

Comparison of Waste-to-Energy Project Development in Asia and Europe



1. Company profile

2. Case study



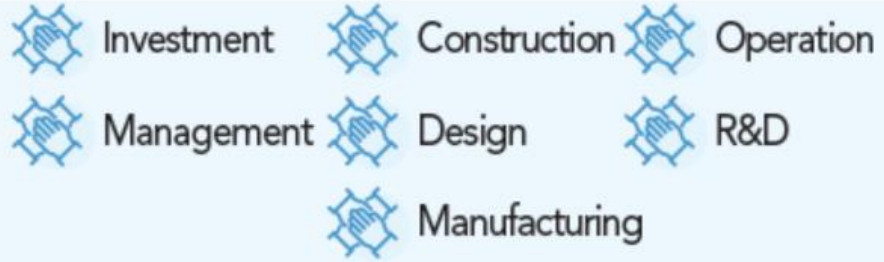
CHINA EVERBRIGHT AT A GLANCE

- China Everbright Environment Group Ltd., or Everbright Environment, the backbone enterprise of China Everbright Group, a state-owned financial holdings group, Fortune Global 500.
- Established in Hong Kong in 1993. Listed on the Main Board of The Stock Exchange of Hong Kong Limited.
- Largest environmental enterprise in China.
- The world's largest waste-to-energy investor and operator.
- Leading player in Asia's environmental protection sector.
- Total number of employees exceeding 14,000.
- In 2021, recorded a revenue exceeding HKD 49 billion (USD 6 billion) and total assets over HKD 200 billion (USD 25 billion).
- Founder of the China Everbright Belt & Road Green fund, and financial support from China Development Bank, IFC and ADB.

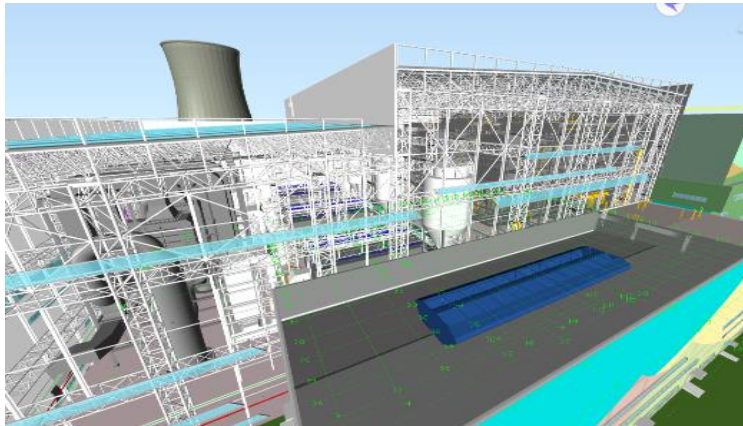


ONE-STOP ENVIRONMENTAL SOLUTION PROVIDER

Full-chain Services

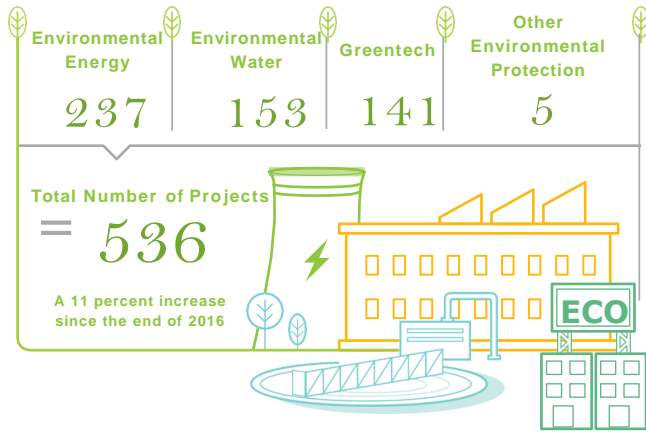


Xiongan New Area Waste Integrated Treatment Project



GLOBAL FOOTPRINT

Business Scale



Projects at planning stage in 1ST H 2022
23

Projects went into operation in 1ST H 2022
13

Projects under construction in 1ST H 2022
40

- ✓ In the second half of 2016, the **first overseas M&A project** Novago sp. Z o.o. was completed
- ✓ In 2011, CEIL'S **first overseas environmental energy project**, the Ground Solar Energy Project commenced commercial operation
- ✓ In the first half of 2021, the **first overseas sewage treatment operation and maintenance**. Mauritius OM project

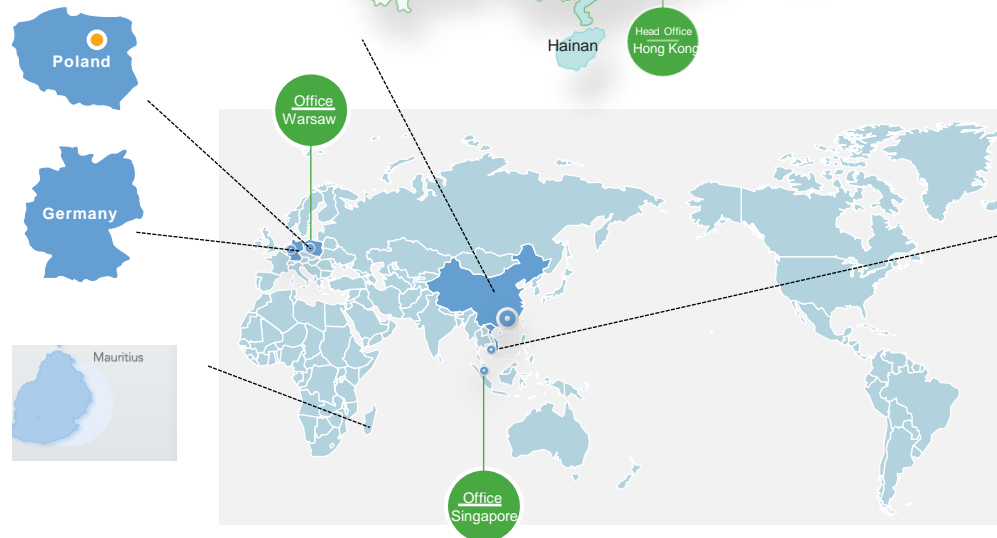


As of 30th June 2021, a diversified portfolio of **236** projects of WTE, greentech and water treatment are operated across **Asia** and **Central and Eastern Europe**

Has processed a cumulative **43,030,000t** of municipal solid waste, **506,000t** of hazardous waste, and **3,203,000t** of agricultural waste. A total power generation of **16,138,466,000KWh**

Has treated a cumulative **6,379,341,000m³** of waste water

- Projects Location (coastal area)
- Projects Location (inland area)
- Business coverage area
- Newly secured projects in 2016 & 1stH 2017



- ✓ In the first half of 2017, the **first overseas waste-to-energy project** Can Tho WTE Project commenced construction



GLOBAL FOOTPRINT



Can Tho WtE Project

the first sophisticated WtE project in Vietnam



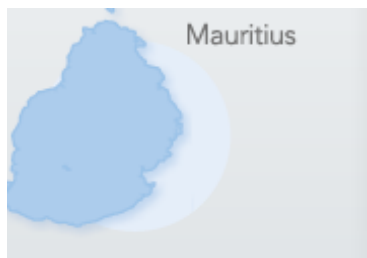
Novago sp. z o.o.

a leading solid waste processing enterprise in Poland



Schönewalde solar energy project

the biggest ground solar energy project in the east of Germany.



Mauritius sewage treatment project

the first overseas sewage treatment operation and maintenance.

WASTE TO ENERGY

WASTE
TO ENERGY

153

PROJECT

DESIGNED DAILY
WASTE PROCESSING
CAPACITY

139,150

TONS

DAILY WASTE PROCESSING
CAPACITY IN OPERATION

114,350

TONS





Changzhou Waste-to-energy Project has a designed daily waste processing capacity of 800 tonnes. Being awarded as the national AAA-rated waste-to-energy project, it is China's only waste-to-energy plant that is located most close to residential communities, operating in harmony with nearby communities that have around 100,000 residents. Changzhou Project launched the opening-up and upgrading work, which removed the fences of the project area and added amenities, such as an environmental protection popularization exhibition hall, a library, a basketball field and a garden.



Hangzhou Waste-to-energy Project has a designed daily household waste processing capacity of 3,000 tonnes. From the start of construction to the completion of the courtyard-style waste-to-energy project, the project serves as a good example of quelling the "Not in My Back Yard" (NIMBY) effect and having a positive impact on the neighboring communities, making the project a world-class benchmark.



