Why fuel matters?

von kories consultants

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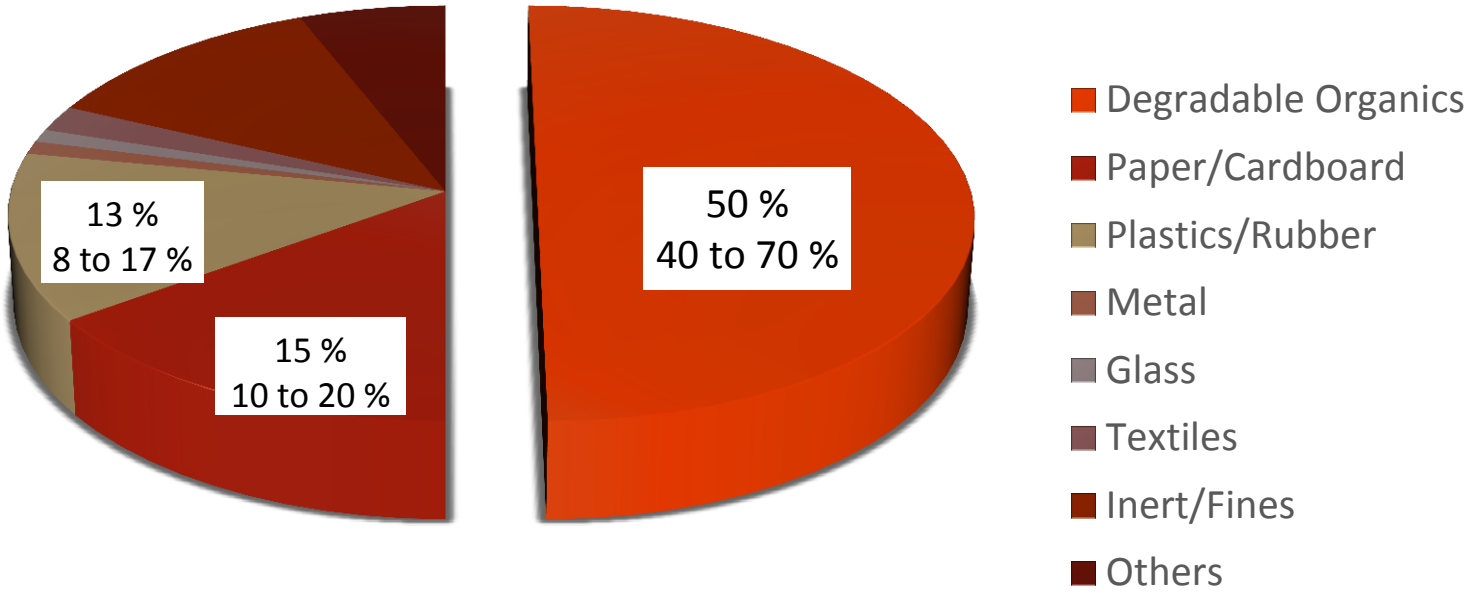
PANEL CONTRIBUTION

