



IS THERE AN ADDED VALUE IN SRF COMPARED TO INTEGRAL WASTE PROCESSING?

Bettina Kamuk, Global Market Director, Ramboll Energy from Waste

RAMBOLL ENERGY FROM WASTE

- 1500 specialists working in energy production (oil, gas, coal, biomass, waste, solar, wind...)
- 60+ dedicated waste-to-energy project managers and specialists
- More than 155 new units and retrofits in 45 countries around the world
- In-depth knowledge of processes, technologies, suppliers and facility operation (grate, fluidised bed, gasification...)
- Strong in-house expertise in technical, contractual and financial matters



WASTE IS NOT A WASTE



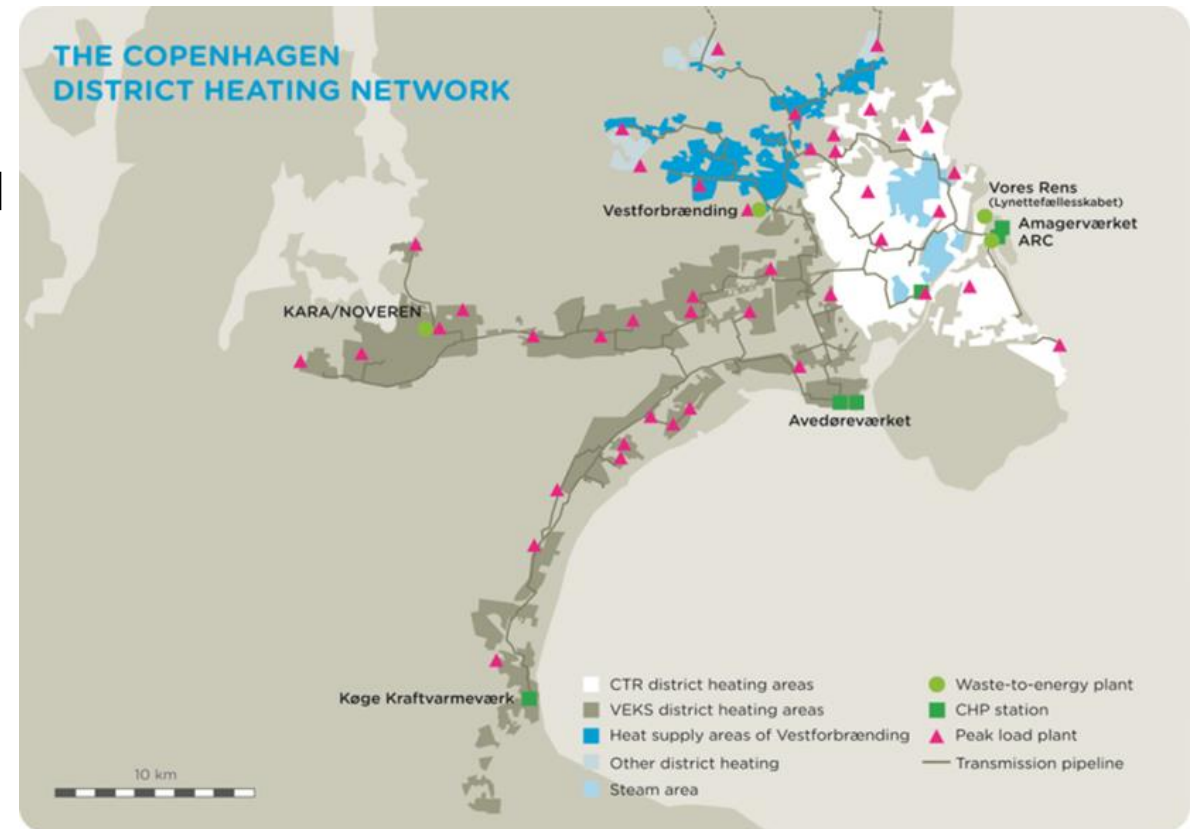
1 TON WASTE
= 2 MWh DISTRICT HEATING
+ 0.67 MWh ELECTRICITY