Suzhou Waste-to-energy Project is Everbright Environment's first waste-to-energy project, which has been awarded the national AAA-rated waste-to-energy project. Phases I, II and III of the project have a combined designed daily waste processing capacity of 3,550 tonnes. The project has undergone dismantling and redevelopment work, as well as upgrading work, to boost the designed daily waste processing capacity to up to 6,850 tonnes. As the first municipal environmental protection project to be recognized as both a national environmental science popularization and education hub and an industrial tourism attraction in China's waste-to-energy industry, the project was dubbed a "Garden-like Waste-to-energy Plant" by CCTV.

Under development

Xiong'an-Everbright Eco-environmental Industry park set to be China's first large-scale, integrated and semi-underground comprehensive waste treatment facility.



waste-to-energy [2,250 t/d]
[300 t/d]

Sludge drying treatment [150 t/d]
[5 t/d]

Comprehensive utilization of slag [760 t/d]

Food & kitchen waste treatment [300 t/d]

Medical waste treatment [10 t/d]

Sewage treatment [1,000 m³/ d]

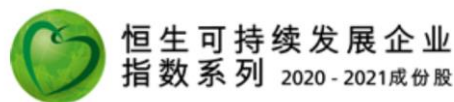
Fecal treatment

Fly ash melting

Achievement and Recognition

Member of
**Dow Jones
Sustainability Indices**

Powered by the S&P Global CSA



- Top Ten Solid Waste Processing Enterprises in China for 10 consecutive years
- Top 50 Environmental Enterprises in China for 2 consecutive years
- Included in the MSCI China Index for 8 consecutive years
- Included in the Dow Jones Sustainability Indexes for 5 consecutive years
- Included in the HSSUS for 7 consecutive years
- Included in the FTSE4Good Index Series for 4 consecutive years



Sustainability Yearbook
Member 2021
S&P Global



1. Company profile

2. Case study



- WtE business model is usually different in developing and developed economies
- The comparison is made in a typical WtE development model in South East Asia and European Union
- WtE are more active in SEA where population is dense. The business is in demand to cope with less regulated waste management
- New WtE developments are still receiving subsidies and supports from public parties
- WtE infrastructure is highly developed in many EU members and EU has shifted to reuse and recycle decades ago.
- New WtE developments are less active and generally have no or minimum participation from public parties
- Development cost in EU is multiples of that in SEA.



Can Tho WtE Developed by CEE



- 400t/d Incinerator
- 7.5MW turbine generator

Can Tho WtE Project

- Waste logistics is operated by the Gov.
- Waste supply schedule incl. bottom protection provision

Can Tho Gov.

Investment AGRT. 22 years
Waste supply AGRT



20% equity

CEEGL Can Tho Energy Co. (SPV)

Loan

ADB

- Loaned to CEEGL at a preferential rate.
- CEI is obliged to apply ADB's S&E STD.in project operation

PPA

Vie South Grid

Feasibility Study

- Tariff is a flat rate at 10.05 US cents and is denominated in \$.

Thai Lai County

Land acquisition and land lease

- Land is almost leased for free and was supplied by Thai Lai County under Can Tho City.
- County Gov. helped CEEGL build on-grid transmission line.

EPC AGRT

Contractor

Do not outsource

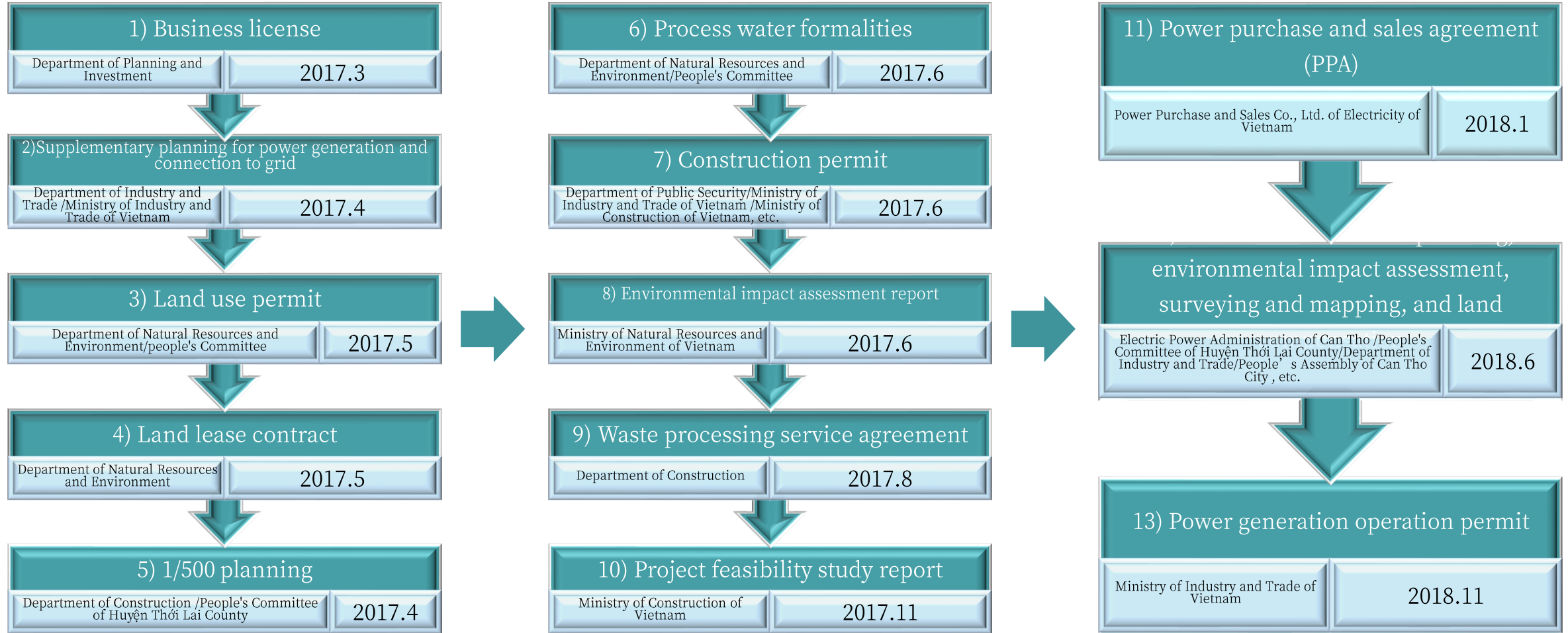
CEEGLCan Tho Enregy Co.

- Set up a joint E&C team between CEEGL and Contractor to guarantee project construction quality

- Technical team from CEEGL
- Train local staff in China
- Employ local manpower as many as possible

No.	Business mode	Description
1	Investment mode	BOO (solely-invested by Everbright International as a foreign company)
2	Total investment	400t/d project with a total investment of about USD 50 million, including a capital fund (20%), and the remaining part borrowed from Asian Development Bank (ADB)
3	Franchise period	22 years (including two years for construction)
4	Waste collection and transportation	The transportation service supplier was selected by the government by means of public tendering. It is expected to transport municipal waste to the plant.
5	Waste processing cost	To be adjusted since the 6 th year according to the CPI. The money is granted by the national treasury of the Can Tho government, settled by the Department of Construction with our company and remitted into our account in the next month after that.
6	Feed-in tariff	According to the 2014-31# document issued by Ministry of Industry and Trade of Vietnam. It is paid by Power Purchase and Sales Co., Ltd. of Electricity of Vietnam and remitted into our account in the next month after that. The electric network for connection to the grid is constructed and maintained by the investor.
7	Land rent	It is free in the construction period (3 years at most) and the first 11 years of the operation

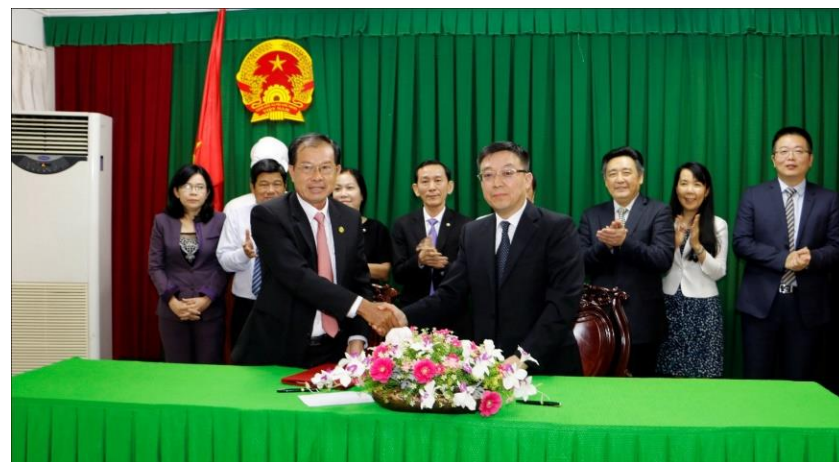
Can Tho WtE Project | List of major government documents



