

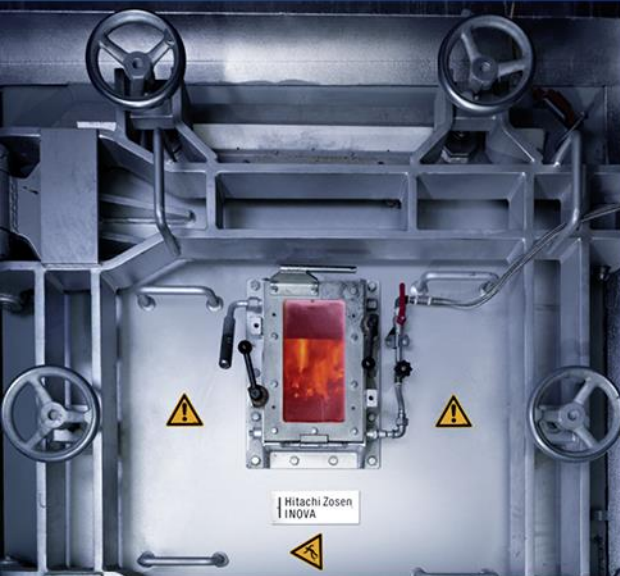


Hitachi Zosen
INOVA

ICCI
Istanbul EfW Session
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October 14, 2020

Hitachi Zosen
INOVA



Waste is our Energy.



Engineering is our Business.



Sustainable Solutions are our Mission.

Agenda

- | Waste - Sustainable Economy with Energy from Waste
- | Hitachi Zosen Inova - Who are we?
- | Hitachi Zosen Inova - Advanced Technology for Energy from Waste
- | Hitachi Zosen Inova - Istanbul EfW and Selected References

It's growing!

Amount of waste increases faster than population

Worldwide MSW volume

Source: World Bank Reports 2012 & 2018

2050: **3.4 billion tons**

2010: **1.3 billion tons**

1990: **0.7 billion tons**

Increased Urbanization

Economic Growth

Growing Population

It's polluting!

Greenhouse Gas Emissions from Landfills 2050: **2,38**
billion tons CO₂ – equivalent

1990: **0.34**

2010: **0,64**

**5% of total greenhouse gas emissions
from waste sector**

Landfills are relatively cheap but ...

... become more expensive

- | Space for landfill becomes rare
 - | Increasing cost for transportation to remote locations
 - | Additional traffic on limited road infrastructure
- | Increasing compliance costs
 - | Tighter environmental regulations
 - | Provision of funds for unforeseen developments
- | Operation over decades
 - | Even after landfill is closed

... are unsustainable

- | Waste of human habitat
- | Pollute groundwater and atmosphere for centuries
- | Generate emissions for transport to remote locations
- | No recovery of ecological and economic valuable resources

Future of Waste Management in Europe

EU Circular Economy Package: 65% Recycling by 2030

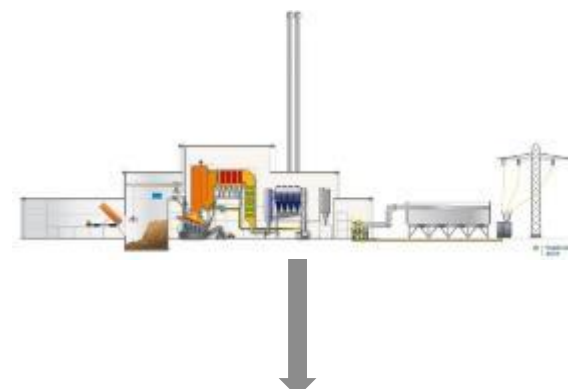
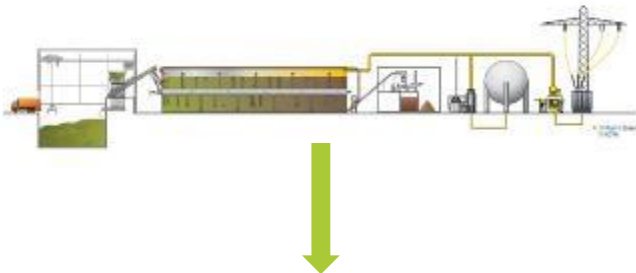
Energy & Compost
from biowaste with
anaerobic digestion



Energy & Material
from non recyclable waste
with thermal treatment

**Recovered
Material**

from dry Recyclables
in Material Recycling
Facility



Energy Recovery

■ Biomethane

Material Recycling

■ Compost & Fertilizer

Material Recycling

■ Glass, Paper, Metals

■ Recyclable Plastic

Energy Recovery

■ Power & Heat

Material Recycling

■ Metals & Minerals

The main title "Hitachi Zosen Inova" in a dark blue sans-serif font, positioned in the lower-left quadrant of the slide.