DEEP DIVE WORK SHOP ON WASTE TO ENERGY

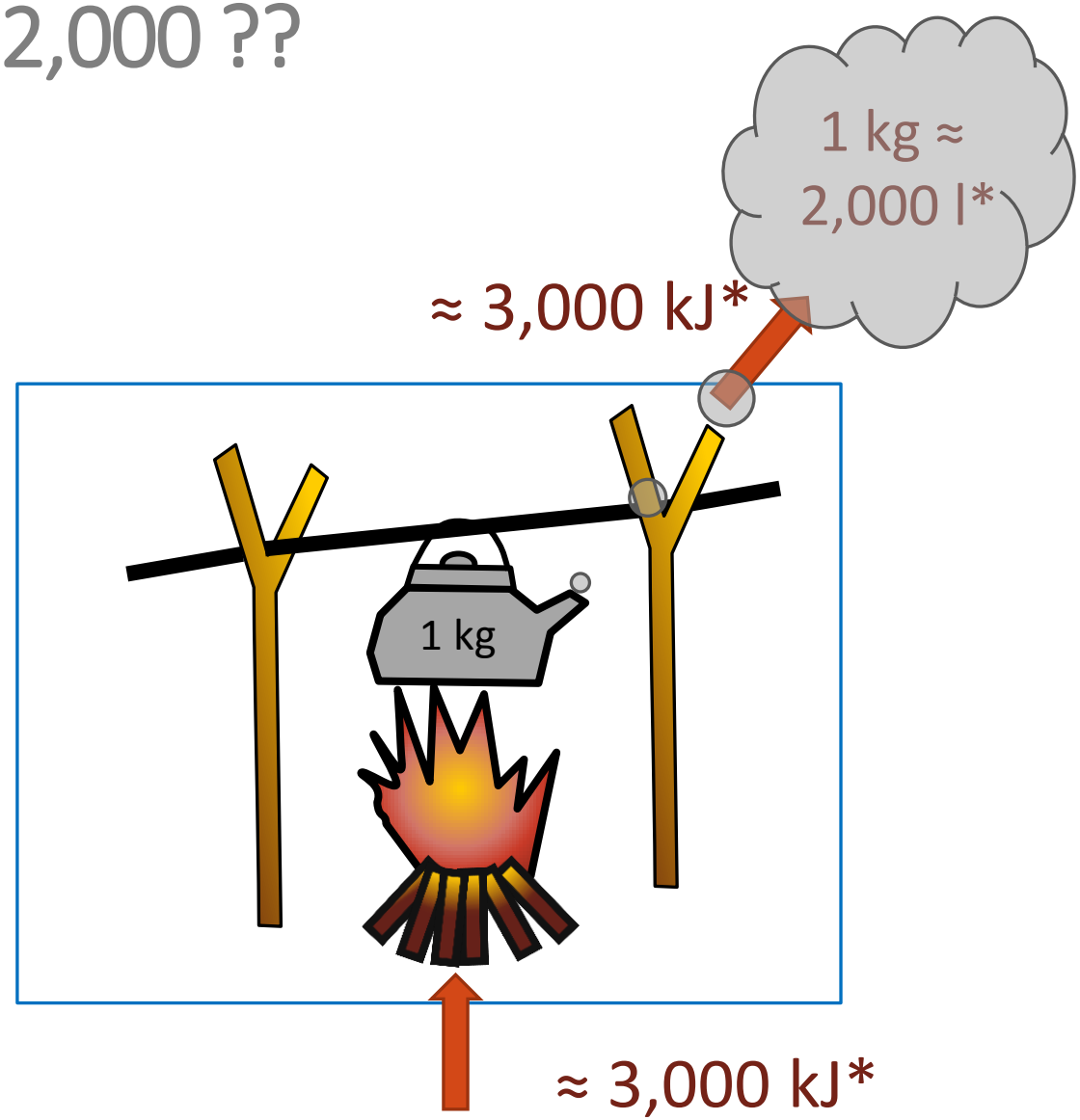
11TH ASIA CLEAN ENERGY FORUM, MANILA, 7 JUNE 2016

Is this waste suitable for incineration?