Can Tho WtE Project | Project milestones



Date	Project construction node
2016.12.20	Contract signing
2017.6.30	Commencement ceremony
2017.7.2	Foundation excavation of main workshop
2018.5.20	Hydraulic pressure test of boiler
2018.8.27	Turbine cylinder closing
2018.9.21	Inverse power transmission
2018.10.15	Approaching of waste into the plant
2018.10.31	First time of generator unit connection to grid
2018.11.9	72+24h operation
2018.11.26	Power generation operation permit was obtained
2018.12.8	Completion ceremony

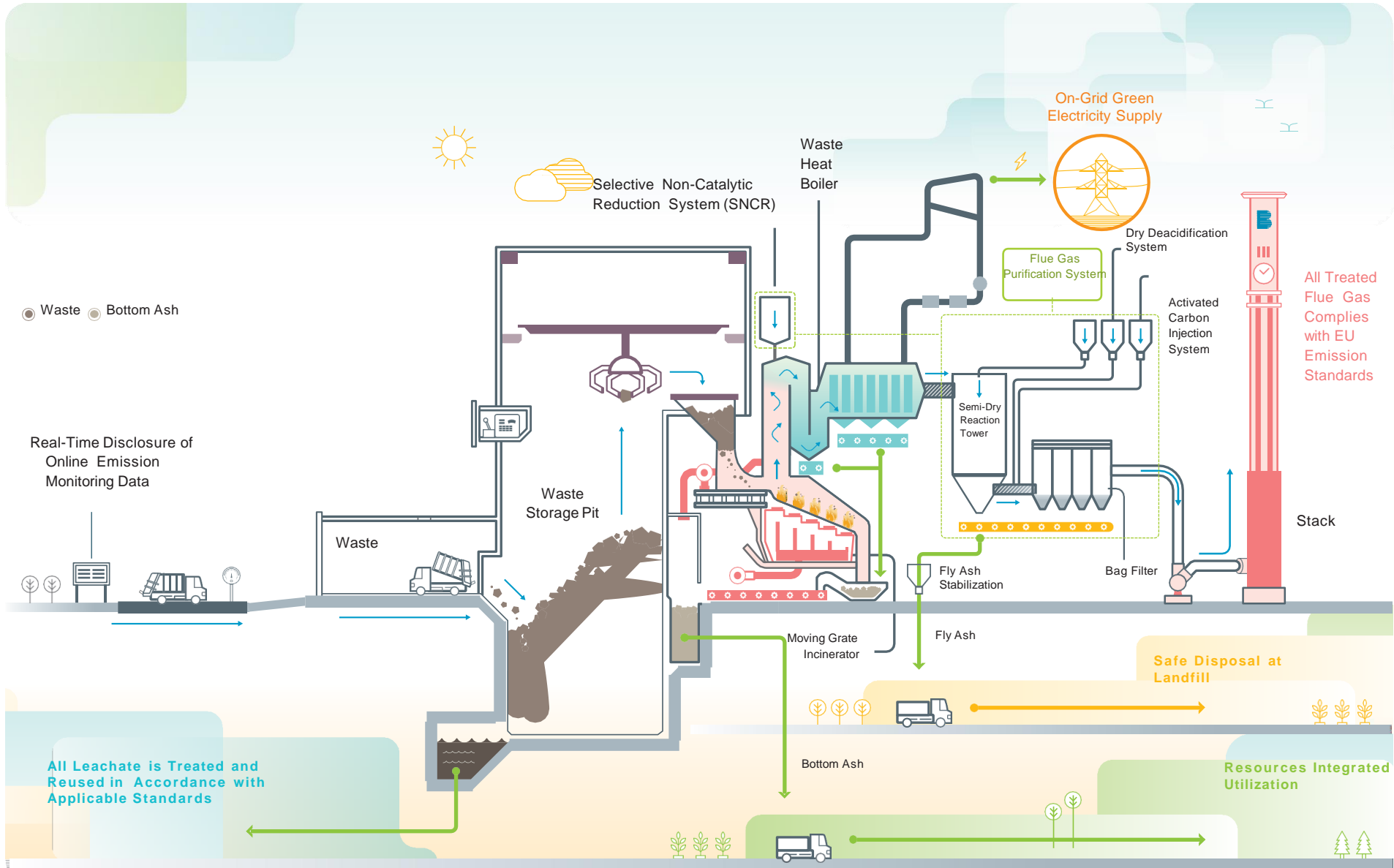


Can Tho WtE Project | Construction history

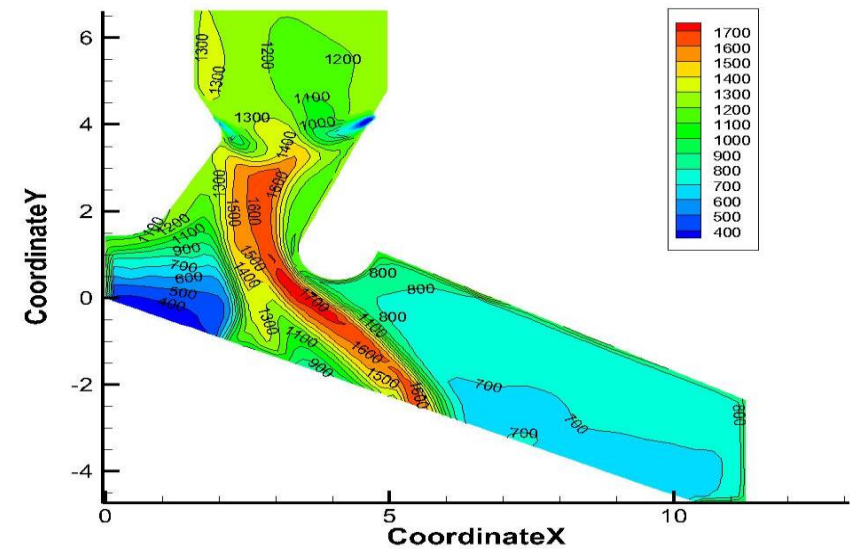
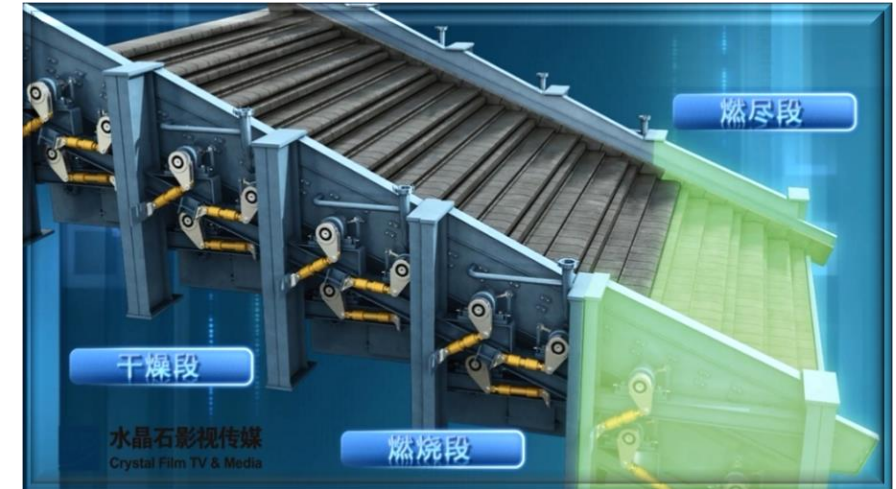


Can Tho WtE Project | Process

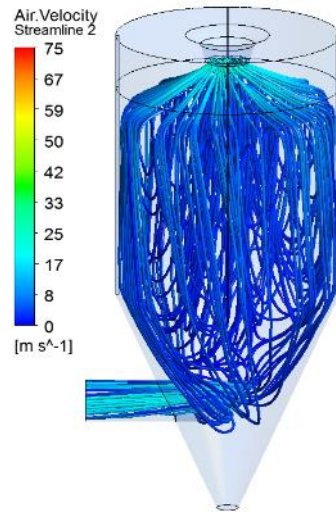
Waste-to-Energy System — Process Flow Diagram



