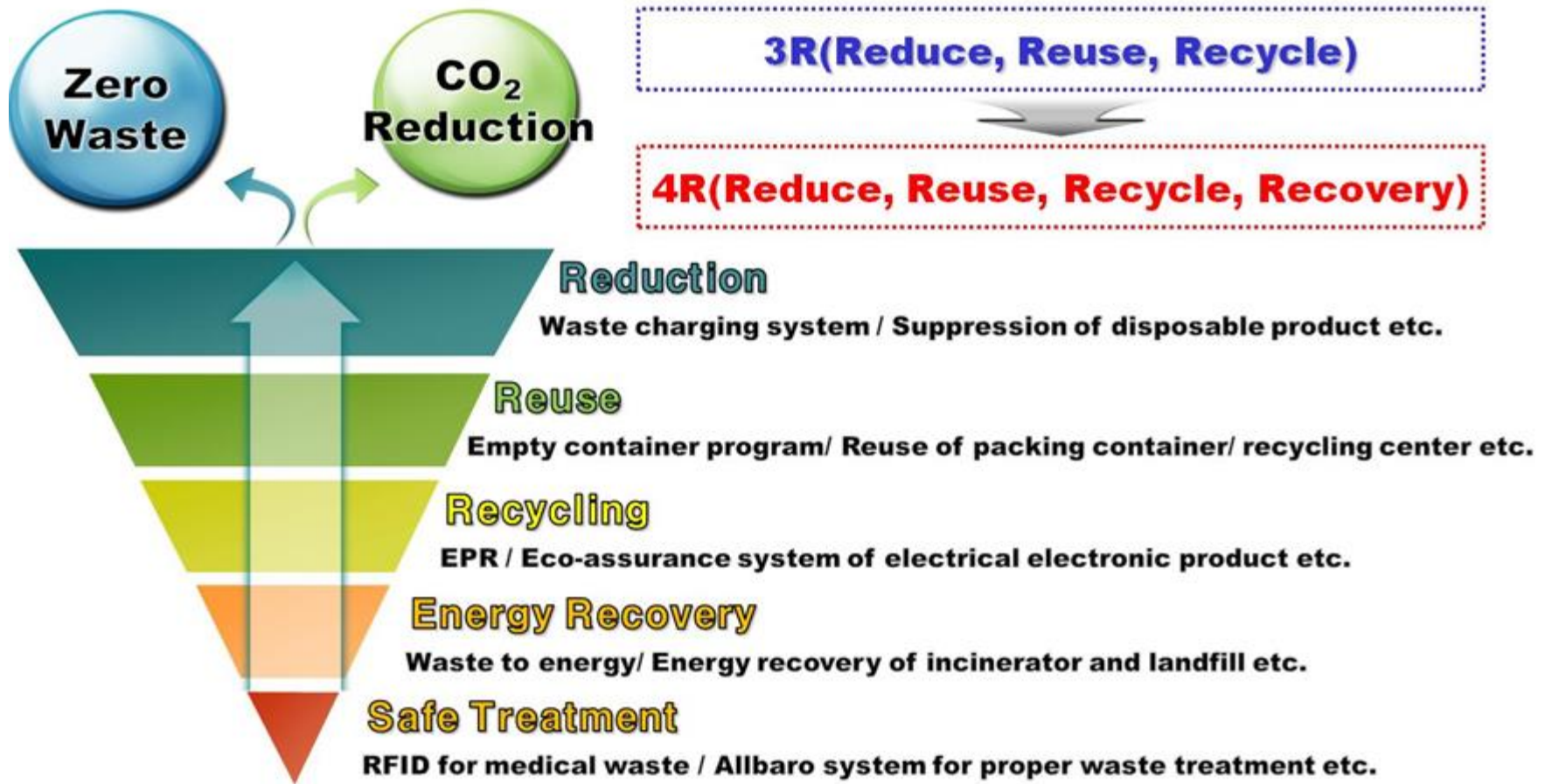
[Production rates of renewable energy ('13)]