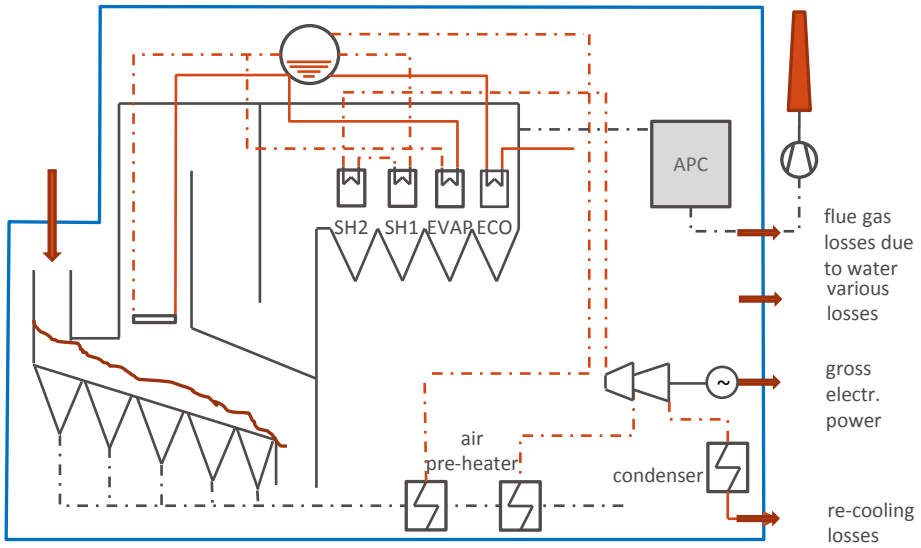
Water Content	**50 % and higher**
LHV	**4,000 – 7,000 kJ/kg**

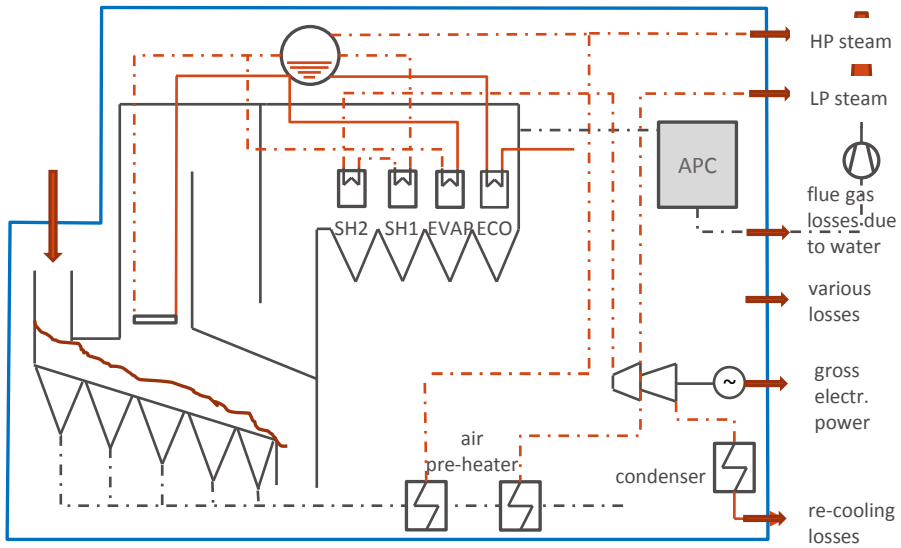
-3,000 x 2,000 ??