CEE Developed Moving-Grate Incinerator



Air Pollution Control in line with EU Directive 2010

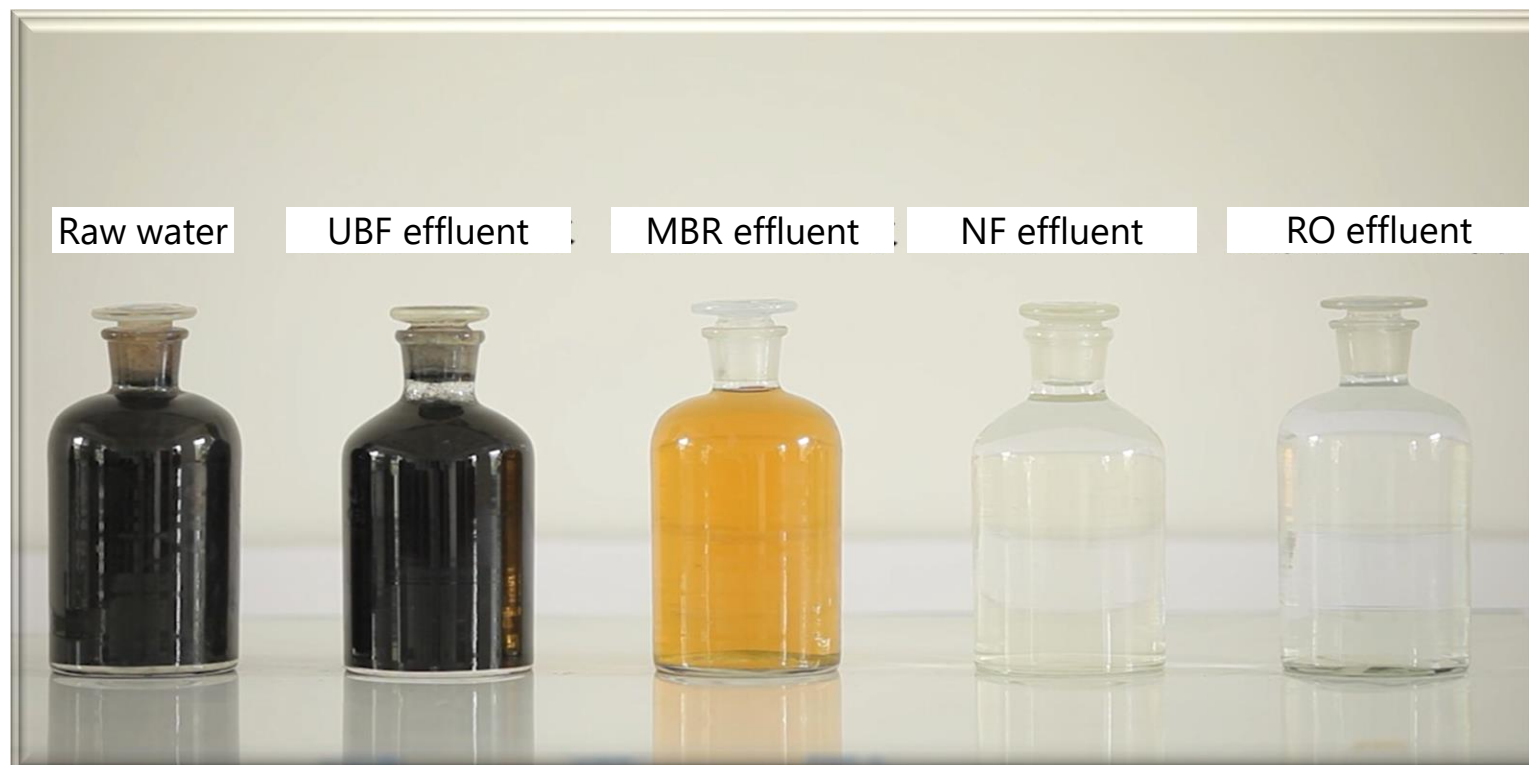


Indicator	QCVN61-MT: 2016/BTNMT	EU2010/75/EC	Can Tho Everbright's
Dust (mg/m ³)	100	10	2.41
NOx (mg/m ³)	500	200	149.72
SOx (mg/m ³)	250	50	11.19
CO (mg/m ³)	250	50	11.18
HCl (mg/m ³)	50	10	5.22
Hg (mg/m ³)	0.2	0.05	0 – 0.001
Cd (mg/m ³)	0.16	---	0 – 0.006
Pb (mg/m ³)	1.2	---	0 – 0.003
TEQ (ng/m ³)	0.6	0.1	< 0.1

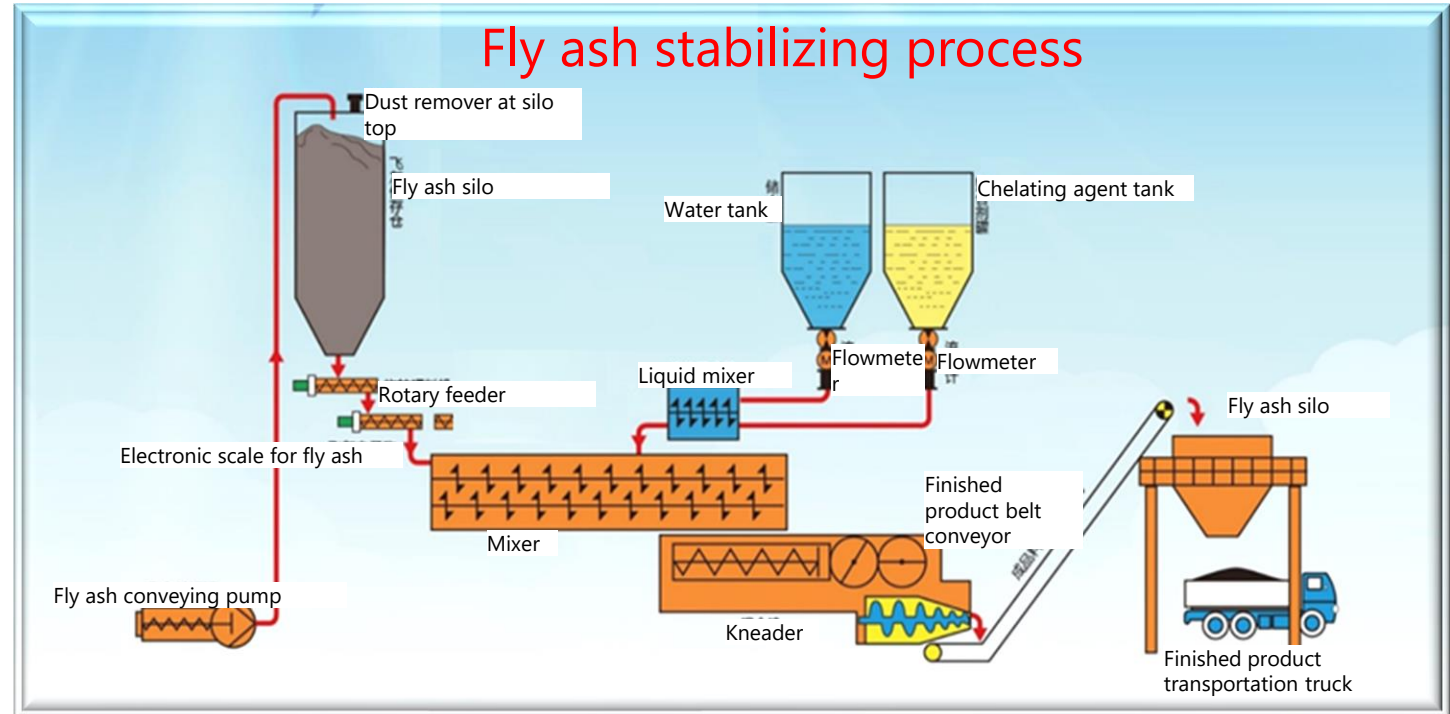
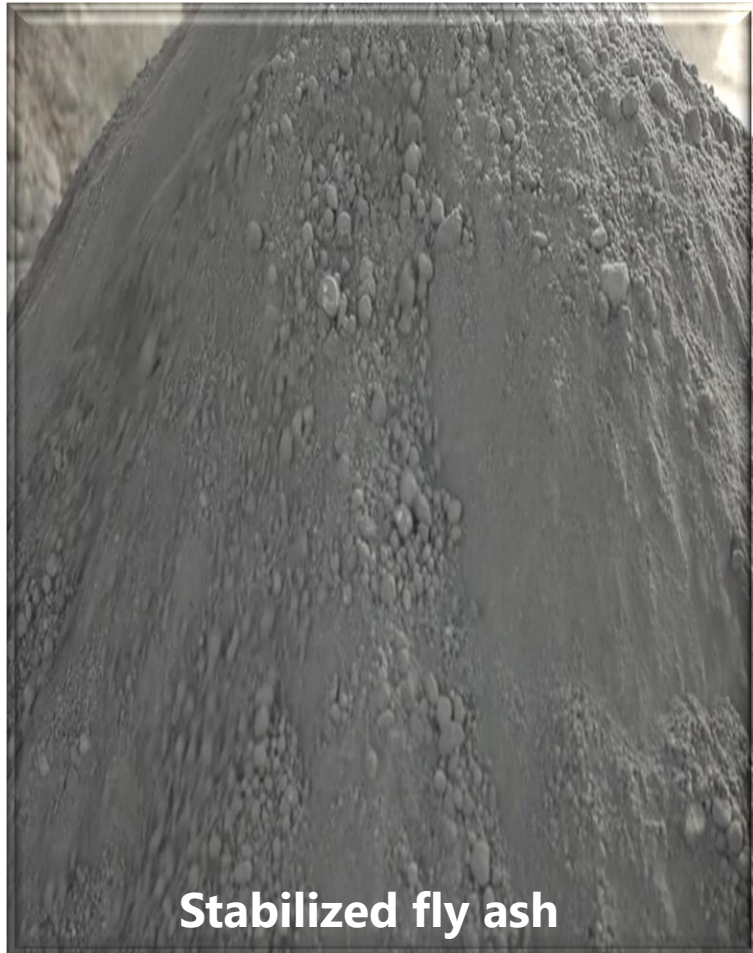
Leachate: Fully treated and recycled