1 WASTE MANAGEMENT PARADIGM



1 WASTE MANAGEMENT PARADIGM

Priority of Solid Waste Management

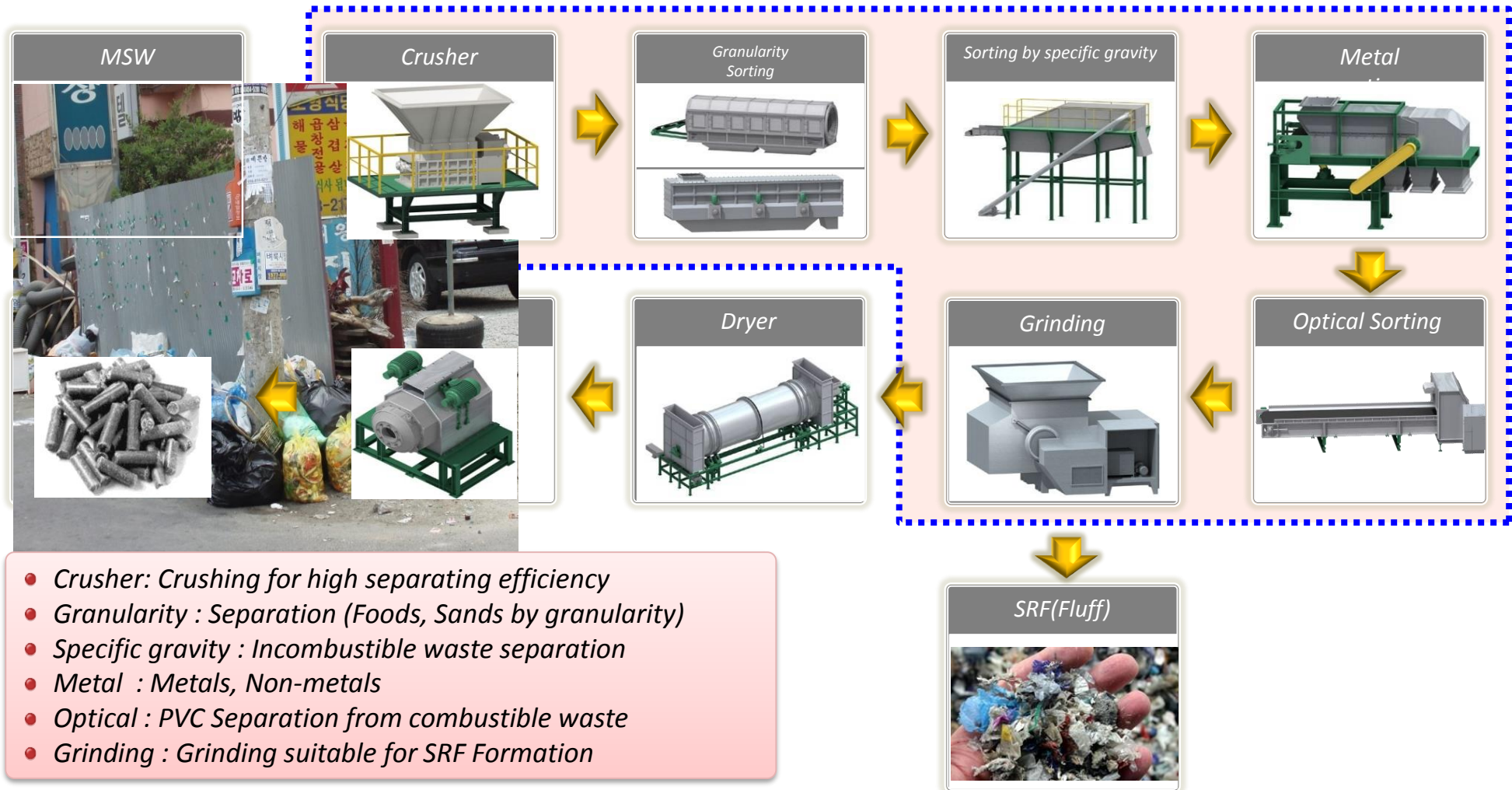


03

*Waste-to-Energy Technologies
of DOHWA*

1 SOLID REFUSE FUEL (SRF)

SRF(Solid Refuse Fuel) Production Process



1 SOLID REFUSE FUEL (SRF)

Experience in SRF Production Facility

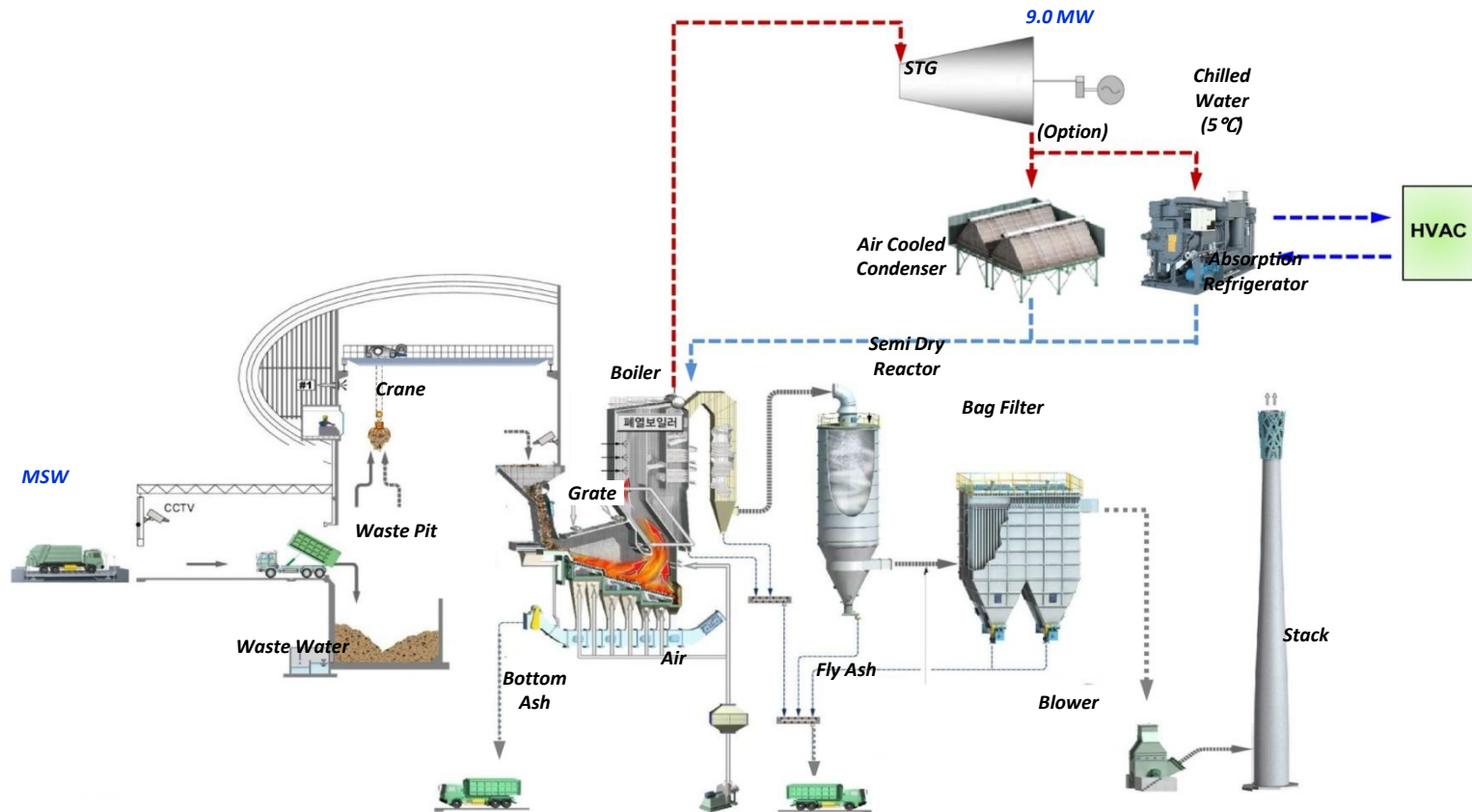


2 INCINERATOR

Incineration Process

Objectives

- Reduction of waste disposed
- Sanitary treatment of combustible waste
- Energy recovery



2 INCINERATOR

Experience in Incinerator



3 SLUDGE FUEL

Utilization of Sewage Sludge for Fuel



Sewage sludge

- Moisture content : 80%
- Character : Microorganisms
(Organic sludge)

Drying & Converting into energy
of Sewage **Sludge**

In case of drying sludge

Fuel value similar with coal

- Combustible content
→ More than 60%
- Carbon content
→ More than 35 %
- Low calorific value
→ More than 3,500kcal/kg

