

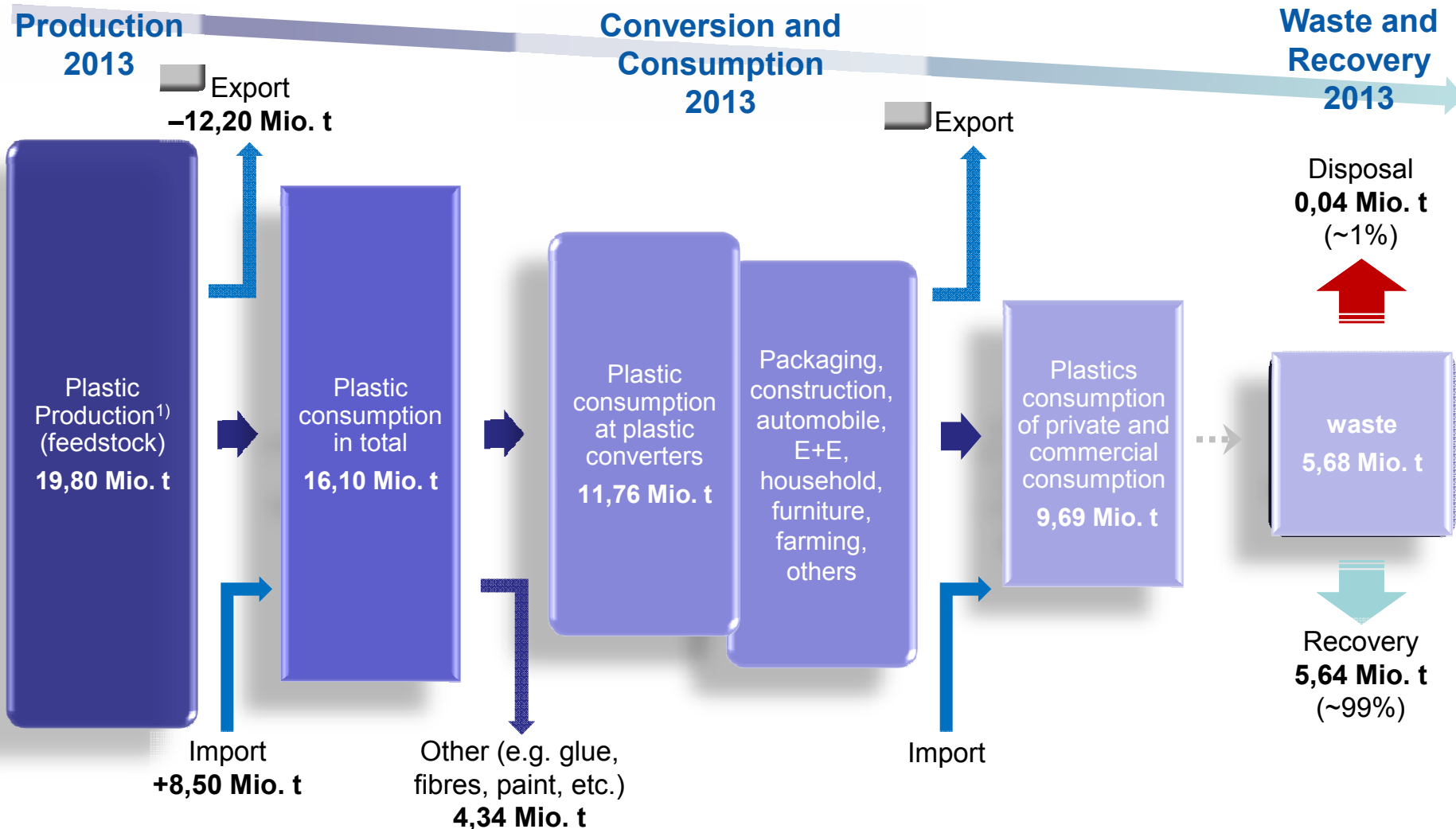
Plastics recovery and the role of energy use