	BOD ₅ (mg/L)	COD _{cr} (mg/L)	SS (mg/L)	NH ₃ -N (mg/L)	pH
Inflow indexes	30000	50000	10000	2000	3.0
Effluent indexes	≤10	≤60	≤10	≤1	6.5-8.5



Fly ash: ed and disposed in specialized landfill



Bottom ash: Treated for reuse



Bottom ash



Utilization workshop



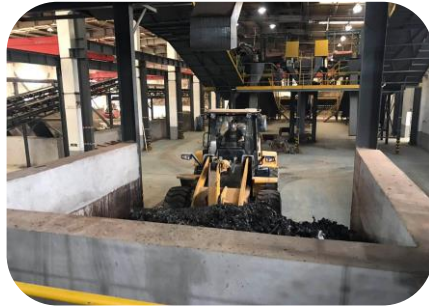
Bottom ash breaking equipment



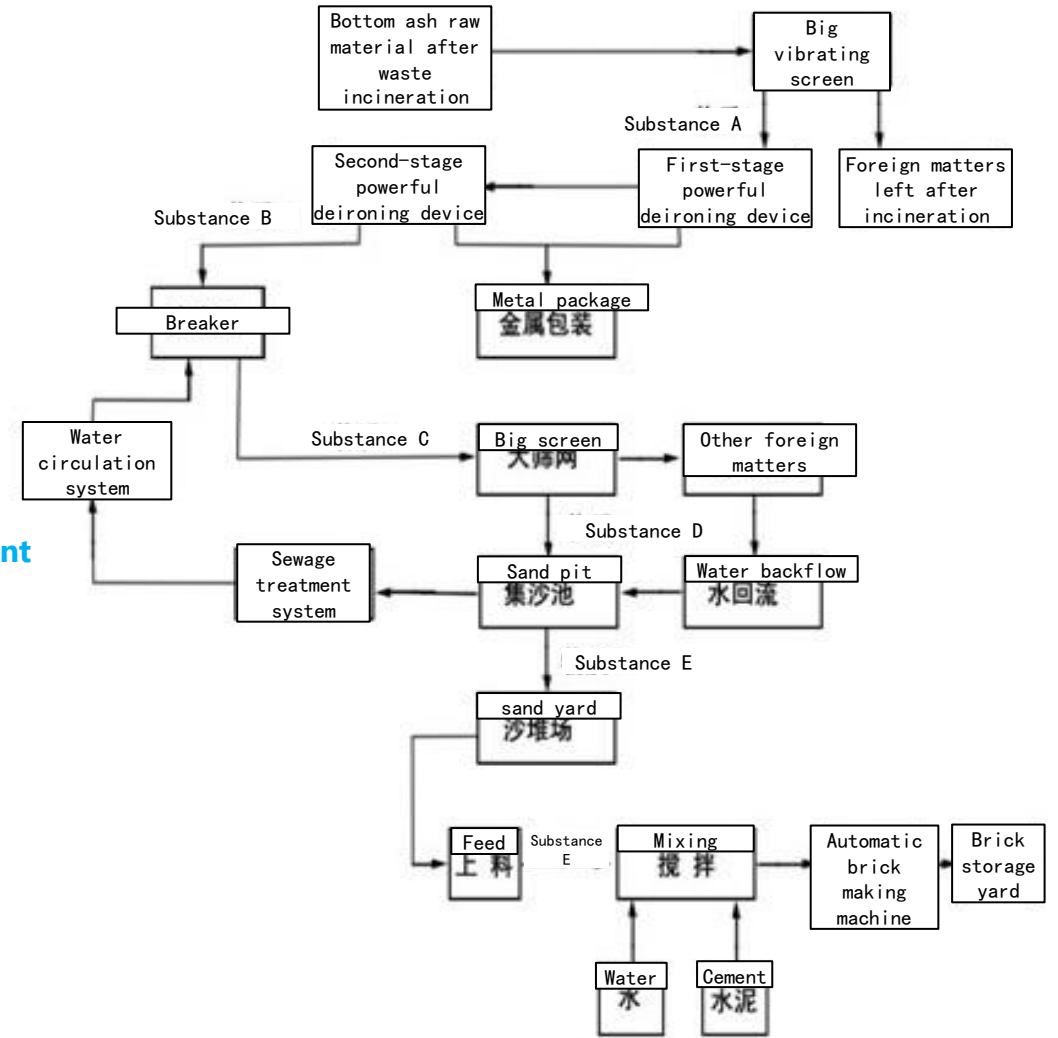
Bottom ash sorting equipment



Finished sand



Finished metals

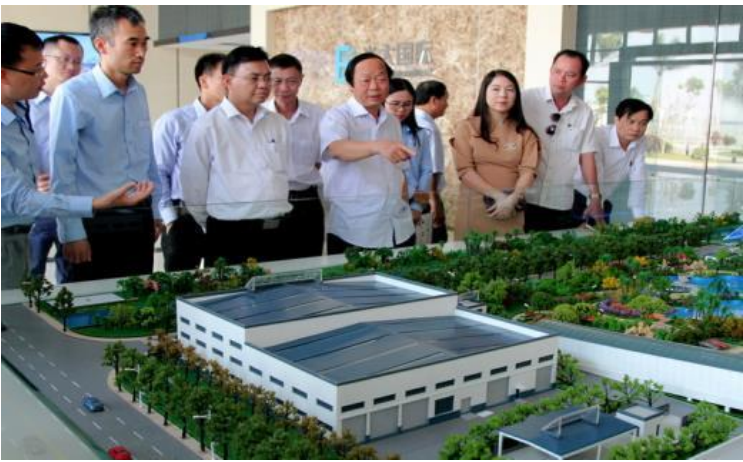


Process Flow Chart of Comprehensive Utilization of Bottom Ash

Outstanding Enterprise Award of Can Tho City



Typical green project of The Belt and Road



Influence and Impact



- Benchmarking Green Project in Mekong River Delta Region .
- Social and economic benefits realized.
- The technical, equipment, construction, operation and management criteria of China have been fully verified and highly recognized by the governments, public and experts of Vietnam.
- It has been proved that good cooperation between enterprises and governments can fruit in reasonable returns on investments of small WtE projects

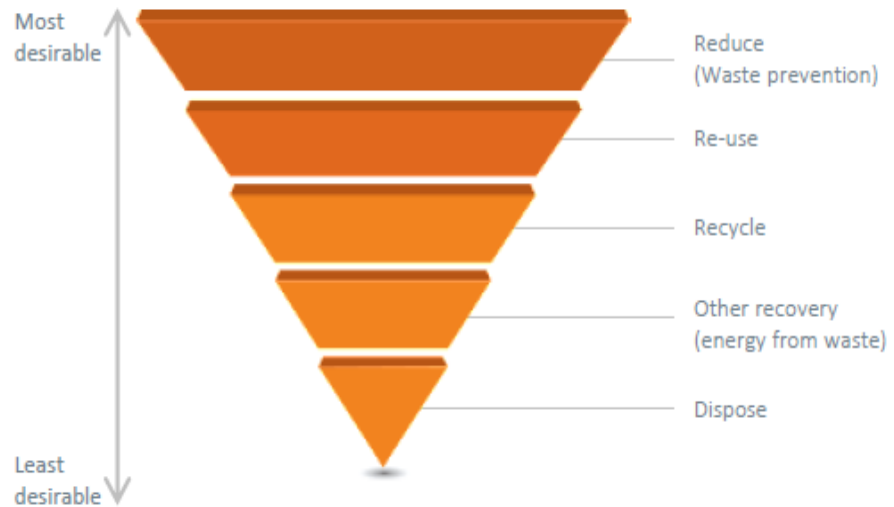
Waste management in EU

Framework Directive



The Framework Directive consolidated EU legislation on waste management by unifying earlier provisions. The Directive introduced a hierarchy of waste management methods (waste hierarchy) in order to ensure that Member States encourage the options that deliver the best overall environmental outcome