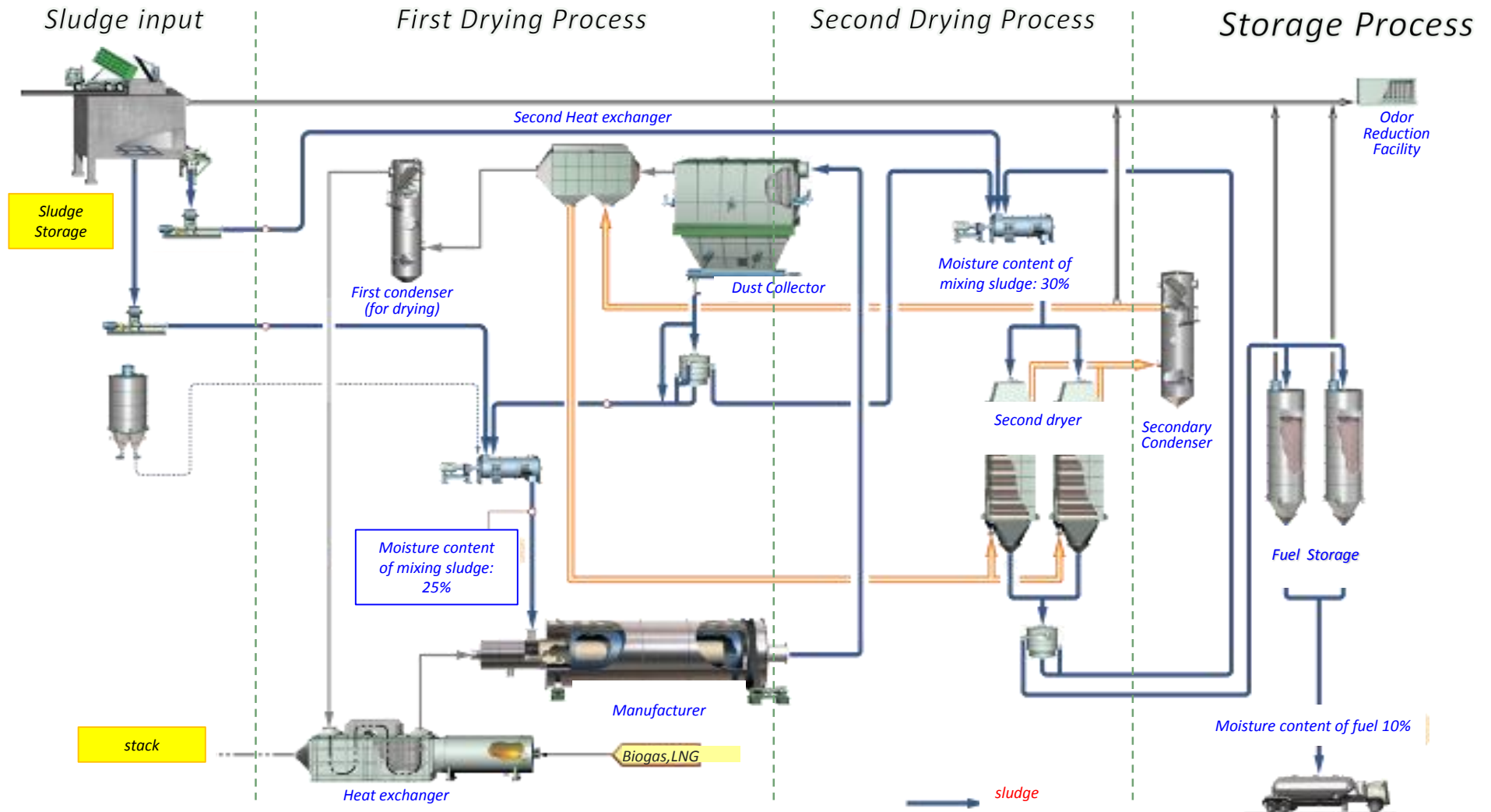


Sludge fuel

- Moisture content : Less than 10%
- Diameter : 2~8mm
- Caloric Value : More than 3,500kcal/kg