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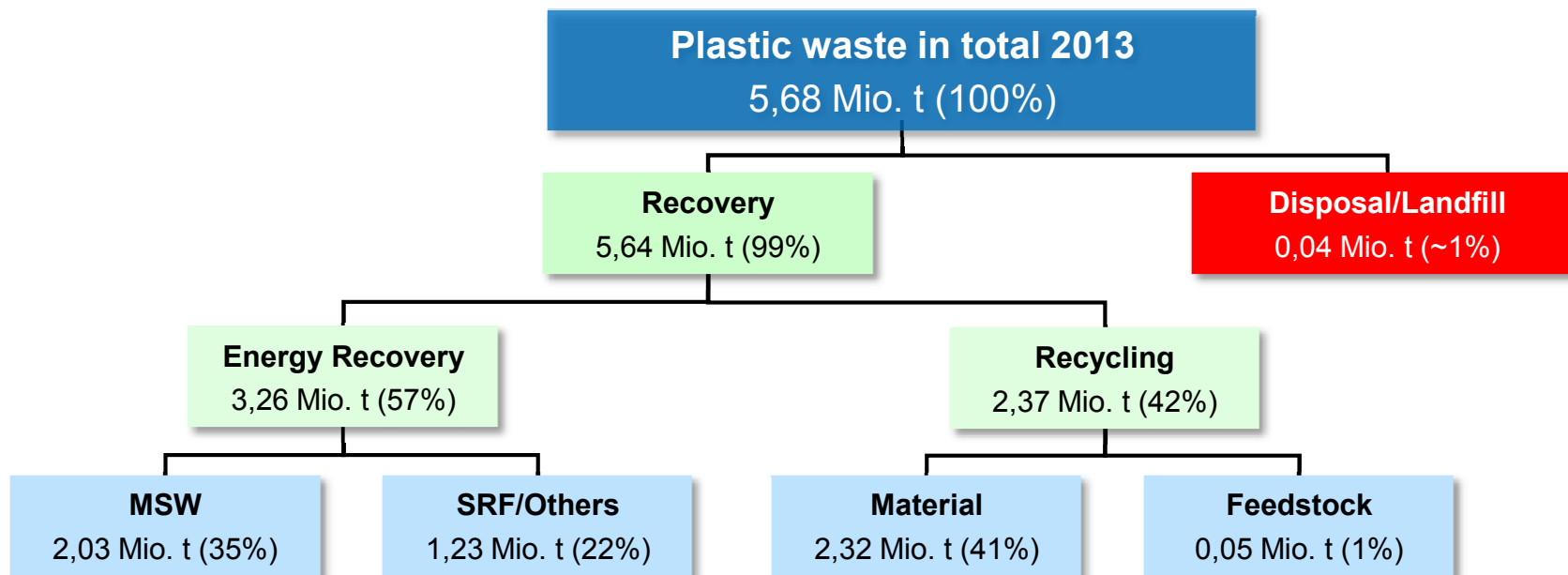
Production, conversion, domestic consumption and recovery of plastics in Germany 2013



1) Plastic types:
PE-LD/LLD, PE-HD/MD, PP, PVC, PS, PS-E, PA, PET, ABS, ASA, SAN, PMMA, other thermoplastics, other plastics incl. PUR

Source: Produktion, Verarbeitung und Verwertung von Kunststoffen in Deutschland 2013, Consultic 2014