The waste management hierarchy



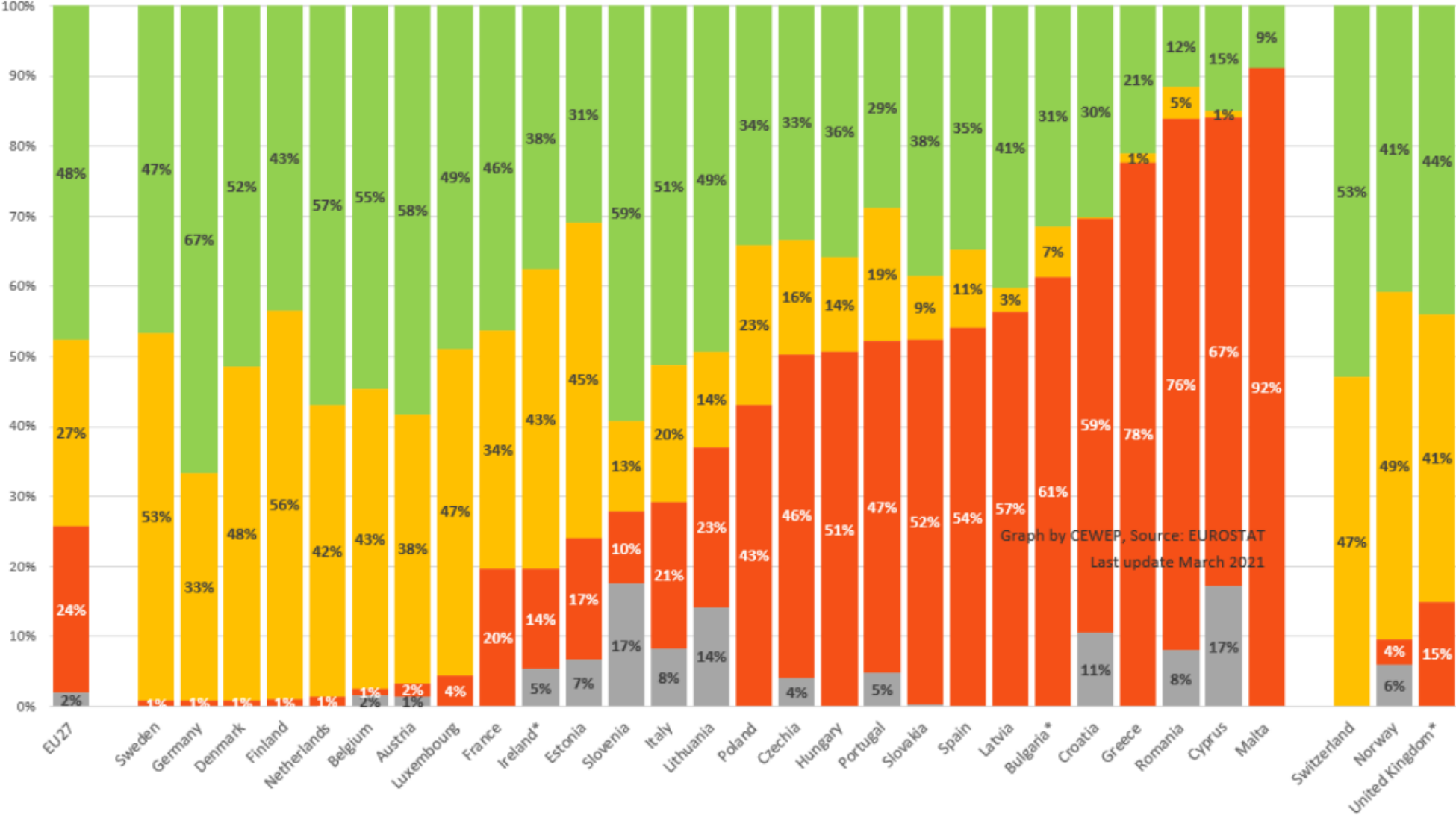
EU promotes development of "a circular economy" supporting decreased consignment of waste quantities to landfills and increased materials recycling processes by establishing clear long-term targets

Waste Management in EU



Municipal waste treatment in 2019

EU 27 + Switzerland, Norway and the UK



- Landfill
- Waste-to-Energy
- Recycling + Composting
- Missing data

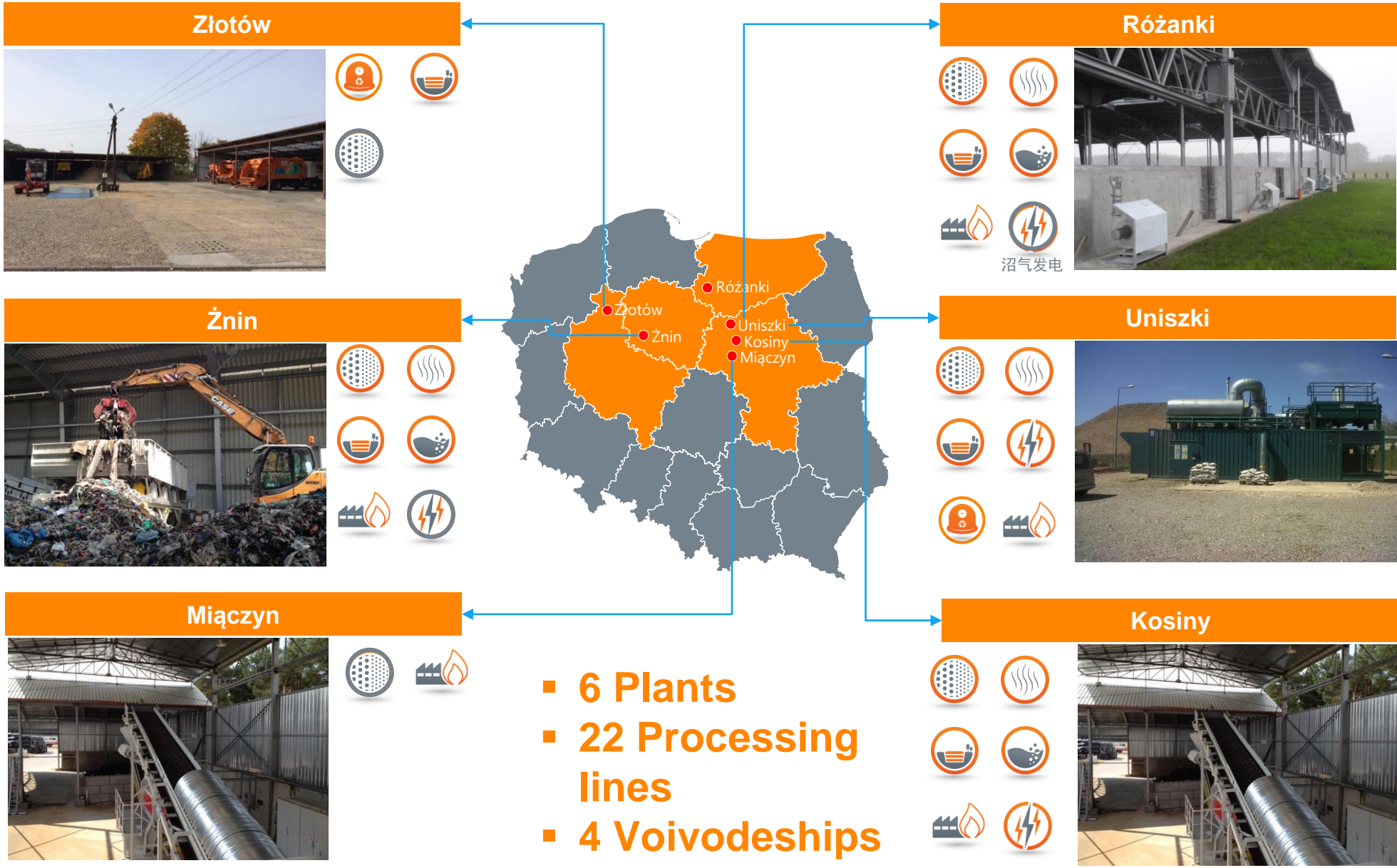


Graph by CEWEP, Source: EUROSTAT
Last update March 2021

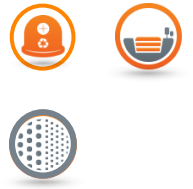
Percentages are calculated based on the municipal waste reported as generated in the country