5 SLUDGE FUEL

Sludge Fuel Production Process



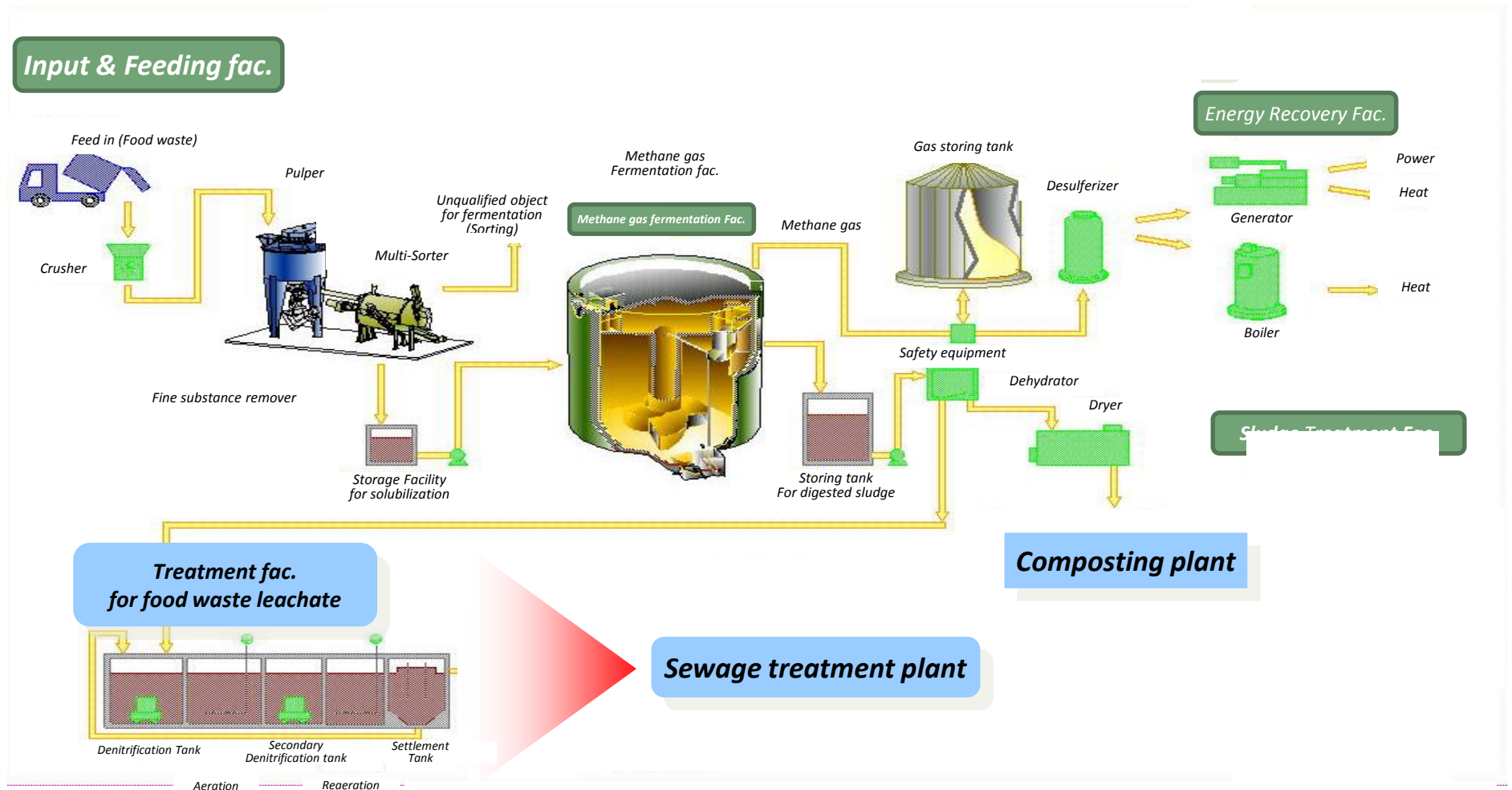
3 SLUDGE FUEL

Experience in Sludge Treatment Facility



4 BIOGAS