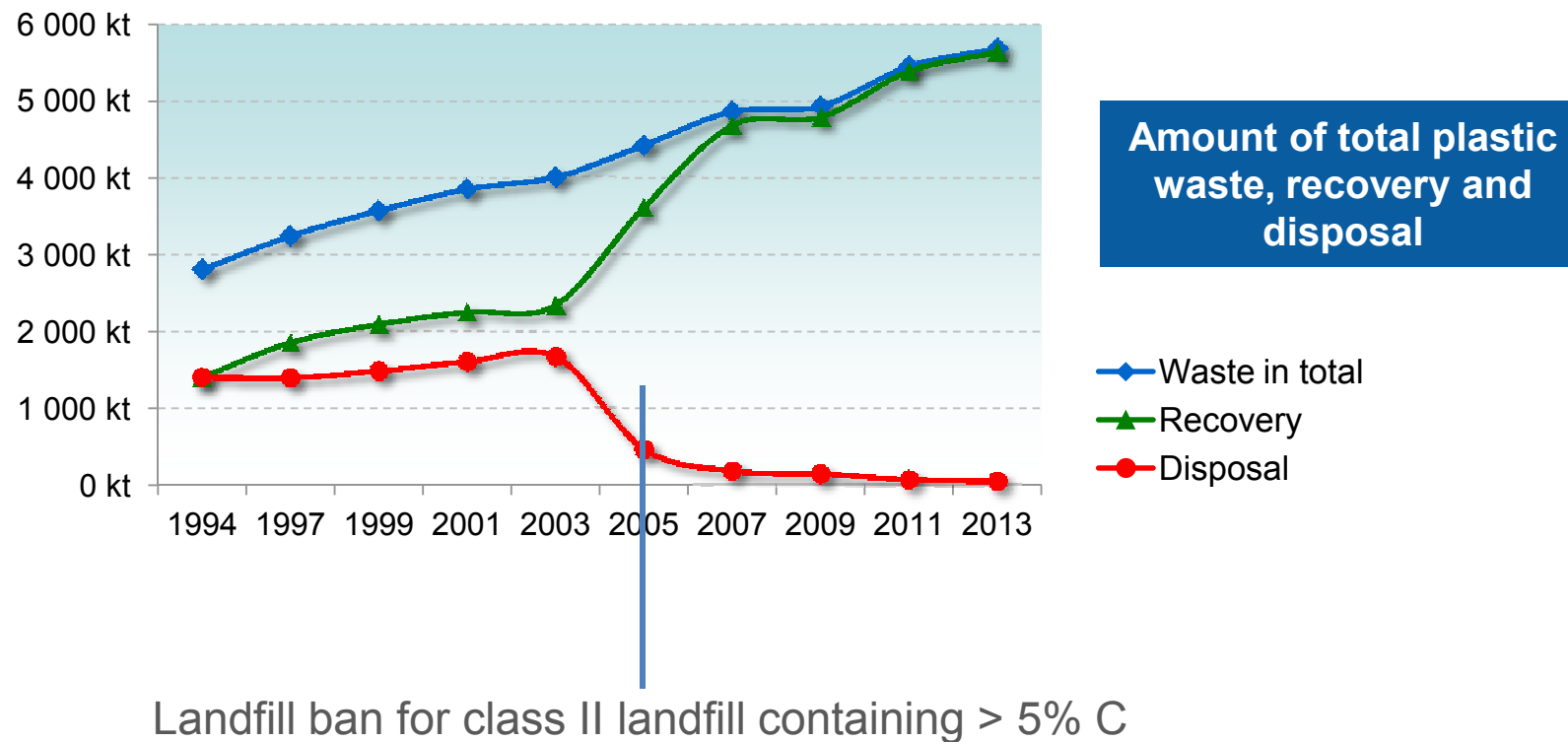
Plastic Waste and Recovery in Germany 2013



- 99 % of the plastic waste generated in Germany is recovered
- 41 % of the plastic waste generated in Germany is recycled