*simplified, depending on pressure and temperature

The Kettle in a Technical System

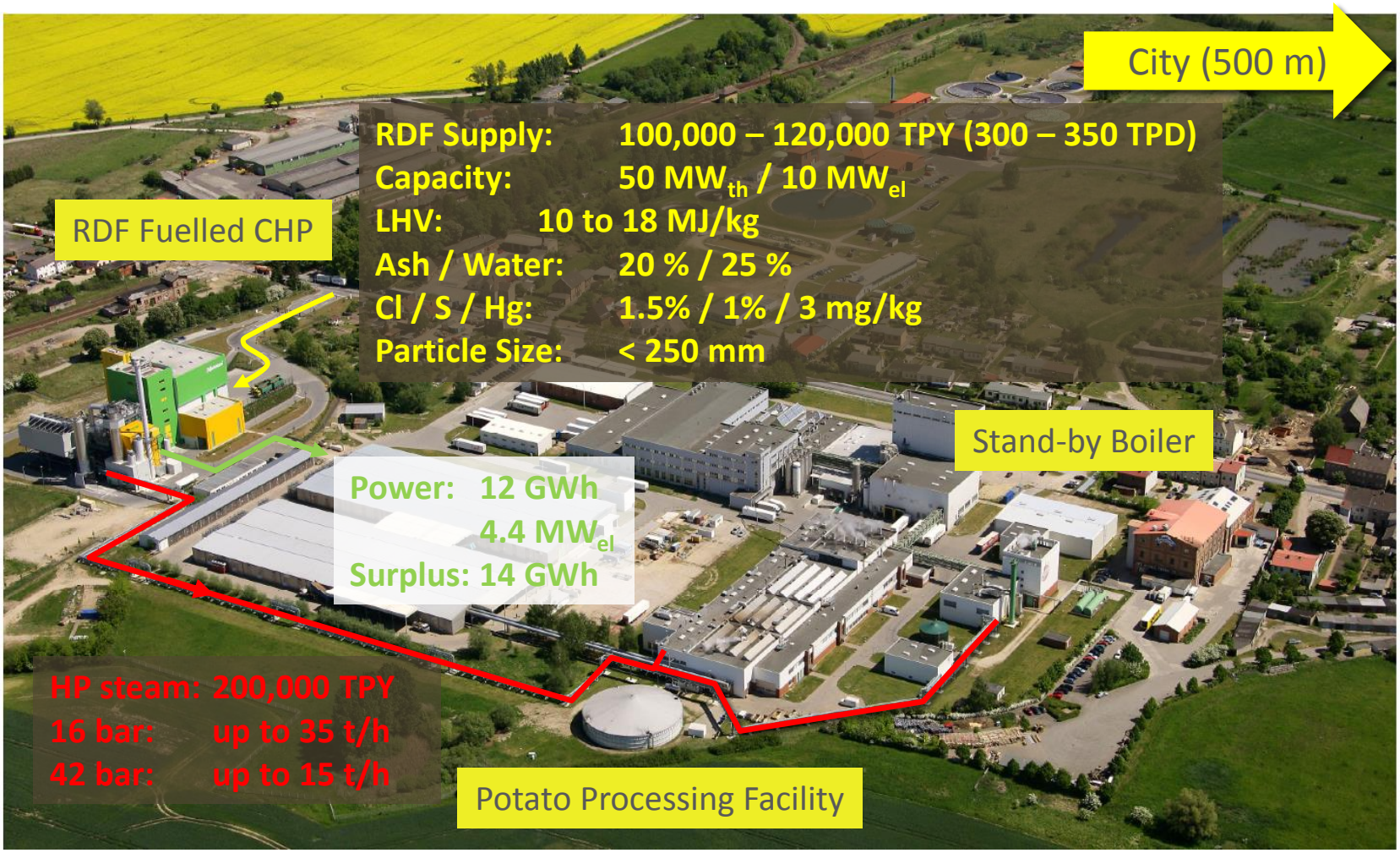




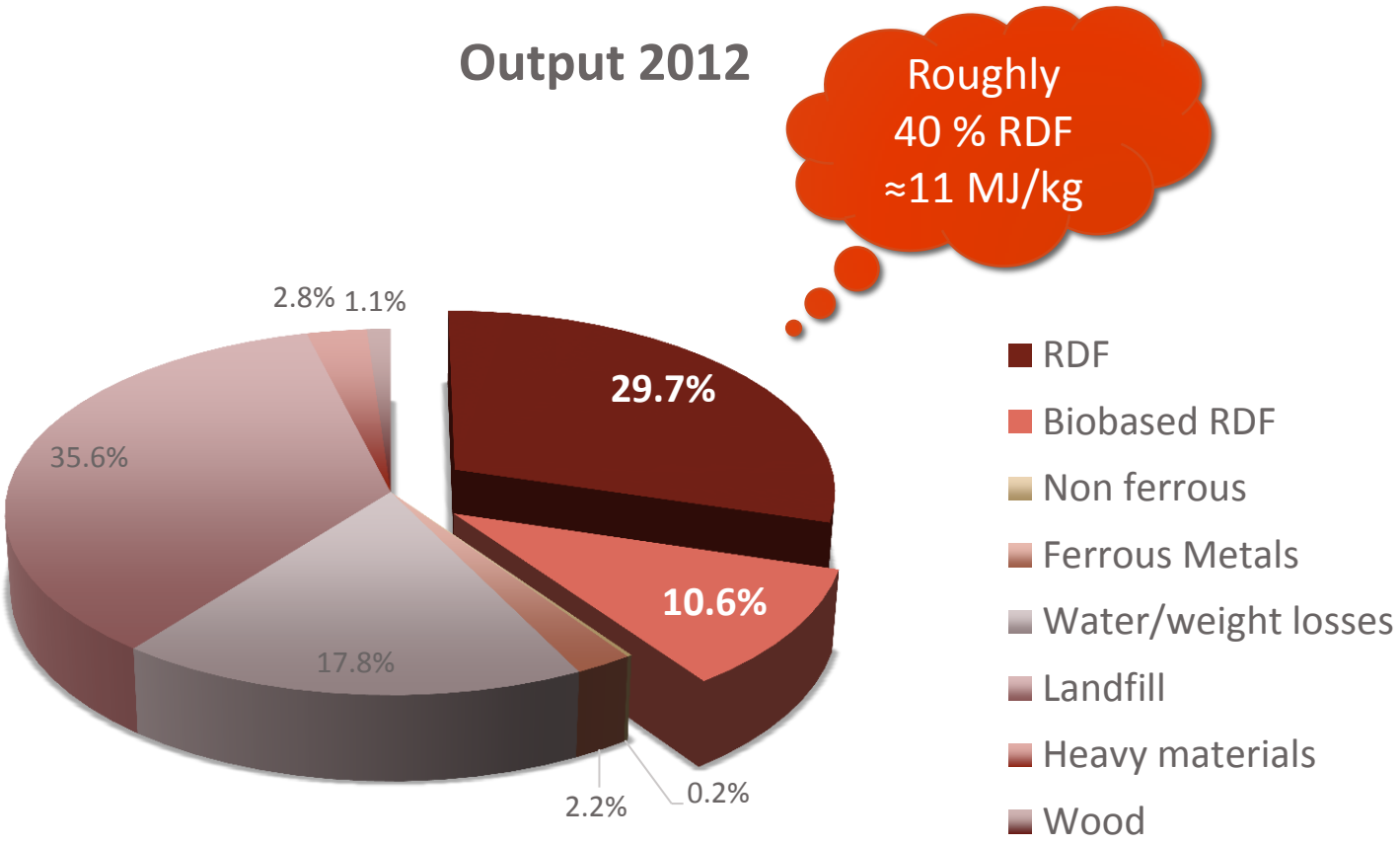
Input 1 Mg, 11 GJ (3.1 MWh), 25 % water / 5.5 GJ (1.5 MWh), 50 % water

Indicative figures in MWh/Mg	Power Optimised	CHP (30 % MP, 30 % HP
Electric power (net)	0.78 / 0.26	0.25 / 0.00
Heat (MP + HP Steam)	0 / 0	1.68 / 0.84
Sensible heat losses water	0.017 / 0.033	0.017 / 0.033
Re-cooling losses	1.9 / 0.93	1.05 / 0.53
Efficiency (net)	25 % / 16 %	63 % / 28 %

CHP-Case Study: Delivering Heat and Power to a Potato Processing Factory / Stavenhagen, Germany