*: 2018 data (last available)

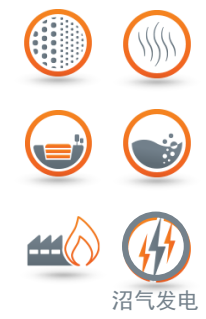
CEE Presence in Poland



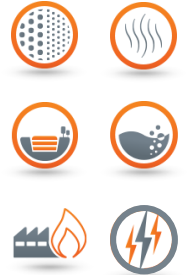
Złotów



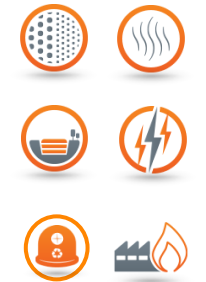
Różanki



Żnin



Uniszki



Miączyn



Kosiny



- 6 Plants
- 22 Processing lines
- 4 Voivodeships

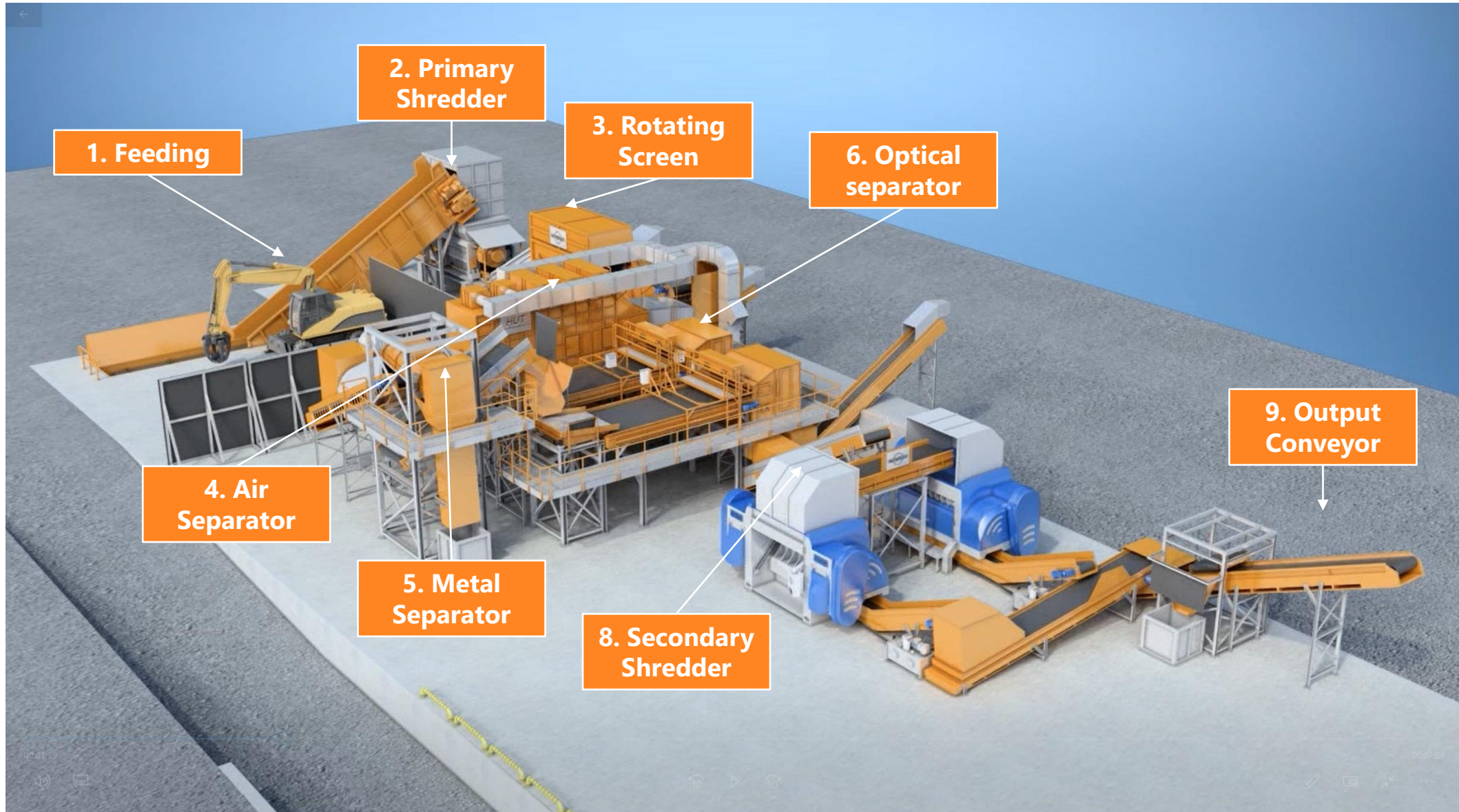
CEE Presence in Poland

Kosiny Plant



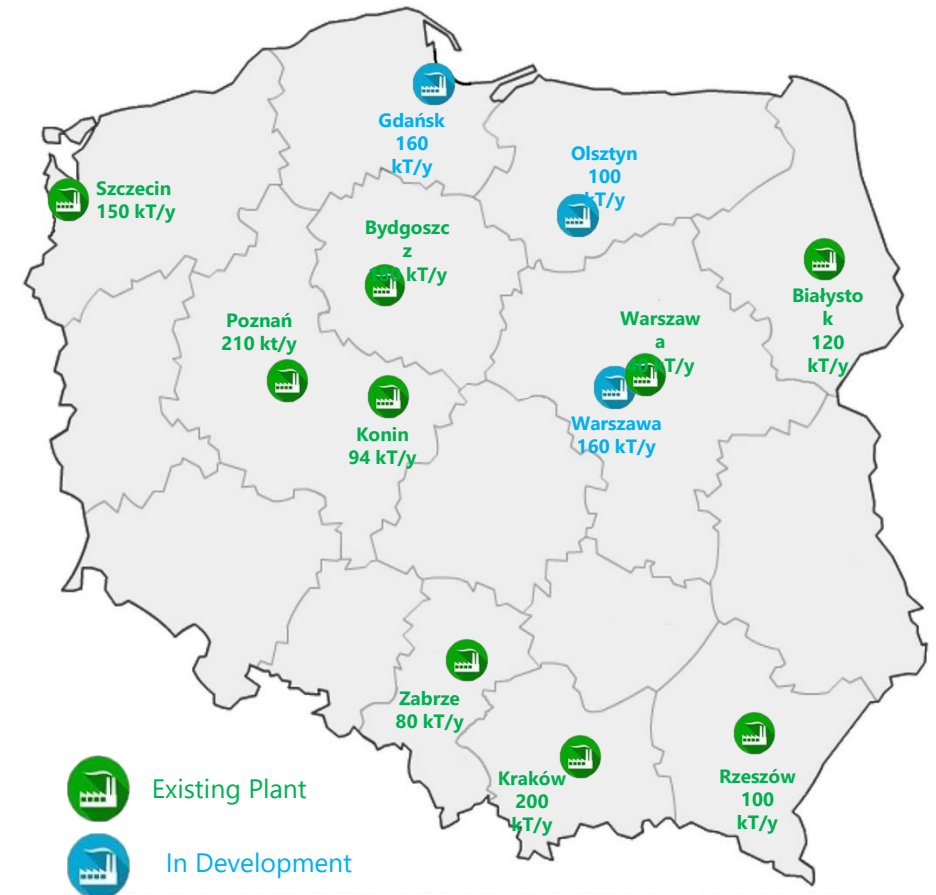
CEE Presence in Poland

MBT Processing Technology

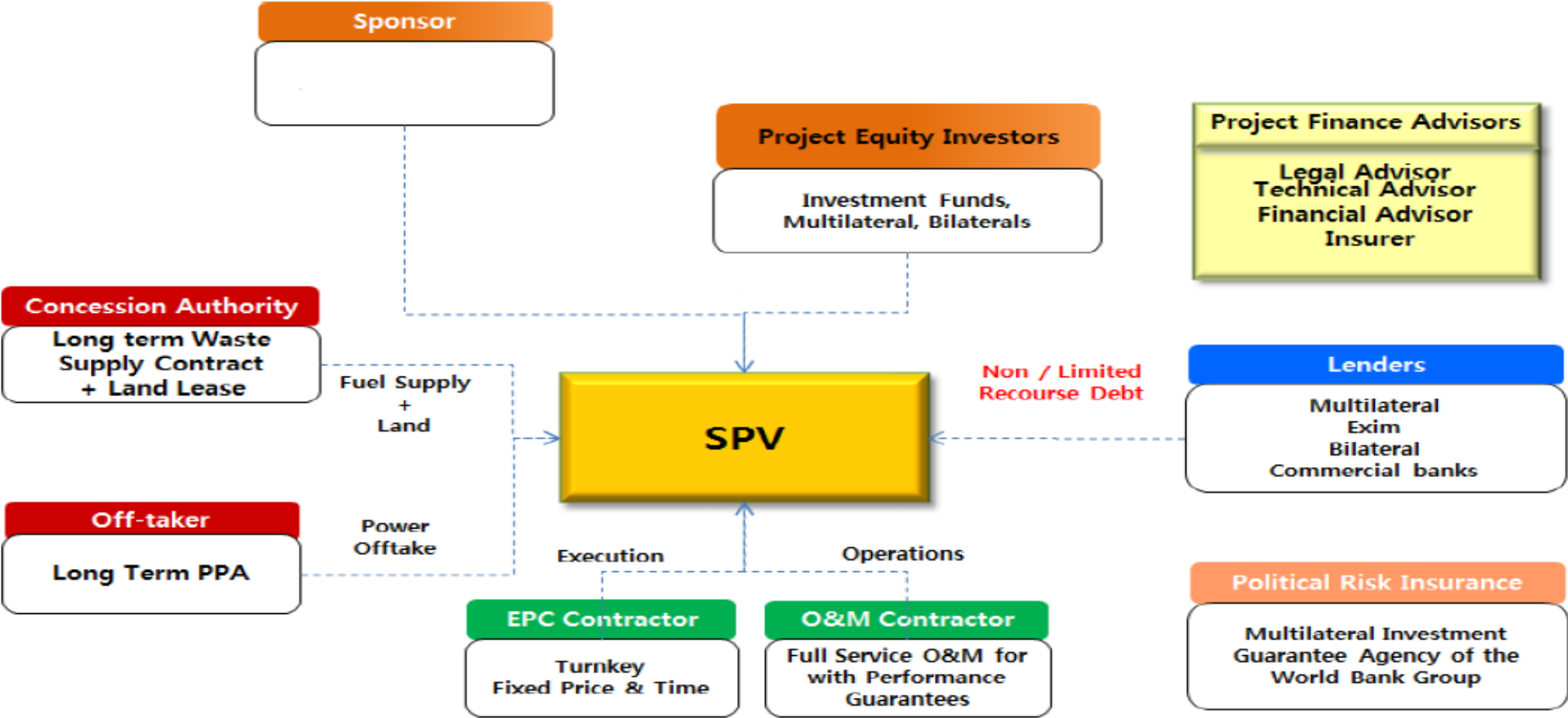


WtE development in Poland

		City	Capacity Tonne/year	Technology	Contract	Onwer
Existing Plant	1.	Poznań	210 000	Moving Gate	PPP	Poznan Municipality and SUEZ
	2.	Konin	94 000	Moving Gate	DB	MZGO Konin: Municipality
	3.	Bydgoszcz	180 000	Moving Gate	DB	Pronatura: Municipality
	4.	Białystok	120 000	Moving Gate	DB	PPUHP LECH: Municipality
	5.	Kraków	220 000	Moving Gate	DB	KHK SA: Municipality
	6.	Szczecin	150 000	Moving Gate	DB	EcoGenerator: Municipality
	7.	Rzeszów	100 000	Moving Gate	DB	PGE: Municipality
	8.	Warszawa	40 000	Moving Gate	DB	MPO Warszawa: Municipality
	9.	Zabrze	80 000	CFB	DB	FORTUM –Municipality
In Development	10.	Gdańsk	160 000	Moving Gate	DBO	Port Czystej Energii: Municipality