Food Waste to Energy Production Process



4 BIOGAS

Experience in Food Waste to Energy Facility

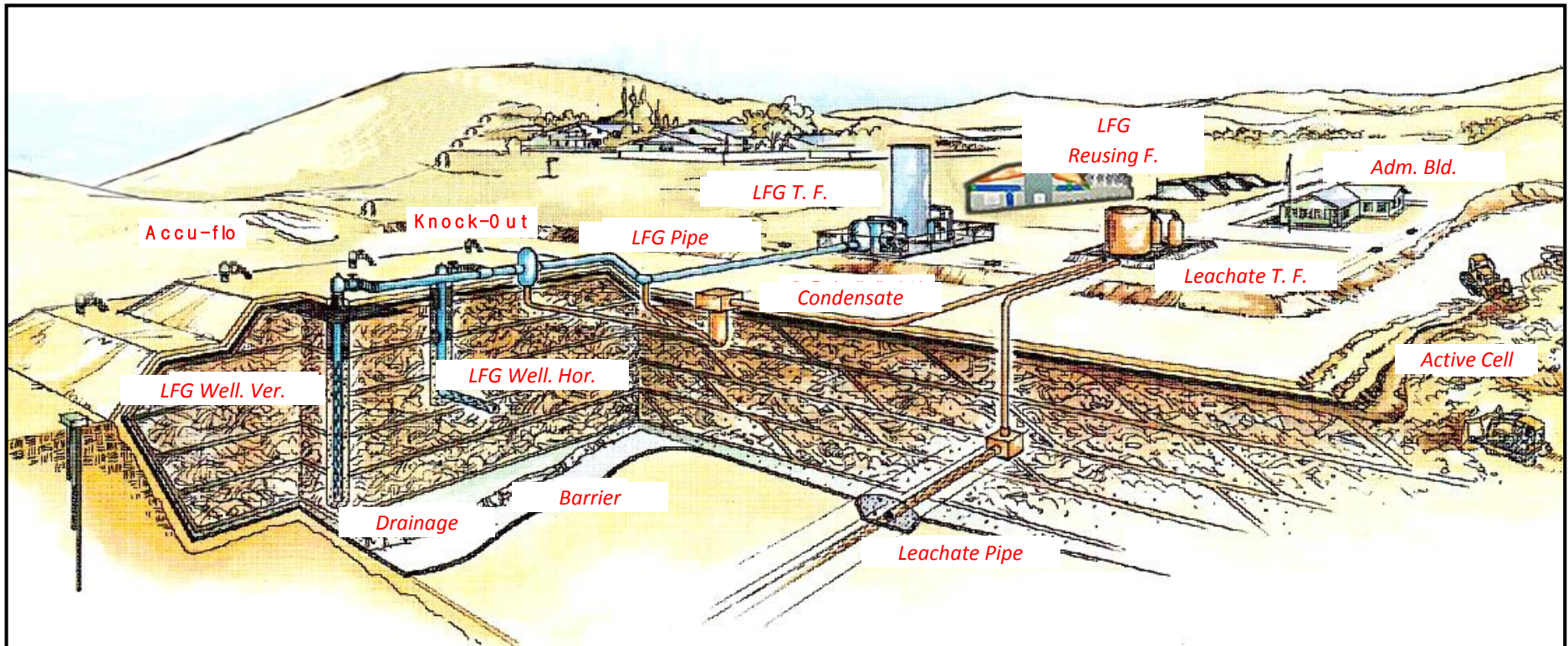
Wonju Foodwaste Anaerobic Digestion Facility