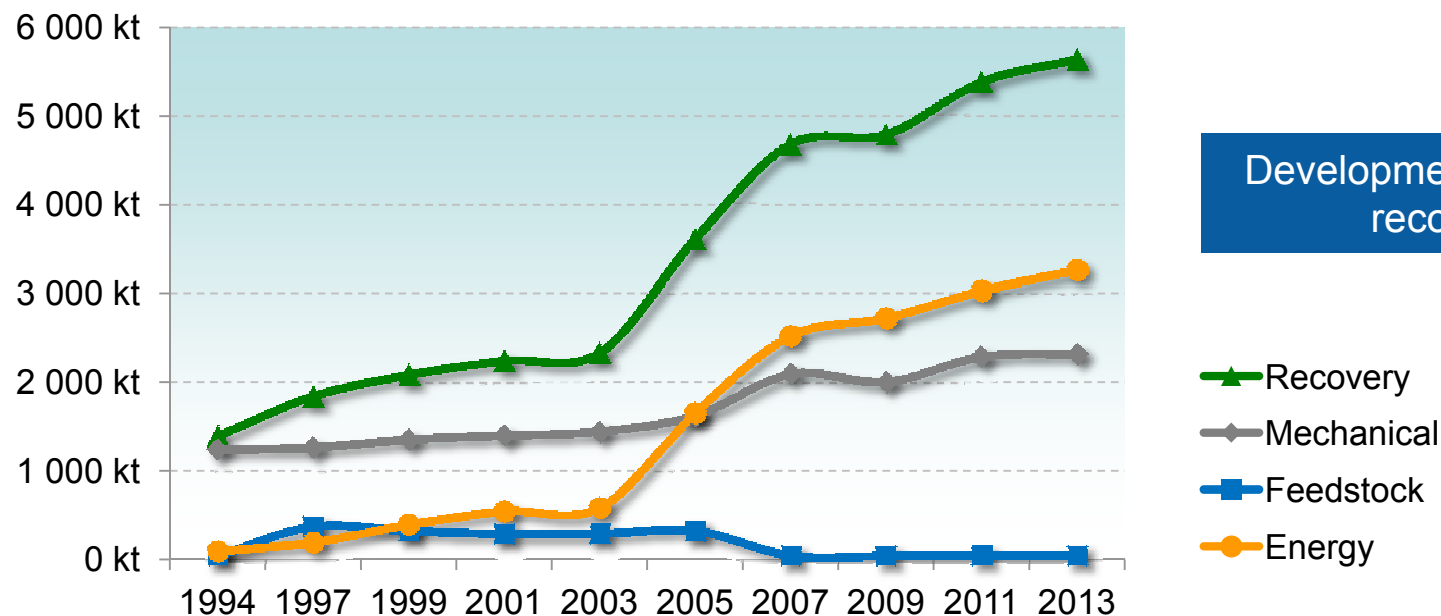
Source: Produktion, Verarbeitung und Verwertung von Kunststoffen in Deutschland 2013, Consultic 2014

Plastic Waste and Recovery in Germany 1994 - 2013



Source: Produktion, Verarbeitung und Verwertung von Kunststoffen in Deutschland 2013, Consultic 2014

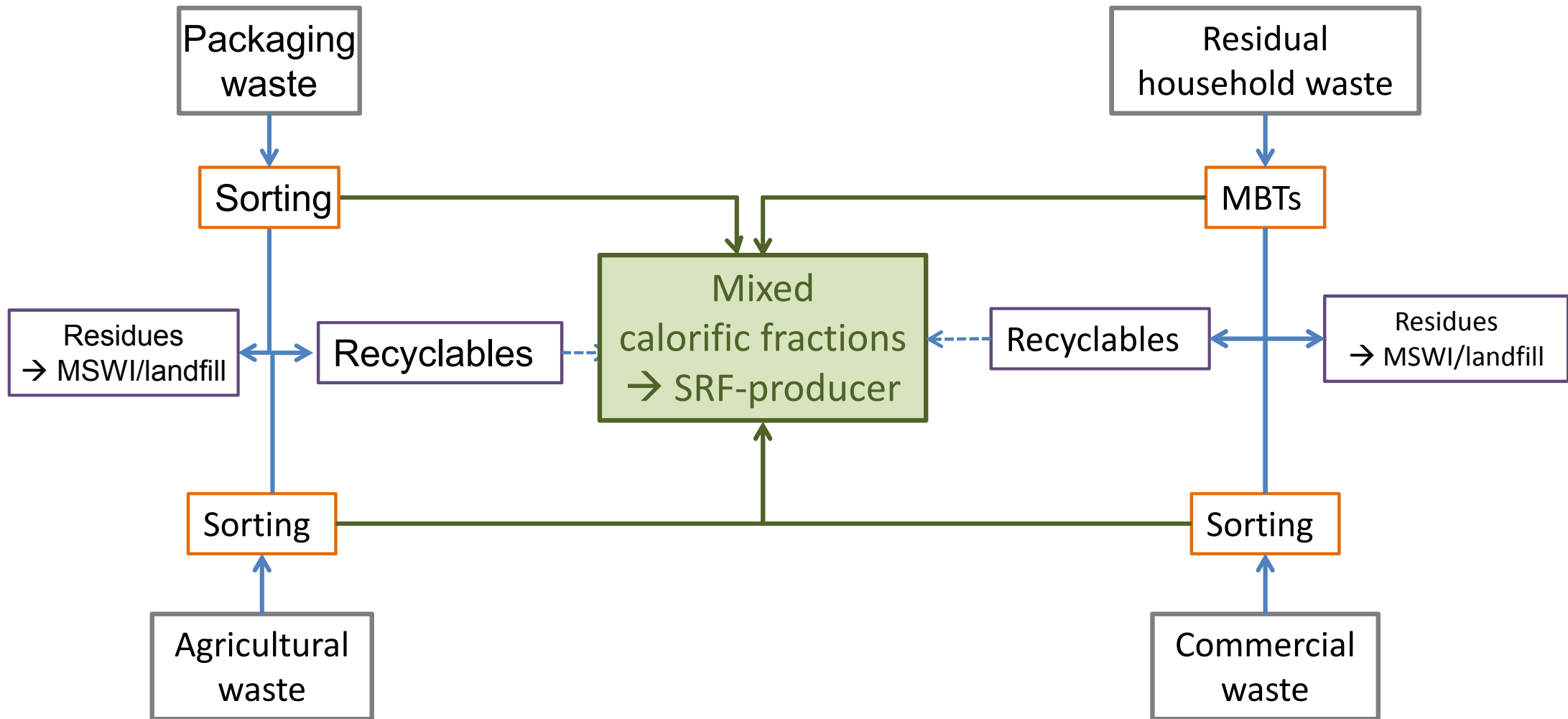
Development of plastic recovery in Germany 1994 - 2013