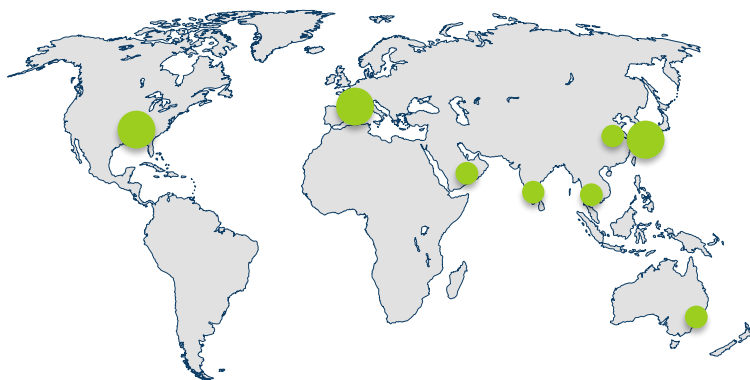
Hitachi Zosen Inova

Edinburgh, UK



Hitachi Zosen Inova

Waste is our Energy

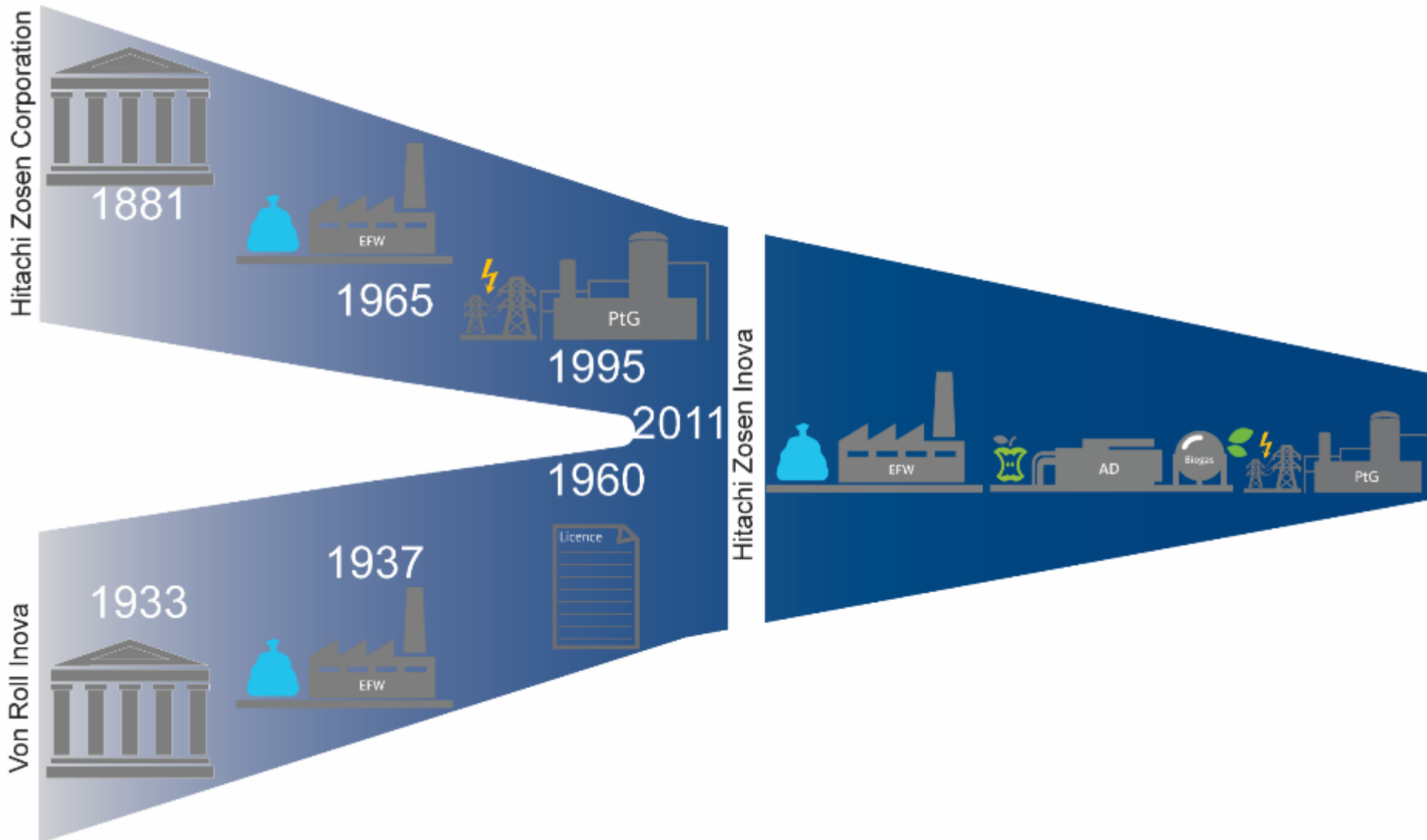


 Hitachi Zosen Locations

- | Zurich-based Hitachi Zosen Inova is a global leader in Energy from Waste solutions
- | Thermal treatment of solid waste, Anaerobic digestion of biowaste and biogas upgrade
- | Operation, maintenance & service business
- | Proprietary technology and complete turnkey plant and system solutions
- | More than 80 years experience
- | 700+ employees
- | More than 600 reference projects worldwide
- | A Hitachi Zosen Corporation subsidiary