	11.	Olsztyn	100 000	Moving Gate	PPP	MPEC Olsztyn
	12.	Warszawa	265 000	Moving Gate	DB	MPO Warszawa: Municipality



A Typical WtE Model in a Developed Economy (EU) under private arrangement



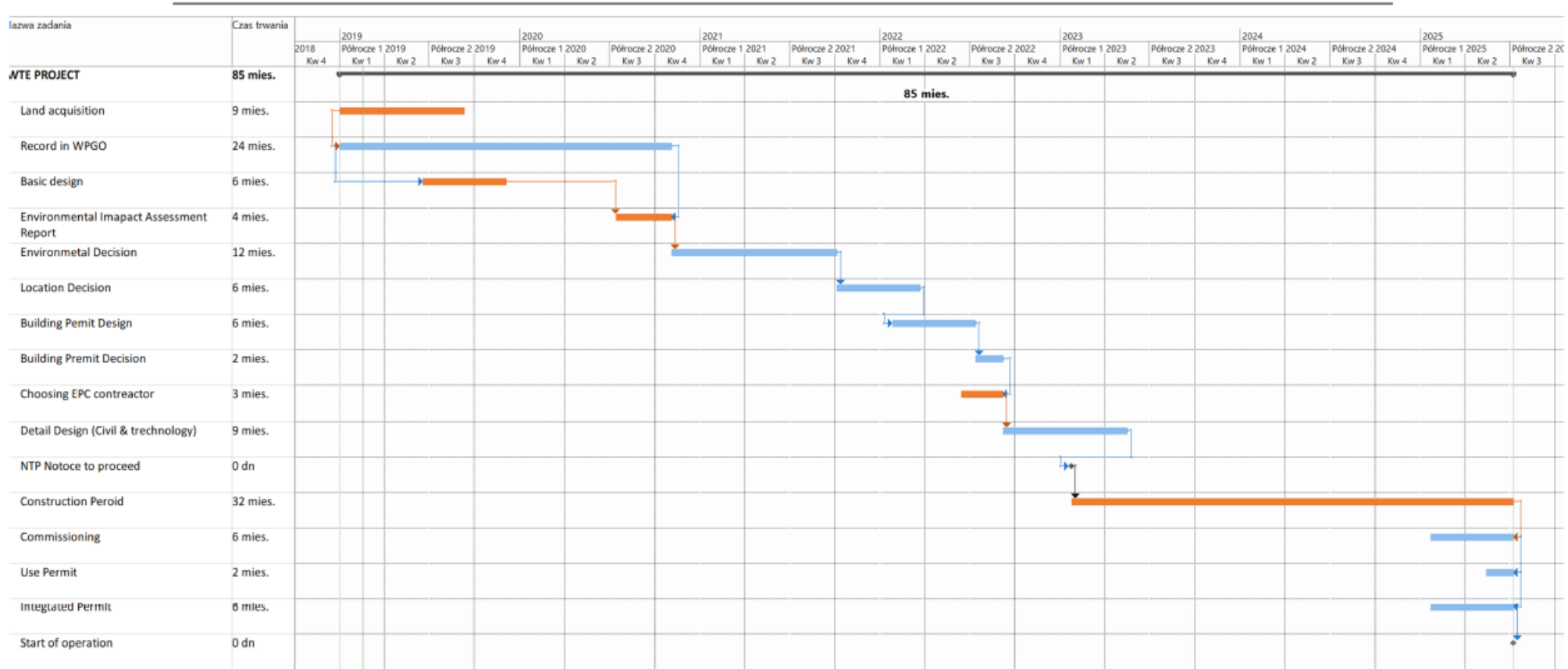
Konin WtE Plant in Poland



- Operating since 2016
- 94,000 tonne/year and 15.8 MW(boiler)
- Power and heat
- 85 million USD in Capex (excluding VAT)
- EU Subsidy and owned by the municipality
- Directive 2010/75/EU

WtE development period

WtE development in Poland and in EU in general takes longer period
More and strict regulations in Permits approval, construction...



Summary

Differences in developing WtE in SEA and EU

In SEA

- More favorable in waste management
- Larger scale
- Lower development and operation cost
- Shorter development period
- High subsidy from government
- Revenue largely from energy sale
- Stable and guaranteed gate fee and energy price

In EU

- Less favorable in waste management
- Smaller scale
- Higher development and operation cost
- Longer development period
- No or minimum subsidy from government
- Revenue largely from gate fee
- Market determines gate fee and energy price

Thank you

Questions and Comments