Daegu Foodwaste Anaerobic Digestion Facility

5 LANDFILL GAS (LFG) TO ENERGY

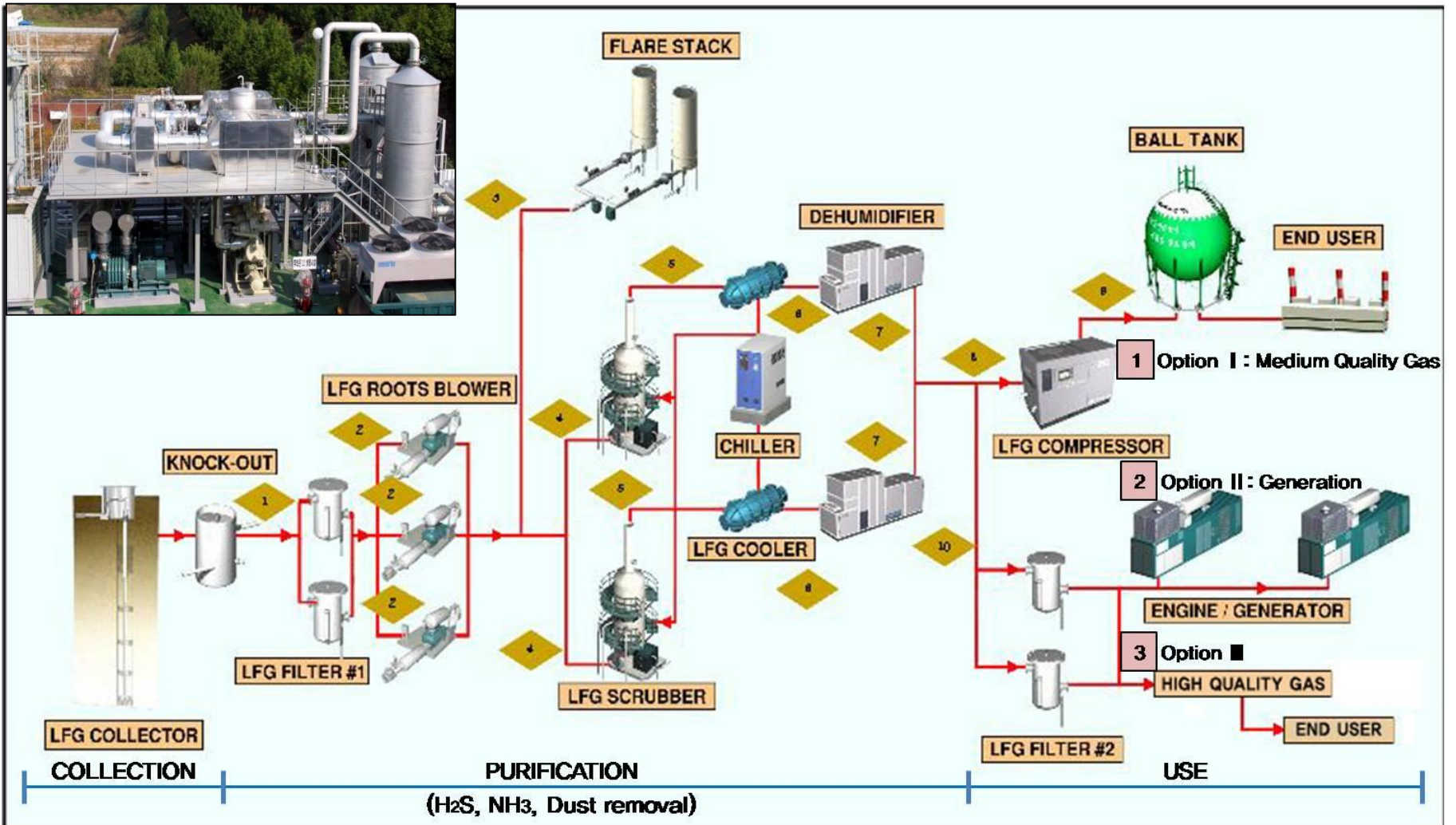
Landfill Gas (LFG) to Energy

- The principle of generation
 - LFG generated from landfill includes 50% of CH_4 and 50% of CO_2 by keeping anaerobic decomposed state of organics. Methane gas is used directly or by refining process
- LFG characteristic in landfill
 - LFG is methane gas generated from landfill and utilized as gas generation
 - Advantage: Utilizing methane gas directly or by refining process