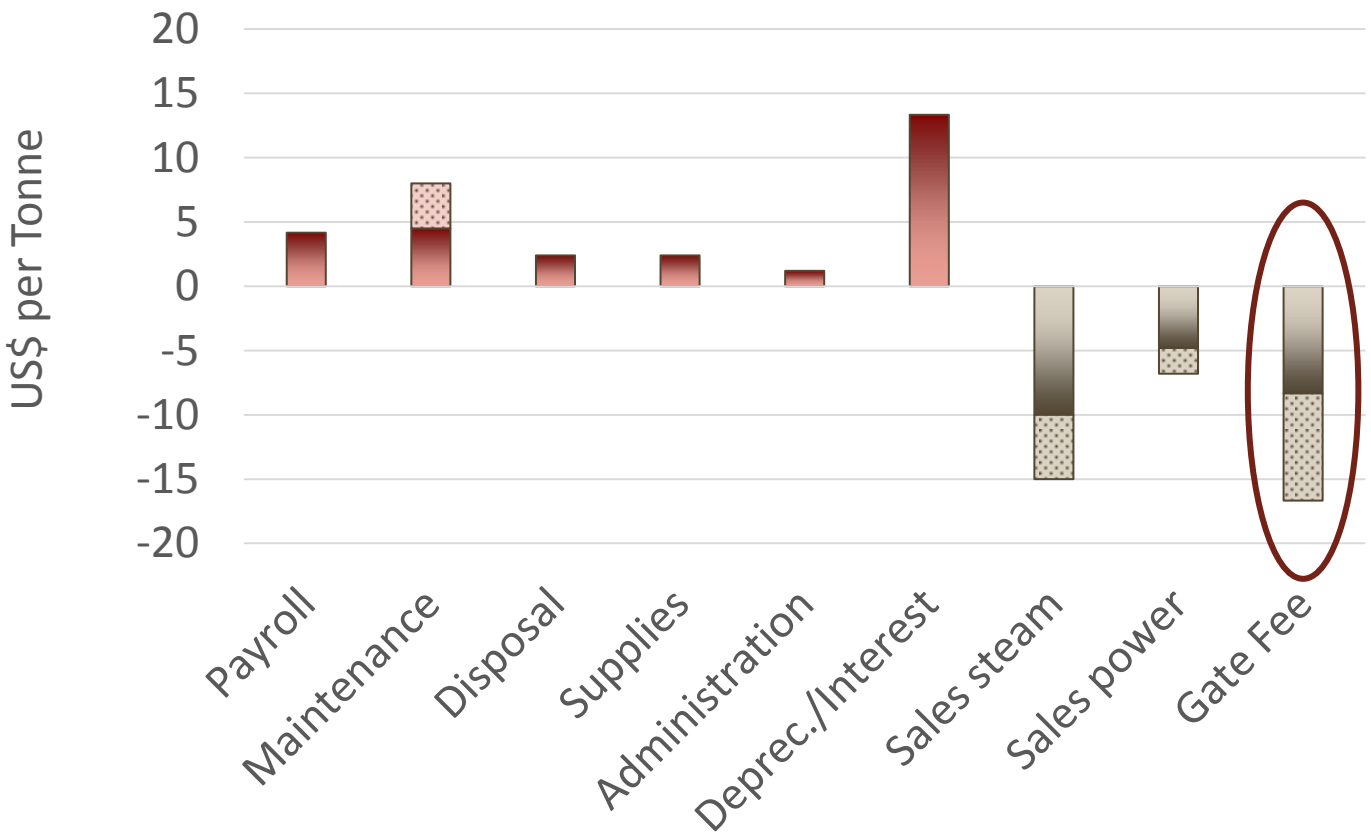
RDF Optimised MBT Facility Providing Main Input to CHP in Stavenhagen



Lessons Learnt

- Private engagement to raise funds for the CHP and the Integrated plant was necessary to launch the project
- Do not burn money in RDF transport
- Take changes in waste composition (due to changes in legislation) and competition into account (commodity market)
- Base ROI calculations on conservative assumptions on both gate fees (market!) and energy sales revenues
- Gate fee beyond US$ 55/tonne for economic viability (Germany)

Tentative Cost Projection to DMC Conditions



Conclusions for DMCs

- Given the unique waste characteristics, waste treatment should be tailored – integrated waste management system
- Raise awareness towards the costs of an integrated waste management system
- Bring industrial consumers and WtE CHPs together
- Low steam parameters of a WtE favour CHP mode, (unless power sales prices are spiking), yet gate fees will depend on both heat and power supply

Photo: Andreas Caspari

…thank you for your attention.