ELECTRICITY FOR 550,000 CITIZENS, HEAT FOR 140,000 HOUSEHOLDS

400,000+ TONS OF WASTE/YEAR

FRAMEWORK DECISIONS BY THE CITY

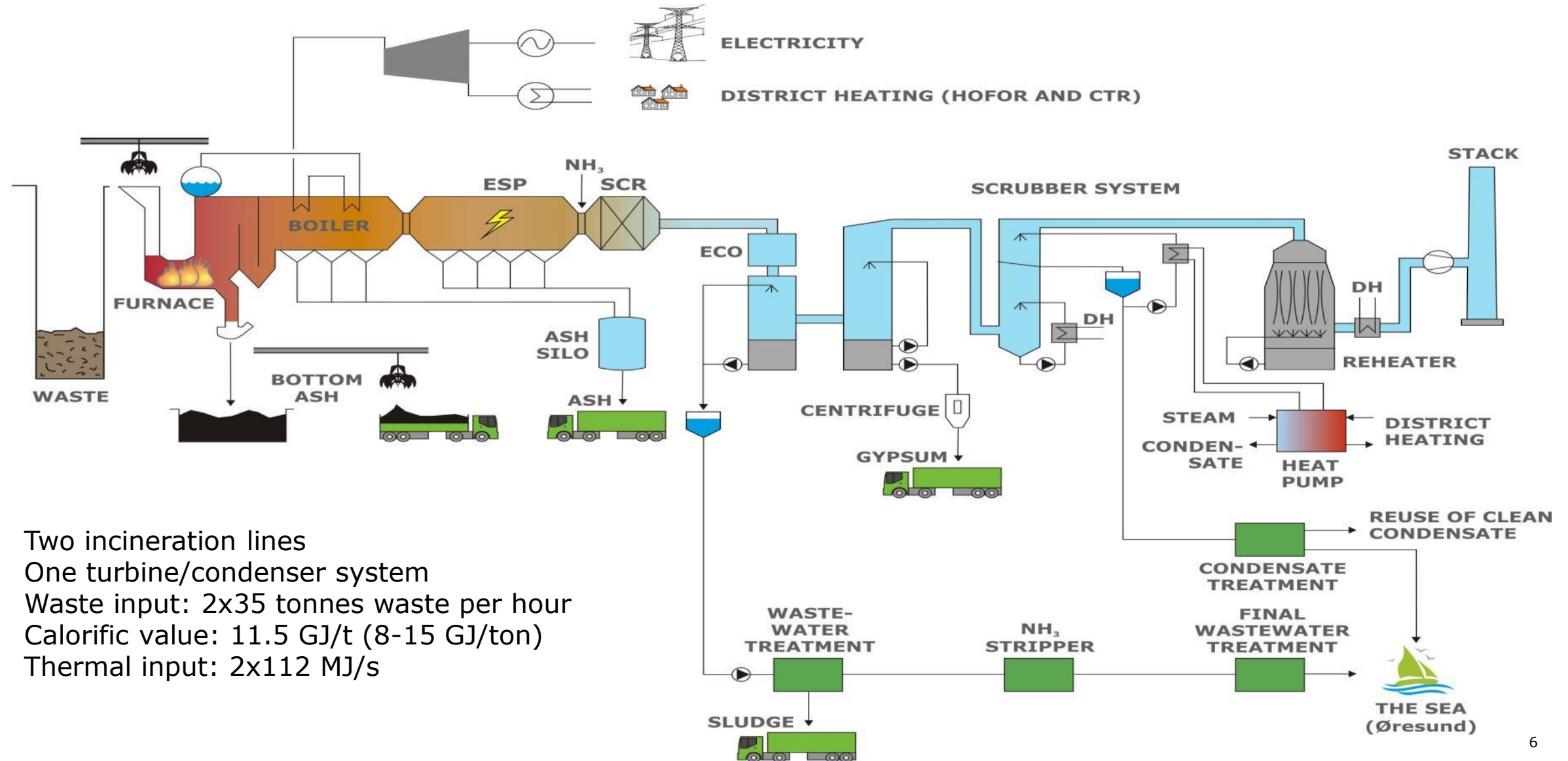
- An important contribution to reaching climate goals for Copenhagen City
- Can offer very high energy efficiency and high potentials for material recycling and recovery (metal)
- Can offer a high environmental performance
- Shall be open to public and offer an recreational area for the society
- Shall become a beacon for the city of Copenhagen



AMAGER RESOURCE CENTER (ARC), COPENHAGEN, DENMARK

- New WtE facility
- Capacity: 2 x 280,000 tonnes of waste annually
- Energy output: 400,000 MWh electricity and 1,000,000 MWh heat per year
- Commissioning: 2017