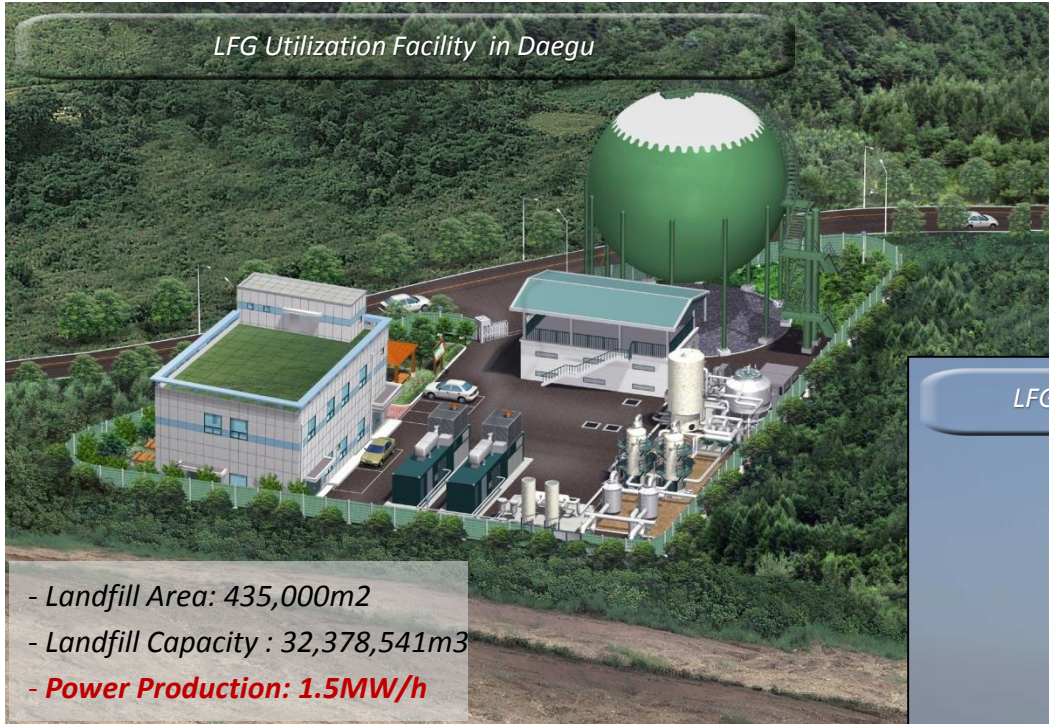
5 LANDFILL GAS (LFG) TO ENERGY

LFG to Energy Production Process



5 LANDFILL GAS (LFG) TO ENERGY

Experience in LFG to Energy Facility

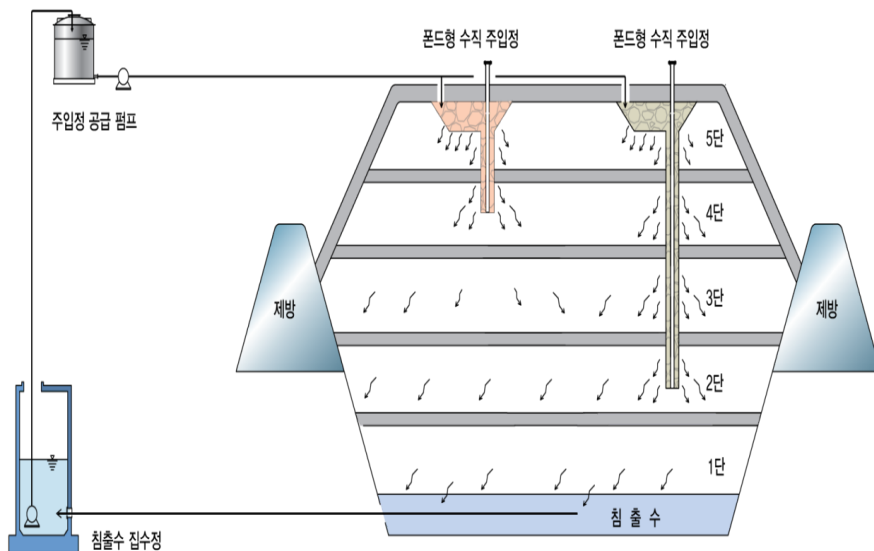


6 BIOREACTOR

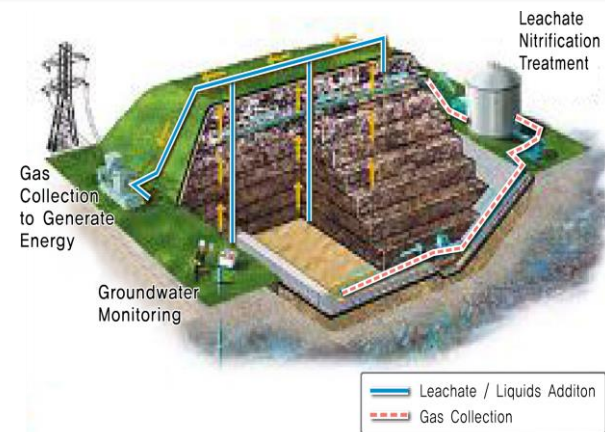
Bioreactor

*Leachate re-circulation
(Bioreactor)?*

- *A method to accelerate waste decomposition and LFG generation by providing organic waste water or moisture*



- *Improvement of waste decomposition process with increasing water content through injection water into landfill*
 - *Maximization of LFG Production*
 - *Early Stabilization of landfill*



7 MAJOR EXPERIENCE

Integrated MSW Management Complex

● *Eco Center (Underground type)*



7 MAJOR EXPERIENCE

Integrated MSW Management Complex

● Daejeon Environmental Energy Town

*Waste Preprocessing & Resource Facility :
400ton/day*

*SRF COGEN Generating Facility : 200ton/day
Sludge Treatment Facility : 240ton/day*



7 MAJOR EXPERIENCE

KTH Biomass Fired Power Plant

- **PROJECT SUMMARY**

1) Location : Kalimantan, Indonesia

2) Fuel : Biomass (Wood Bark)

3) Capacity : 34 TPH / 7.3 MW

4) Period : 2011. 09 ~ 2013. 03

- **Reason for success of project**

1) Cooperation with Indonesia's local companies

2) Technical support and cooperation in "Standard Castle"

3) Facility planning appropriate to local conditions



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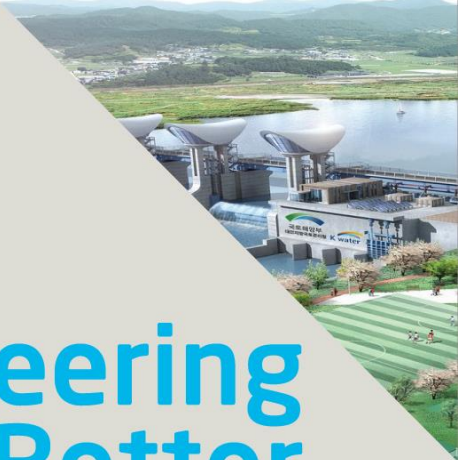
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