- Landfill ban was key for the success of recovery
- Energy recovery is not “cannibalizing” the recycling

Source: Produktion, Verarbeitung und Verwertung von Kunststoffen in Deutschland 2013, Consultic 2014

What is SRF¹⁾?



1) SRF Solid recovered fuel

Practice Examples

Integrated secondary resources supply

- e.g. Bernegger TBS – Technische Behandlungssysteme GmbH (Austria), VW-Sicon, ARN Netherlands

Input-Material

- e.g. ~ 100.000 t/a (SR, mixed plastics) at TBS (Austria)

Processes

- grinding, separating
- high-performance metals separation
- separation of plastics fractions

Use + Markets – Examples

- secondary metal smelters
- reduction agent for blast furnaces
- secondary fuel for gasification → ICCG power plants, e.g. Elco Gas
- dewatering agent for sewage sludge

Practice Examples

Integrated secondary resources supply by “Sita-Suez 1)“

Input-Material

- ~ 100.000 t/a mixed plastics – particularly post consumer packaging

Processes

- sorting
- compacting + agglomerating

Use + Markets – Examples

- wood-plastics-compounds
- reduction agent for blast furnaces

1) meanwhile closed

Practice Examples

Secondary fuel for dedicated power plants

- several in different European countries -

E.g. “Pfanni” (potato refining - Stavenhagen)

Input-Material

- ~ 90.000 t/a secondary fuels from high calorific waste (mainly plastics)