HZI and HZC a Common History Lead into Collaboration

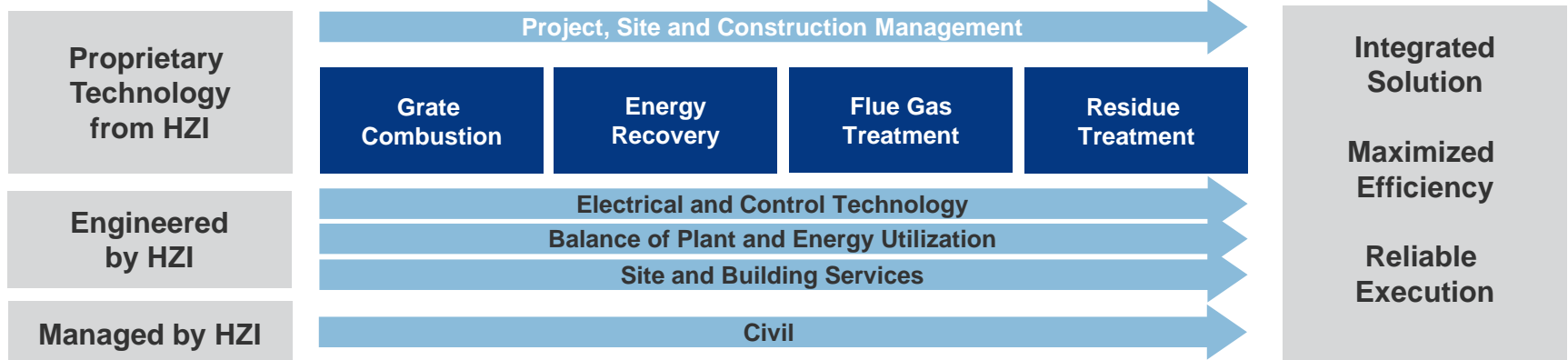
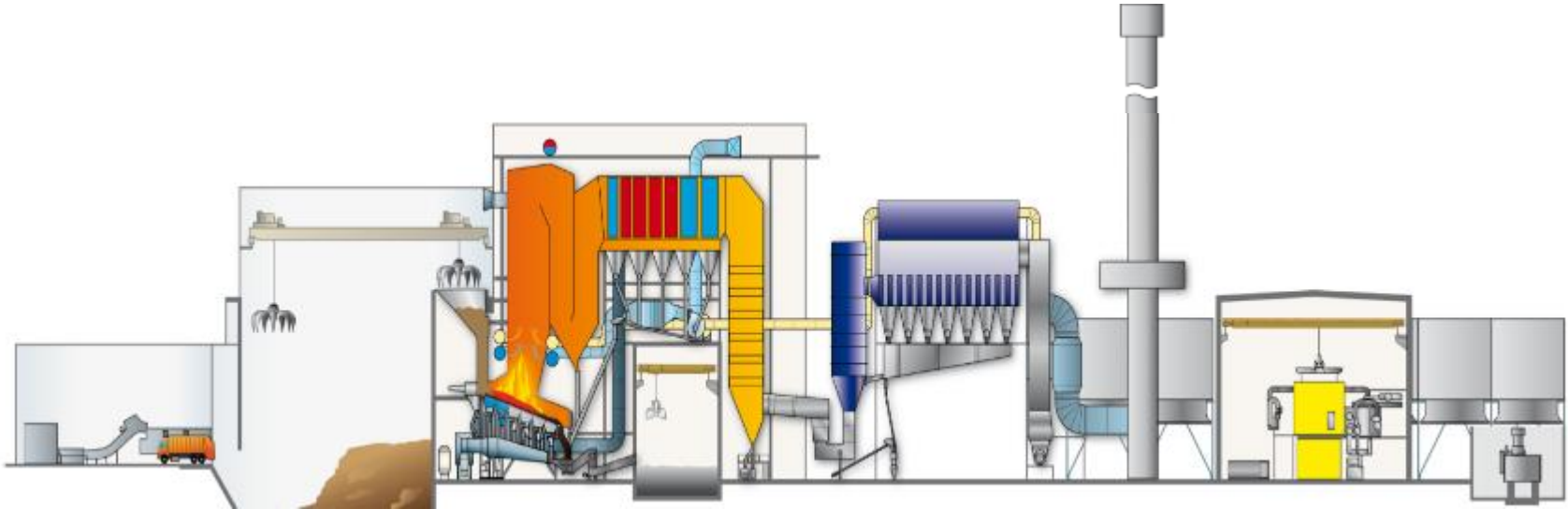