ARC - OVERALL TREATMENT PROCESS



Two incineration lines
 One turbine/condenser system
 Waste input: 2x35 tonnes waste per hour
 Calorific value: 11.5 GJ/t (8-15 GJ/ton)
 Thermal input: 2x112 MJ/s

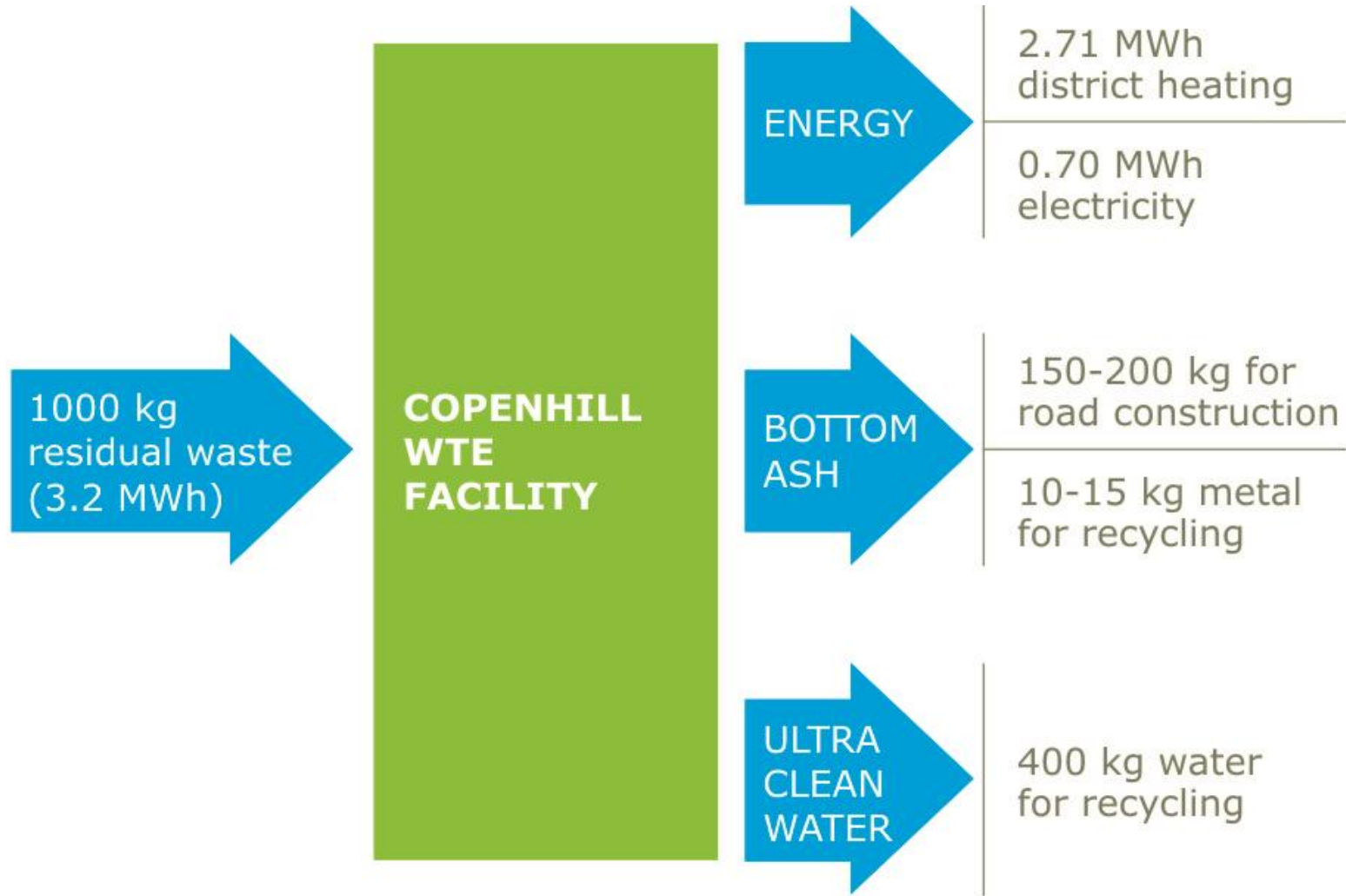
ARC - AIR EMISSION

Air Emission, daily average mg/m ³ , ref.*	EU Industrial Emissions Directive (IED), (3)	Environmental permit, (4)	Expected operational emissions
CO	50	39	10
Total organic carbon	10	8	1
Dust	10	5	3
HCl	10	5	0.5
HF	1	1	0.05
SO ₂ and SO ₃ (as SO ₂)	50	30	2
NO _x (as NO ₂)	200	100	15
NH ₃	-	3	0.5
N ₂ O	-	-	0.5
Cd + Tl	0.05	0.025	0.001
Σ 9 metals ¹⁾	0.5	0.25	0.015
Hg	0.05	0.025	0.001
PAH	-	0.0025	0.002
Dioxins and furans, TEQ (ng/m ³ , ref.*)	0.1	0.1	0.02

* ref. is reference condition,
i.e. 0 °C, 101,325 Pa, dry flue gas at 11% O₂.

