

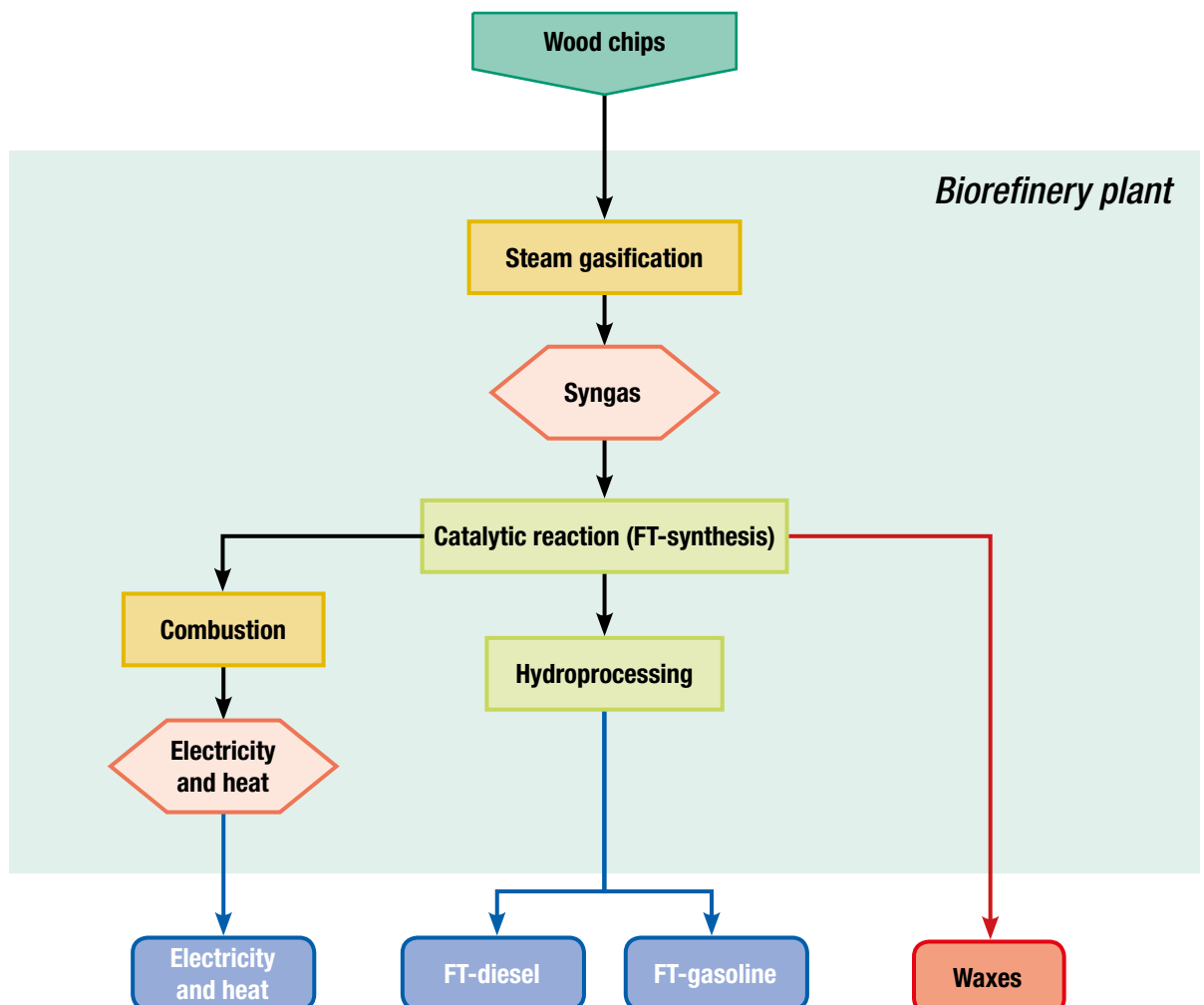
2-platform (electricity&heat, syngas) biorefinery using wood chips for FT-diesel, FT-gasoline, heat and waxes with steam gasification