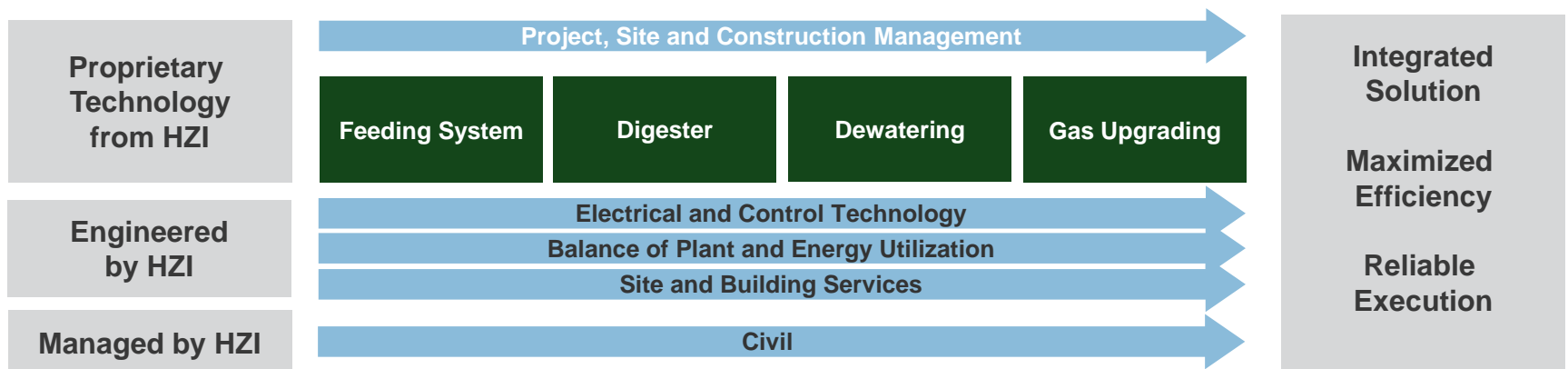
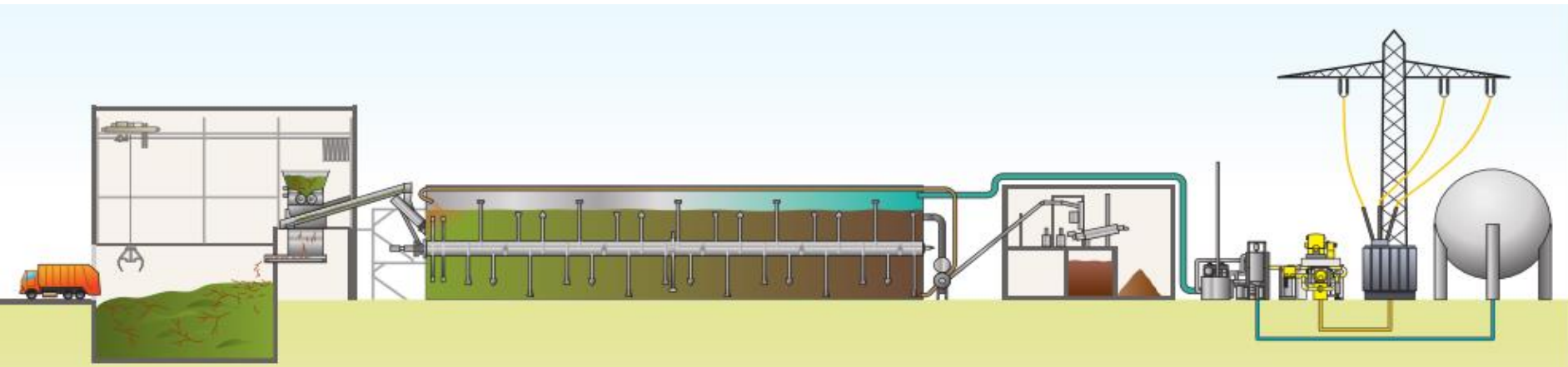
Hitachi Zosen Inova