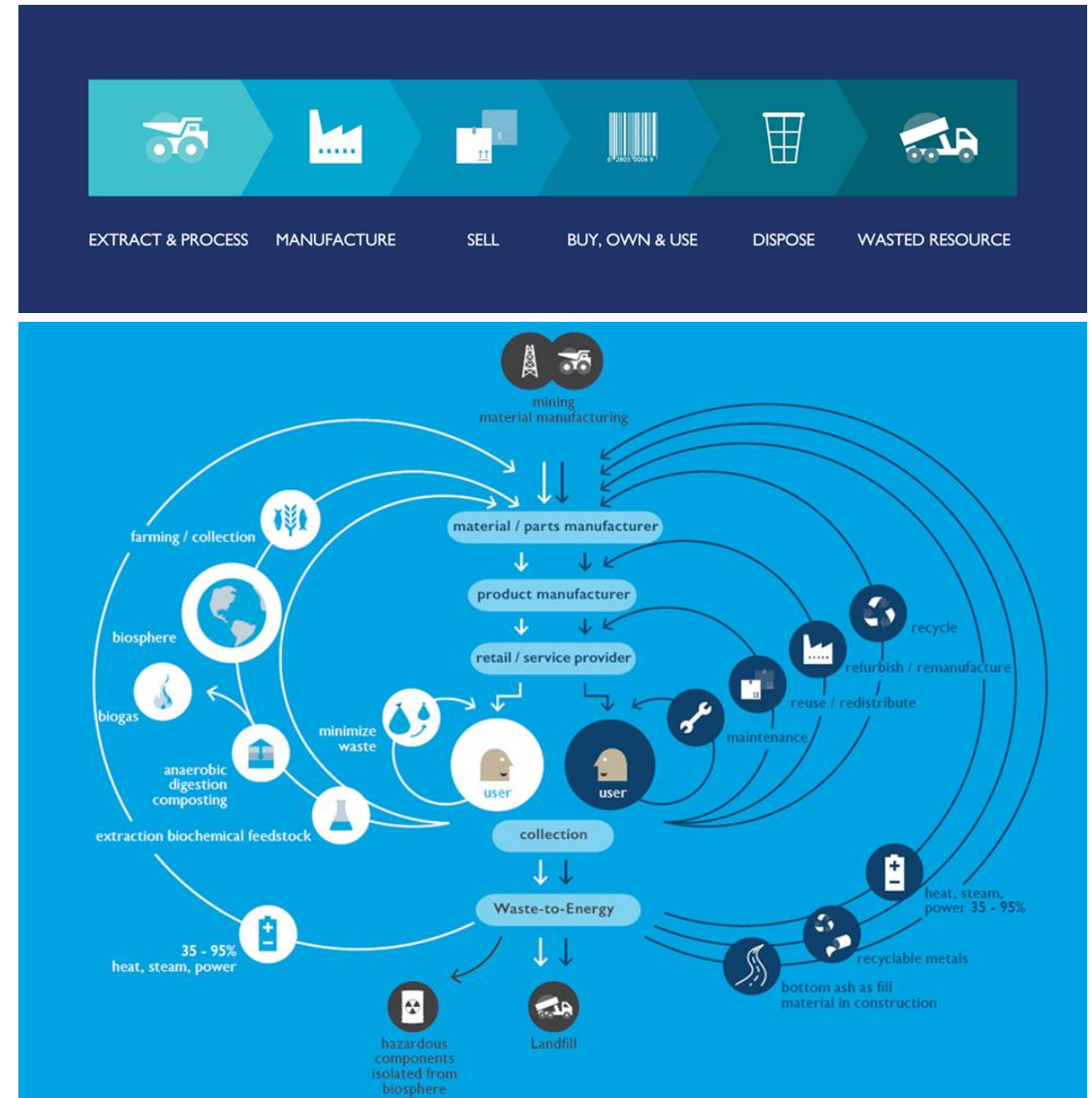
1): Sb+As+Pb+Co+Cr+Cu+Mn+V+Ni

ARC - ENERGY AND MATERIAL RECOVERY



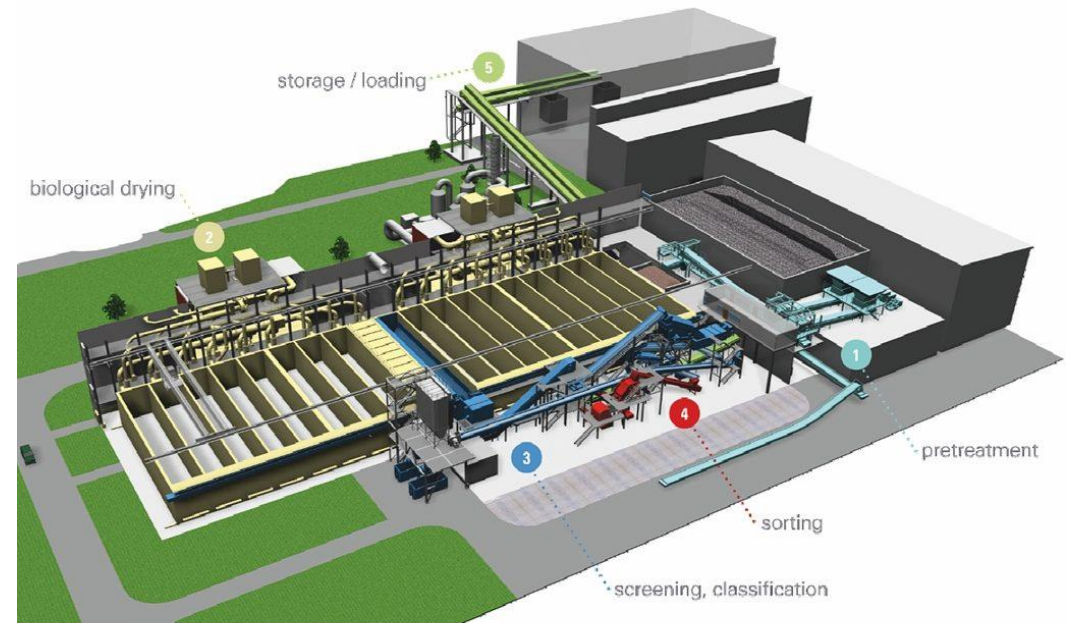
IS WTE PART OF CIRCULAR ECONOMY?

- Source segregation of bio waste and high quality recyclable materials (plastic packaging, paper, metals, etc.)
- Significant amounts of residual waste that cannot be recycled due to quality, mixed materials, or left overs from the recycling industry
- Metals for recycling are recovered from the bottom ash and the ashes can be used to replace gravel for construction purposes
- WTE facilities are highly energy efficient generating electricity and district heating
- Waste to Energy goes hand-in-hand with recycling and is part of circular economy