Processes

- SRF power plant – steam and electricity provision

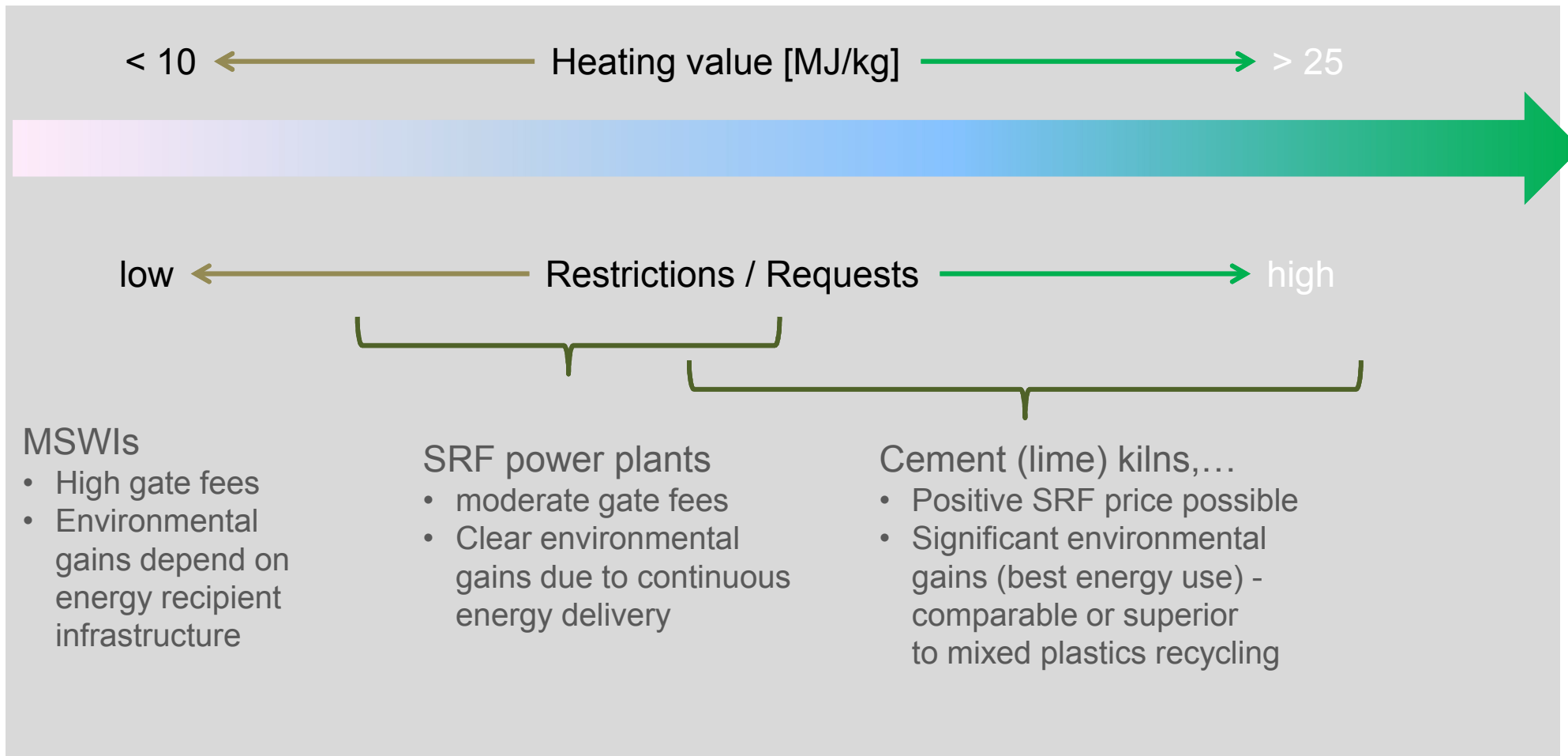
Products

- ~ 220.000 t/a steam – supply for “Pfanni-plant”
- ~ 15.000 MWh/a electricity – supply for “Pfanni-plant”
- ~ 50.000 MWh/a electricity to the public grid

What is SRF?

Composition & properties		Comments
Plastics [%]	15 → 40	} Attractive: CO2-credits
Paper [%]	15 → 40	
Wood [%]	5 → 25	
Other (bio-) waste [%]	5 → 40	
Inerts [%]	2 → 15	Extra payments for > 10 %
Heating value [MJ/kg]	12 → > 30	Positive price for > 25 MJ/kg
Restrictions		
Chlorine content [%]	< 1 preferred	Extra payment for > 1 %
Sb, As, Ba, Be, Cd, Cr, Co, Cu, Pb, Hg, Ni, Se, Ag, Th, V, Zn,...	User specific limits	
Moisture, size, incineration properties,...	User specific requests	

SRF use vs. MSW¹⁾ incineration



1) MSW Municipal Solid Waste

Why to develop SRF-routes?

Resource efficiency & environmental protection

- Land filling (energy) resources is no longer an acceptable option
 - Sustainable waste management needs SRF-routes & MSWIs to supplement recycling
 - Using mixed (plastic-rich) combustibles as SRF is superior to recycling
- Specific CO₂-emissions of energy from SRF are below respective emissions from natural gas
- SRF-use is technically well-prove, safe, and compliant with strict emissions control

Economics & energy supply

- SRF-use offers an opportunity to disburden from volatile fuel markets
- 5 – 10 % of the industry energy demand can be supplied by SRF
- SRF power plants are particularly attractive for continuous heat but also for combined heat & power supply

Summary

- All recovery options – material recycling, feedstock recycling and energy recovery – are necessary.
- Where clean and single type plastics waste can be easily recycled, energy recovery processes are a good solution for mixed and comingled waste streams.
- A clear “Divert from Landfill Strategy” is key to stimulate plastics recovery.

Market optimizes Recovery Mix

Recovery competes with landfill