Advanced Technology for Energy from Waste

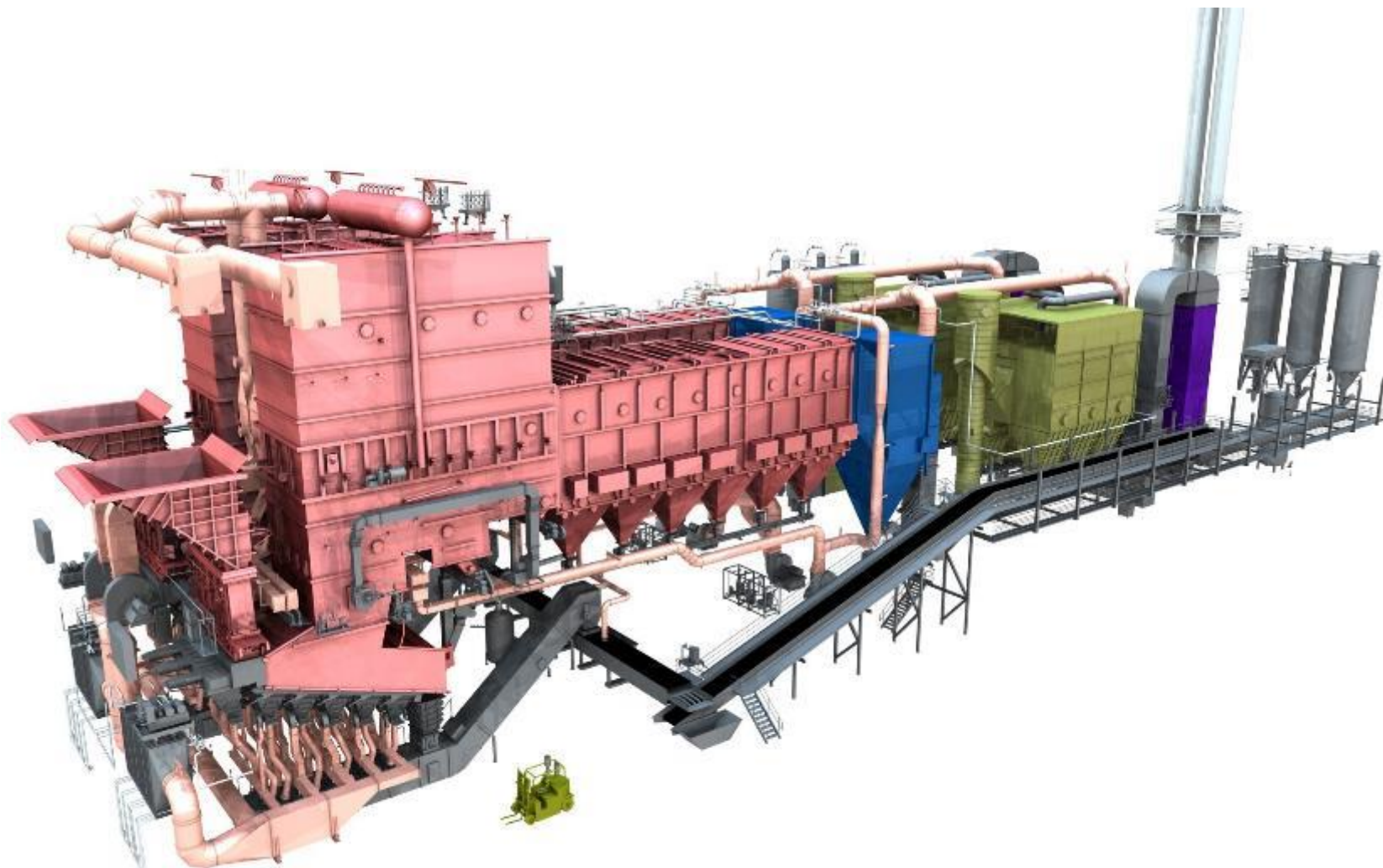
Integrated Solutions and Turnkey Capability for Thermal Energy from Waste Plants



Integrated Solutions and Turnkey Capability for Kompogas® Plants



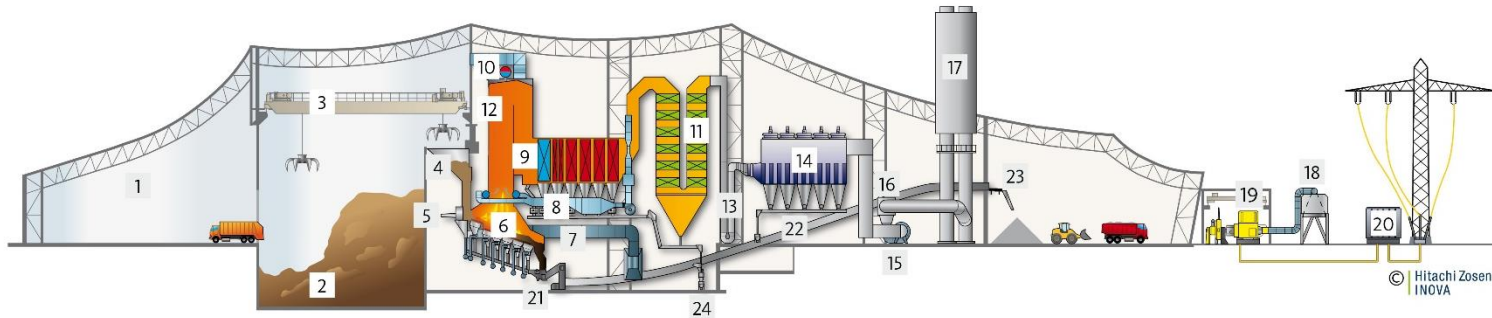
Integrated Design (Chute to Stack) Saves CAPEX and OPEX