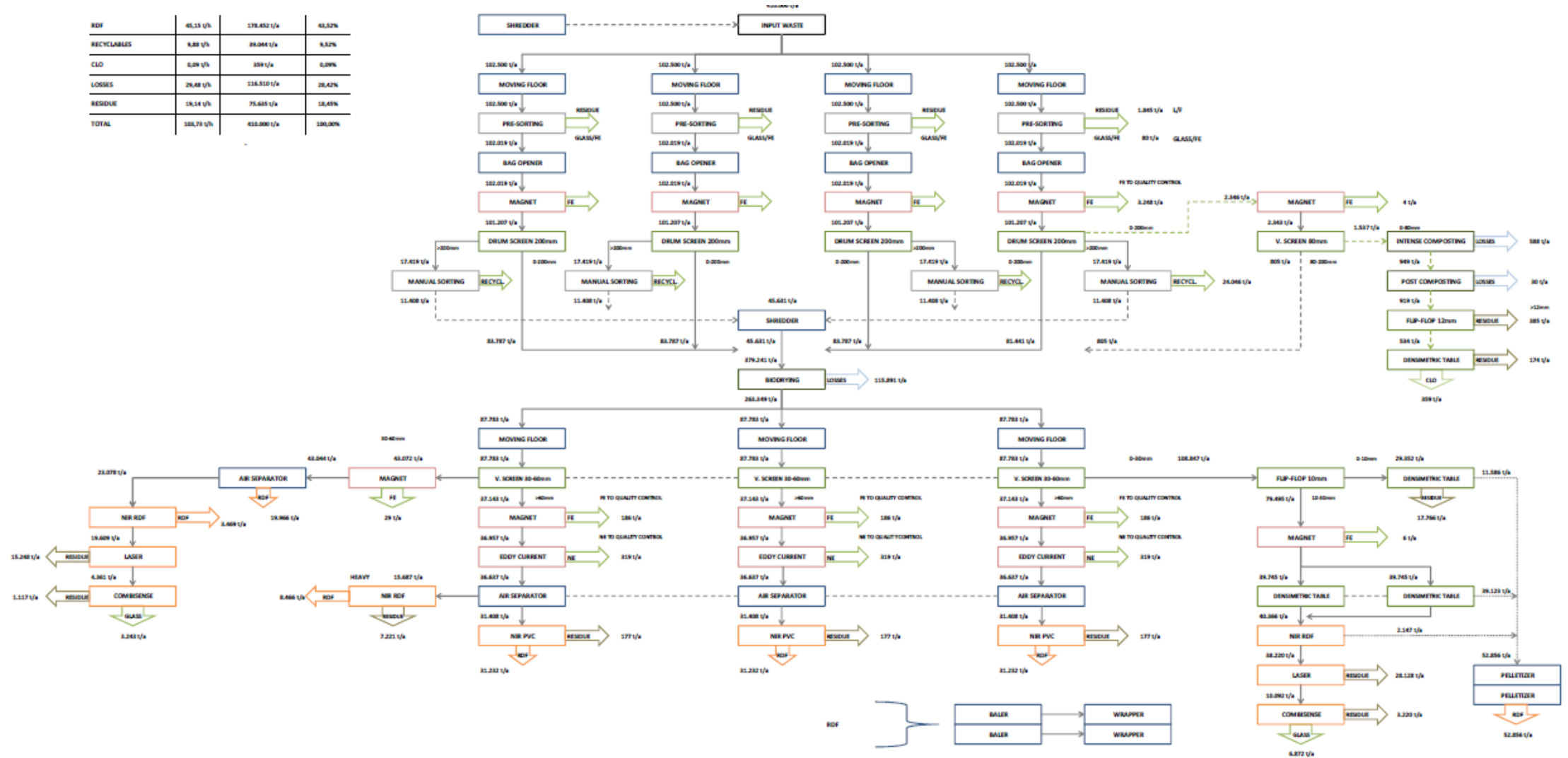
IS THERE AN ADDED VALUE IN SRF COMPARED TO INTEGRAL WASTE PROCESSING

- SRF – RDF?
- What kind of recyclables do we want to recover from the sorting process?
- What do we do with the biological fraction?
 - Compost
 - “Stabilised” fraction for landfilling
- Who is interested in the SRF/RDF fraction?
 - WTE facilities
 - Cement industry
 - Others