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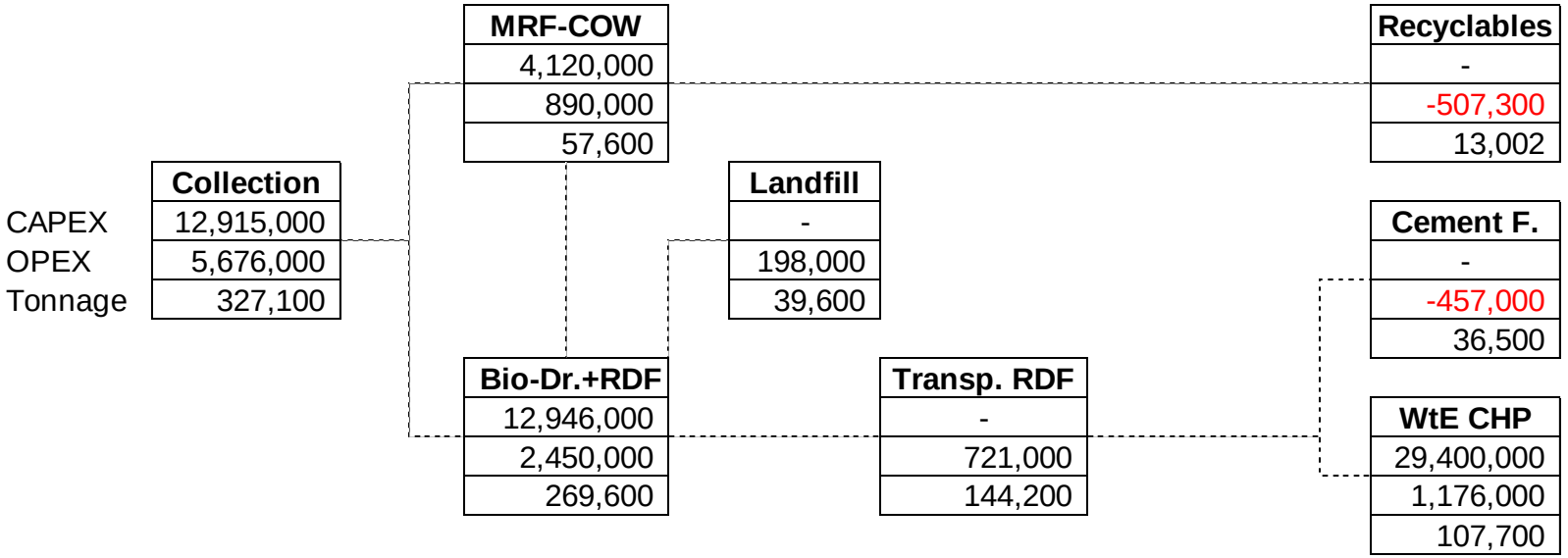
Back-up Slides

Indicative Cost Evaluation – CHP with Bio-Drying (CAPEX/OPEX in US$)