Hitachi Zosen Inova

Istanbul EfW and Selected References



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Waste Receiving and Storage

- 1 Tipping hall
- 2 Waste bunker
- 3 Waste crane

Combustion and Boiler

- 4 Feed hopper
- 5 Ram feeder
- 6 HZI grate
- 7 Primary air system
- 8 Secondary air system
- 9 Five-pass boiler
- 10 Boiler drum
- 11 Economiser

Flue Gas Treatment

- 12 SNCR
- 13 Xerosorp® Reactor
- 14 Fabric filter
- 15 Induced draught fan
- 16 Silencer
- 17 Stack

Energy Recovery

- 18 Air cooled condenser
- 19 Turbine
- 20 Transformer

Residue Handling and Treatment

- 21 Bottom ash extractor
- 22 Bottom ash conveying
- 23 Bottom ash discharge
- 24 Fly ash discharge

Key Figures

- | 3 process trains, one turbine
- | Post recycling waste capacity 3 * 42 t/h, 3'000 t/d, 1'00'000 t/a
- | Thermal capacity 3 * 87 MW
- | Calorific value of waste 7,5 MJ/kg (6-9 MJ/kg)

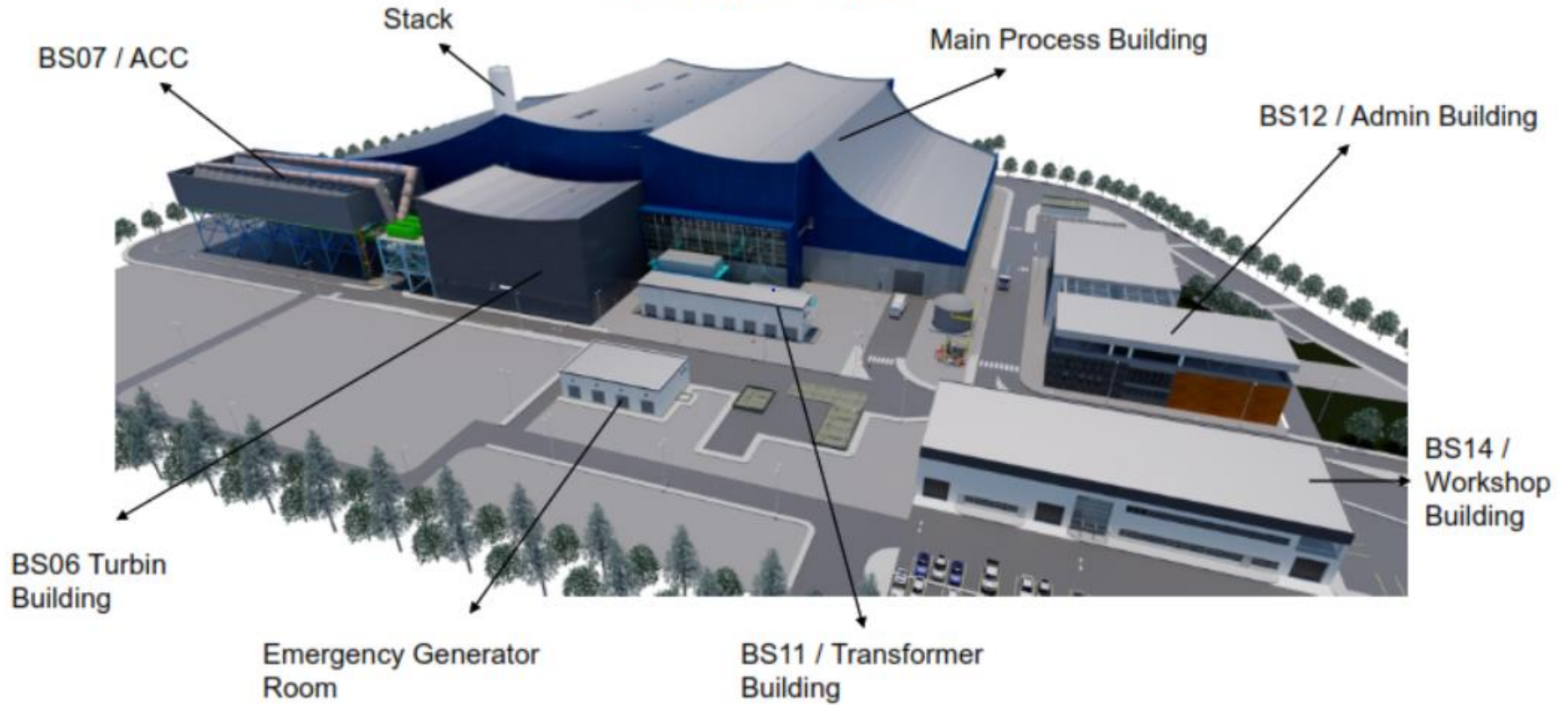
Istanbul, Turkey



Client	Istanbul Metropolitan Municipality (IMM)
Start-up	2020
Technology	
Furnace	Grate furnace (air-cooled)
Energy Recovery	4-pass vertical boiler, turbine
Flue gas treatment	SemiDry with SNCR
Technical Data	
Fuel	Municipal and industrial waste
Waste capacity	1,000,000 t/a in 3 lines
Thermal capacity	3 * 87 MW

- | EPC turnkey contract for complete plant incl. civil works and O&M for one year
- | Largest energy-from-waste plant for municipal solid waste in Europe
- | With 1 Mio t/a largest turnkey project ever awarded in Europe
- | The project is executed by the JV of Hitachi Zosen Inova and its Turkish partner Makyol

General View







- Long-Term Financing 
- Buyer Credit Insurance

PRODUCTS PREM

04.06.20 | Awards for Europe's largest energy-from-waste plant

SERV has been recognised by two international export financing platforms this year for a special deal in Turkey. It received the "Environmental Enhancement ECA-backed Deal of the Year" award from TXF and was featured in the "Best Deal of the Year" category by Global Trade Review. The deal was for the construction of Europe's largest energy-from-waste plant that will convert up to 1 million tonnes of waste per year into around 70 MW of electrical energy for feeding into the grid.

The deal was initially covered by supplier credit insurance alone. However, due to the increasing turbulence in Turkey, it became apparent how important the involvement of an ECA would be for all parties. Long-term financing was a key requirement for the Turkish buyer. SERV is therefore insuring the deliveries from Hitachi Zosen Inova in Switzerland with long-term buyer credit insurance, thereby helping to improve liquidity for both the exporter and the buyer.

One of the many special provisions of the deal was that the export contract be concluded in Turkish lira with a price escalation clause and combined with a euro-denominated loan. When calculating the loan, predictions had to be made about inflation in Turkey and the lira-euro exchange rate.

This deal is very important to the Turkish buyer as it is likely to be the first of several such plants to be built in Turkey. For the exporter, the project opens the door to possible follow-up projects in the region. BNP Paribas and AIL Structured Finance were also instrumental in the successful completion of the deal.