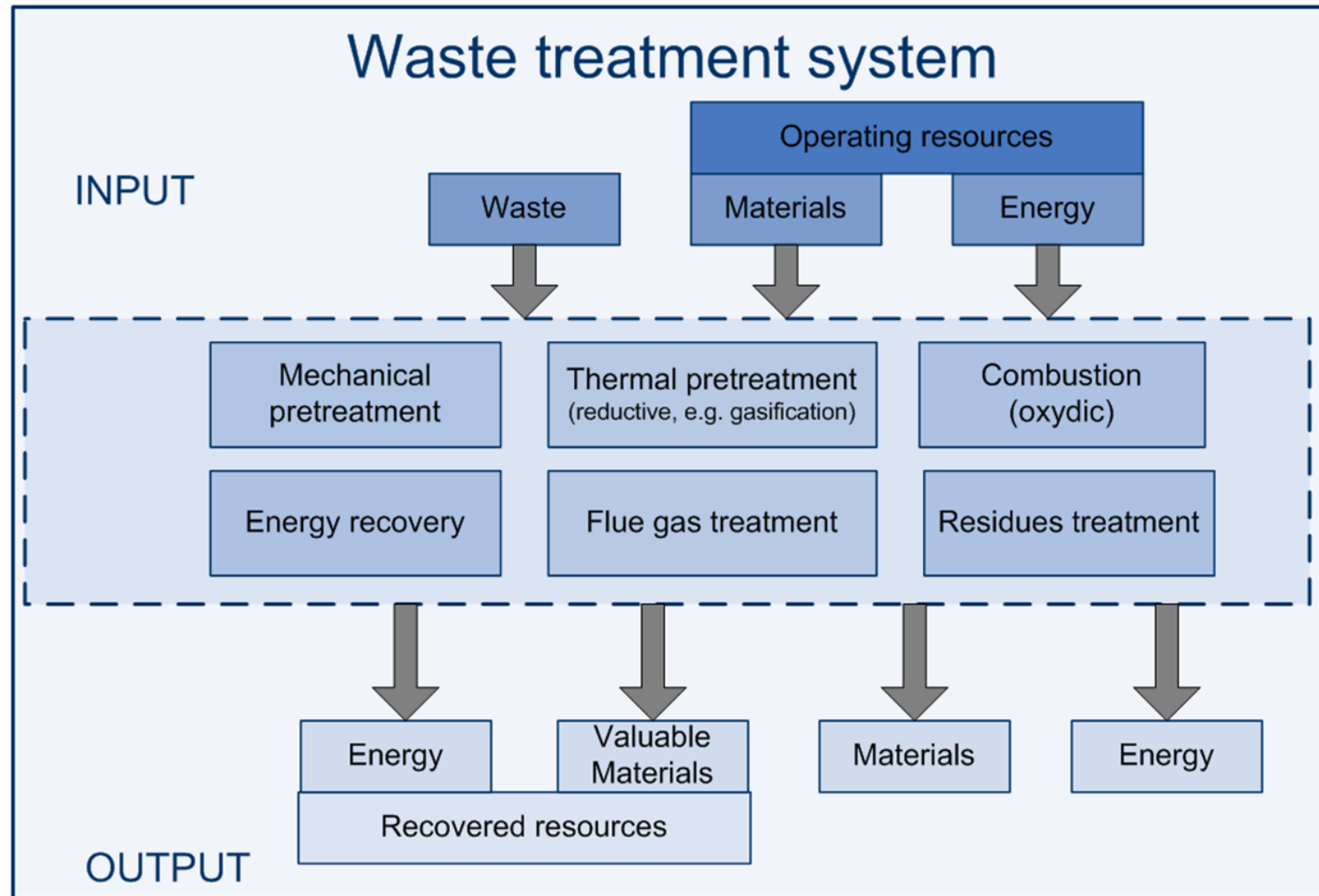


MECHANICAL BIOLOGICAL TREATMENT – EX. MSW 9 MJ/KG TO 16 MJ/KG RDF

RDF	45.15 t/a	178.452 t/a	43.52%
RECYCLABLES	8.88 t/a	39.044 t/a	9.52%
CLO	0.29 t/a	359 t/a	0.29%
LOSSES	29.48 t/a	116.310 t/a	29.42%
RESIDUE	15.14 t/a	75.635 t/a	18.45%
TOTAL	100.73 t/a	410.800 t/a	100.00%



REMEMBER THE COMPLETE SYSTEM WHEN DOING MASS AND ENERGY BALANCES – AND COST ASSESSMENT



EU TRENDS

- Separate Collection of Special Fractions:
 - ✓ 2023 Separate Collection of Organic Household Waste
 - ✓ 2025 Separate Collection of Textiles
- The EU Plastics Strategy
- Extended Producer Responsibility for Packaging Waste 2025
- Phasing-Out MBT from 2027



CONCLUSION

- Keep recyclables separate to keep a high quality
- Keep the organic fraction separate to ensure a clean fraction for AD/compost/fertilizer
- Avoid a fraction for landfilling which is often the case for residuals after SRF/RDF production
- The total energy balance often turns out in favour of combustion of mixed MSW rather than RDF/SRF
- The cost estimate often turns out in favour of combustion of mixed MSW rather than RDF/SRF



THANK YOU

**BETTINA KAMUK
GLOBAL MARKET DIRECTOR
RAMBOLL ENERGY FROM WASTE
BKC@RAMBOLL.COM
+45 5161 8626**