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The Potential for Sustainable Biomass in the Romanian Energy Sector

Activity 13: Value chain analysis for potential black pellets investments

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Objectives

Main objective

Conduct a value chain analysis for assessing the potential of using black pellets instead of coal for energy production in Romania.

Secondary objectives

- Analysis of feedstock availability in Romania for black pellets production.
- Comparative analysis of operational costs for using black pellets versus coal for energy production.



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Analysis of feedstock availability in Romania for black pellets production

This analysis is based on production of black pellets from sawdust that originates from woody biomass.

$$\dot{M}_{fuel} = W_{capacity} / HHV_{fuel} \times t_{annual} \times (3600 \text{ s/h}) \times (10^{-6} \text{ kt/kg})$$

$$W_{capacity} = 50 \text{ MW}$$

$$t_{annual} = 8000 \text{ hours}$$

Feedstock	HHV [MJ/kg]	\dot{M}_{fuel} [kilotons/year]
Coal	25.82	55.77
Black pellets	21.3	67.61

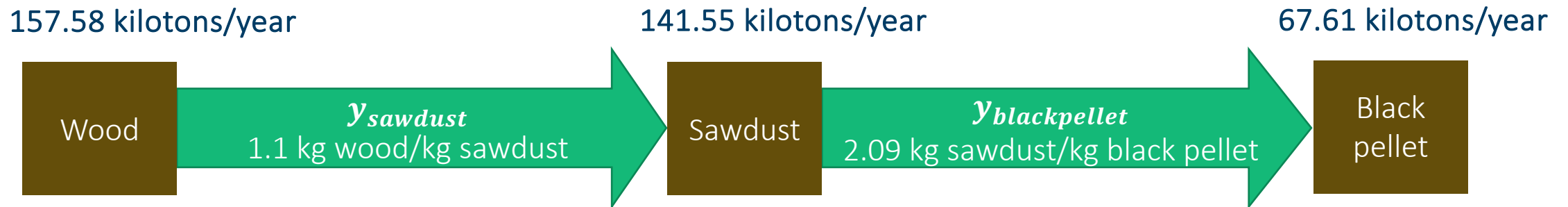
21% more



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Analysis of feedstock availability in Romania for black pellets production

50 MW plant capacity



$$\dot{M}_{sawdust, B_i} = \dot{M}_{wood, B_i} \times y_{sawdust}$$

$$\dot{M}_{blackpellet, B_i} = \dot{M}_{sawdust, B_i} \times y_{blackpellet}$$



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Analysis of feedstock availability in Romania for black pellets production

157.58 kilotons/year

Wood



4849×10³ m³ fuelwood harvested in Romania in 2017

→ 2570 kilotons

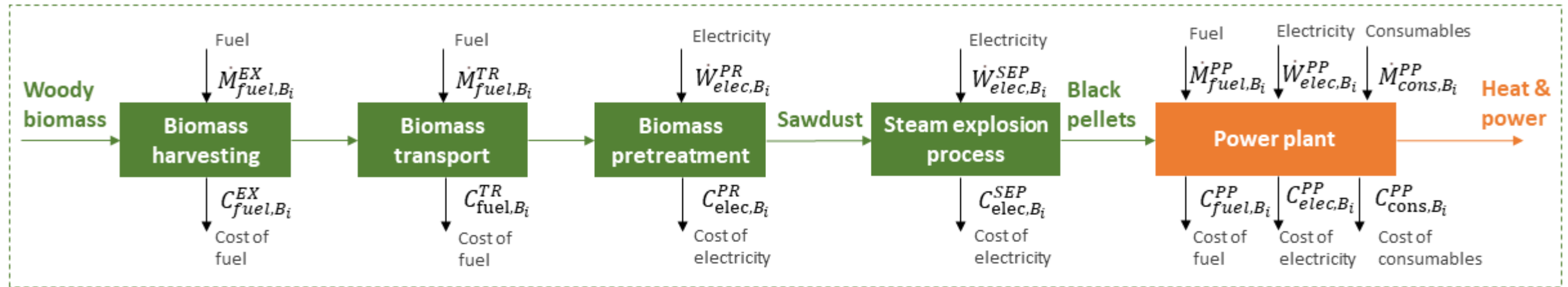
→ 6.13% necessary for 50 MW biomass power plant



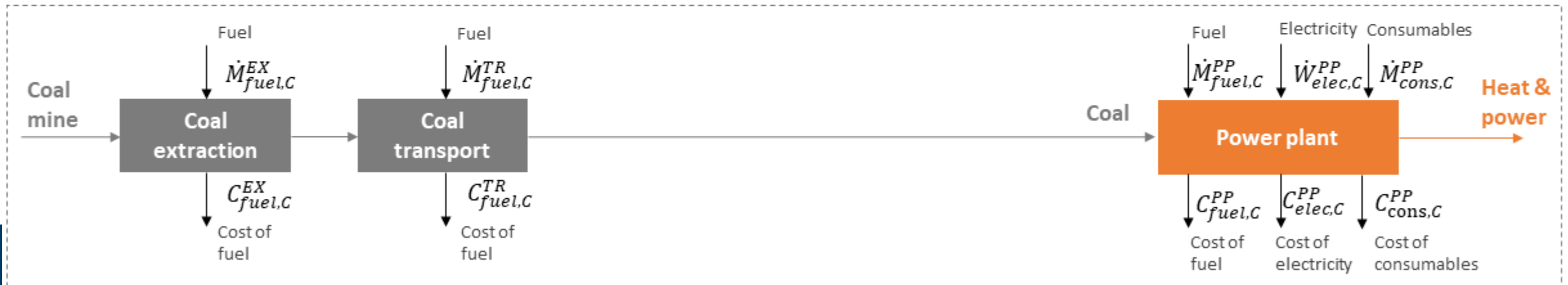
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Comparative analysis of operational costs for using black pellets versus coal for energy production

Value chain of black pellet power plant



Value chain of coal power plant





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Comparative analysis of operational costs for using black pellets versus coal for energy production

- Black pellets value chain
 - Biomass harvesting
 - Biomass transport
 - Biomass pretreatment
 - Steam explosion process
 - Power plant
- Coal value chain
 - Coal extraction
 - Coal transport
 - Power plant

Operational costs arising due to consumption of

- Electricity
- Fuel
- Consumables



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Comparative analysis of operational costs for using black pellets versus coal for energy production

		Black pellets value chain [MRON/year]	Coal value chain [MRON/year]
Harvesting/extraction		70.77	9.70
Transport		5.3	0.3
Pretreatment		3.23	-
Steam explosion		12.61	-
Power production	Fuel	0.58	0.58
	Electricity	4.90	4.90
	Consumables	3.28	2.70
TOTAL		100.68	18.18

- 5 times higher for black pellets → biomass harvesting is more costly than coal mining activity
- Higher amount of black pellets → higher transport cost
- Pretreatment and steam explosion are energy demanding.
- Fuel used in auxiliary burners and internal power consumption is defined per MJ fuel → costs associated with these are the same for both value chains.
- Consumption of consumables is defined in terms of per ton of fuel, which is higher for black pellets value chain. → higher costs



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