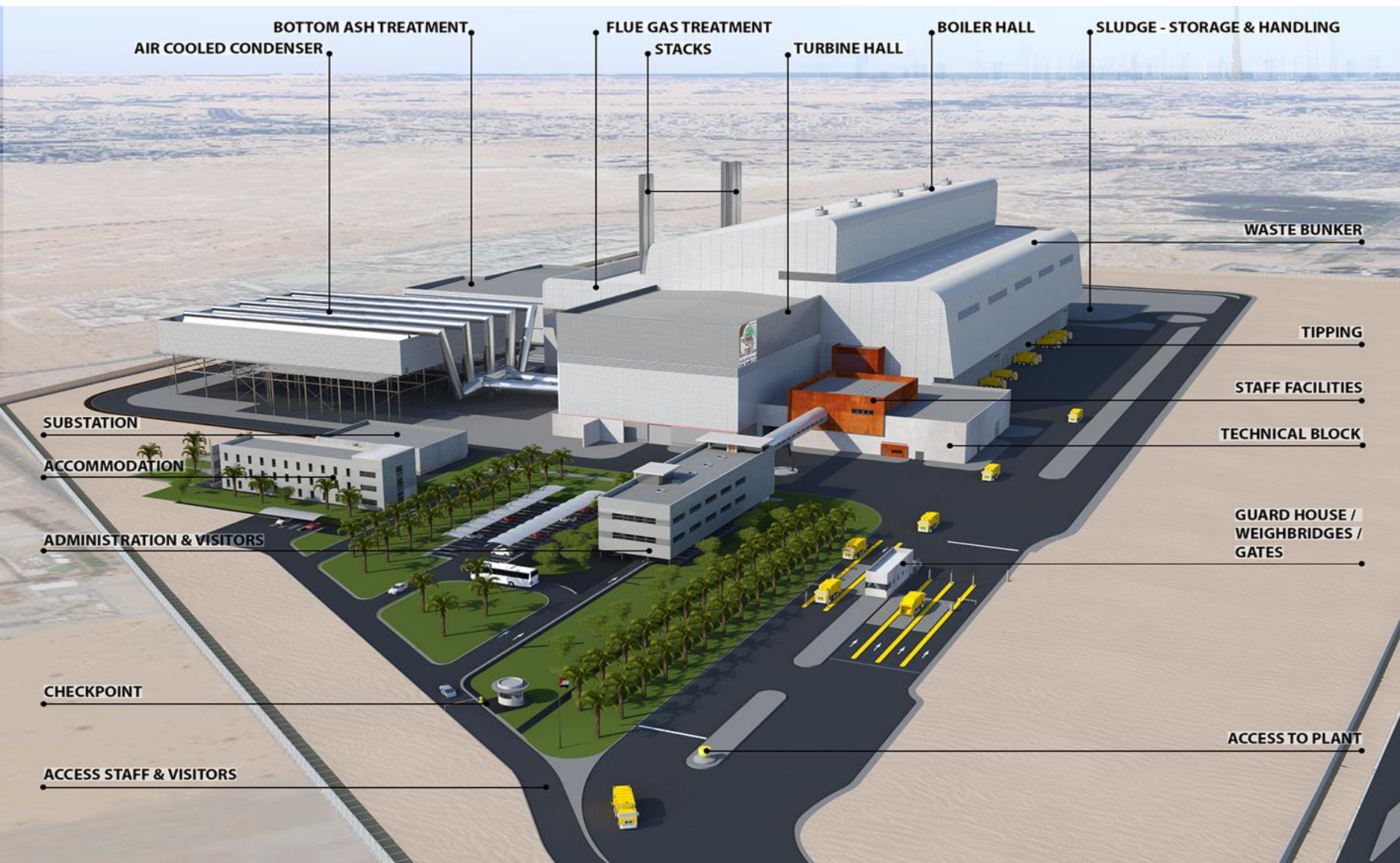
Dubai, UAE



Client	Dubai Municipality
Start-up	2022/23
Technology	
Furnace	Grate furnace (air-cooled)
Energy Recovery	4-pass horizontal boiler, turbine
Flue gas treatment	Dry with SNCR
Technical Data	
Fuel	Municipal and industrial waste
Waste capacity	1'825'000 t/a (5 x 46.29 t/h)
Net calorific value	7 – 14 MJ/kg
Thermal capacity	5 x 122.17 MW

- | The largest Resource Recovery Facility worldwide
- | Build, Operate and Transfer project for 30 years Operation
- | Joint venture formed by Hitachi Zosen Inova (Switzerland) and BESIX (Belgium), a truly unique partnership, to implement a first class Energy from Waste plant for the Emirate of Dubai
- | The facility will convert approximately 1'500'000 tonnes of waste per year into baseload renewable energy, producing 137MW of electricity at full capacity

Dubai, UAE



AIR COOLED CONDENSER

BOTTOM ASH TREATMENT

FLUE GAS TREATMENT
STACKS

TURBINE HALL

BOILER HALL

SLUDGE - STORAGE & HANDLING

WASTE BUNKER

TIPPING

STAFF FACILITIES

TECHNICAL BLOCK

GUARD HOUSE /
WEIGHBRIDGES /
GATES

ACCESS TO PLANT

SUBSTATION

ACCOMMODATION

ADMINISTRATION & VISITORS

CHECKPOINT

ACCESS STAFF & VISITORS

Moscow, Russia



Client

RT-Invest

Start-up

2022

Technology

Furnace
Energy Recovery
Flue gas treatment

Grate furnace (air-cooled)
5-pass horizontal boiler, turbine