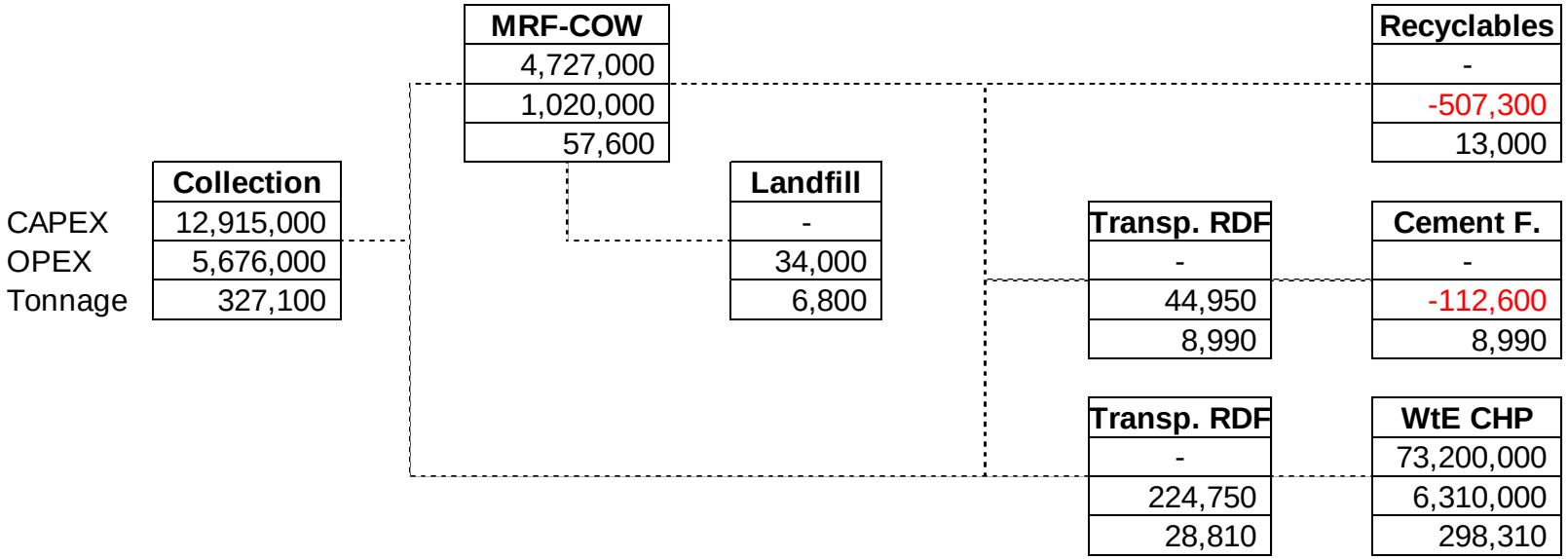
Internal Costs	To be levied to waste generators	External revenues
$11,111,000	$10,146,700	-$964,300
	31.10 US$/tonne	



Assumptions				
Landfilling			5	US$/tonne
Power Sales	0.25	MWh/Mg	-80	US$/MWh
Heat Sales	1.5	MWh/Mg	-6	US/MWh
Transport RDF			5	US$/tonne
Cement factory gate fee			-25	US$/tonne
Deduction due to market variability			50%	of sales prices

Indicative Cost Evaluation – CHP without Bio-Drying (CAPEX/OPEX in US$)

Internal Costs	To be levied to waste generators	External revenues
$13,309,700	$12,811,390	-$498,310
	39.20 US$/tonne	



Assumptions			
Landfilling		5	US$/tonne
Power Sales	0.1 MWh/Mg	-80	US$/MWh
Heat Sales	1 MWh/Mg	-6	US/MWh
Transport RDF		5	US$/tonne
Cement factory gate fee		-25	US$/tonne
Deduction due to market variability		50%	of sales prices

Design Considerations for WtE/IWMS

- Energy efficiency of an AD System is 4 times higher than the WtE in case of food waste (0,25 vs. 0,06 MWh_{el}/Mg)
- Characteristics of pre-processed waste can be controlled, be aware of future changes in waste composition due to different consumption patterns or legal requirements
- Boiler is the bottleneck (thermal capacity cannot be increased → m x LHV = const. → mechanical overload!
- Waste hydrolyses in bunker, released water to be treated (MBT)