Dry with SNCR

Technical Data

Fuel
Waste capacity
Net calorific value
Thermal capacity
Steam

Municipal and industrial waste
700,000 t/a (3 x 30 t/h)
6.0 – 12.0 MJ/kg
3 x 75.83 MW
3 x 95.3 t/h (70 bar, 430°C)

- | Pilot project for a total of five planned energy-from-waste plants in Moscow and Kazan
- | HZI providing process technology and key equipment
- | Plant contributes to Russia's energy strategy according to which by 2020, 4.5% of energy must be from renewable energy sources

Energy Efficiency - Heat Only

Uppsala, Sweden



Client	Vattenfall Värme Uppsala AB
Start-up	2005
Technology	Grate furnace (water-cooled) 4-pass boiler, absorption heat pumps
Flue gas treatment	ESP, two wet scrubber (acid, limestone), condensation reactor, heat exchanger, baghouse filter, low temperature SCR
Technical Data	
Fuel	Municipal and industrial waste
Waste capacity	210,000 t/a (1 x 26.4 t/h)
Net calorific value	10.0 MJ/kg
Thermal capacity	73.3 MW
Steam	100 t/h (saturated 20 bar)

	MW	% of Input*	kWh / t Waste
Fuel Input	73.3	100%	2,780
District Heating incl. Heat from Condensation	75.0	102%	2,840
Total Energy	75.0	102%	2,840

* Based on LHV

Issy-les-Moulineaux – Paris, France

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Waste is our Energy.
Engineering is our Business.
Sustainable Solutions are our Mission.

Thank You