Part A: Biorefinery plant

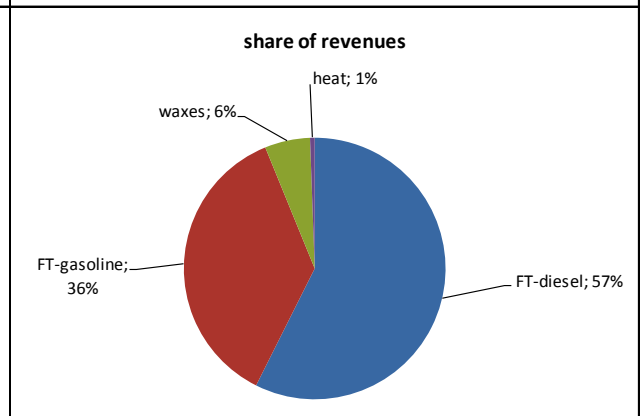
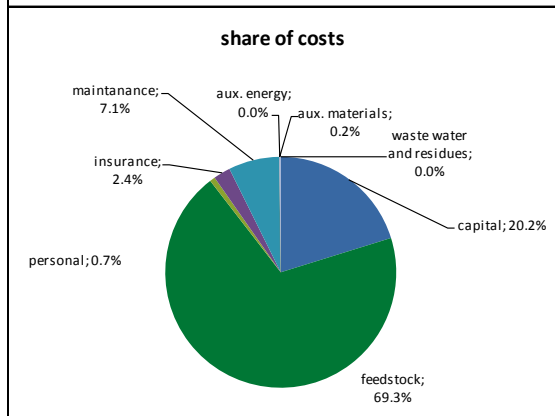
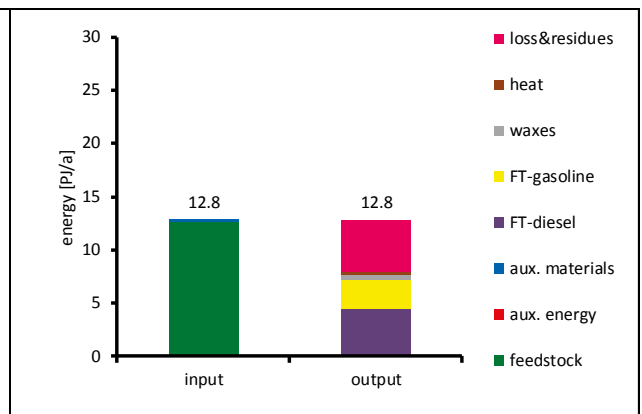
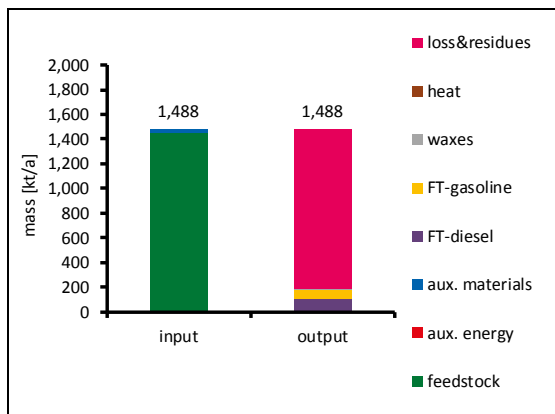
The demonstration scale energy driven “2-platform (electricity&heat, syngas) biorefinery using wood chips for FT-diesel, FT-gasoline, heat and waxes with steam gasification” converts wood to FT-biofuels. The wood chips are gasified with steam to produce synthesis gas containing CO and H₂, which is then converted to raw FT-biofuels via a catalytic reaction (FT-synthesis). The final quality of the transportation FT-biofuels is reached in the upgrading step, e.g. hydroprocessing. The FT-biofuels mainly consist of FT-diesel but also FT-gasoline is produced. The process residues of the catalytic conversion are combusted to produce electricity and heat, whereas the electricity covers

fully the internal electricity demand of the biorefinery. As a further product waxes are produced.

Depending on the further successful development beside the steam gasification of wood chips, which is suitable for smaller to medium sized gasifiers also the gasification with oxygen for large applications (e.g. entrained flow gasification) might become interesting. The large amount of syngas will then be an optimal starting point to produce additional synthetic products depending on the market demand for biomass based chemicals, e.g. methanol, which are not considered in the assessment here.

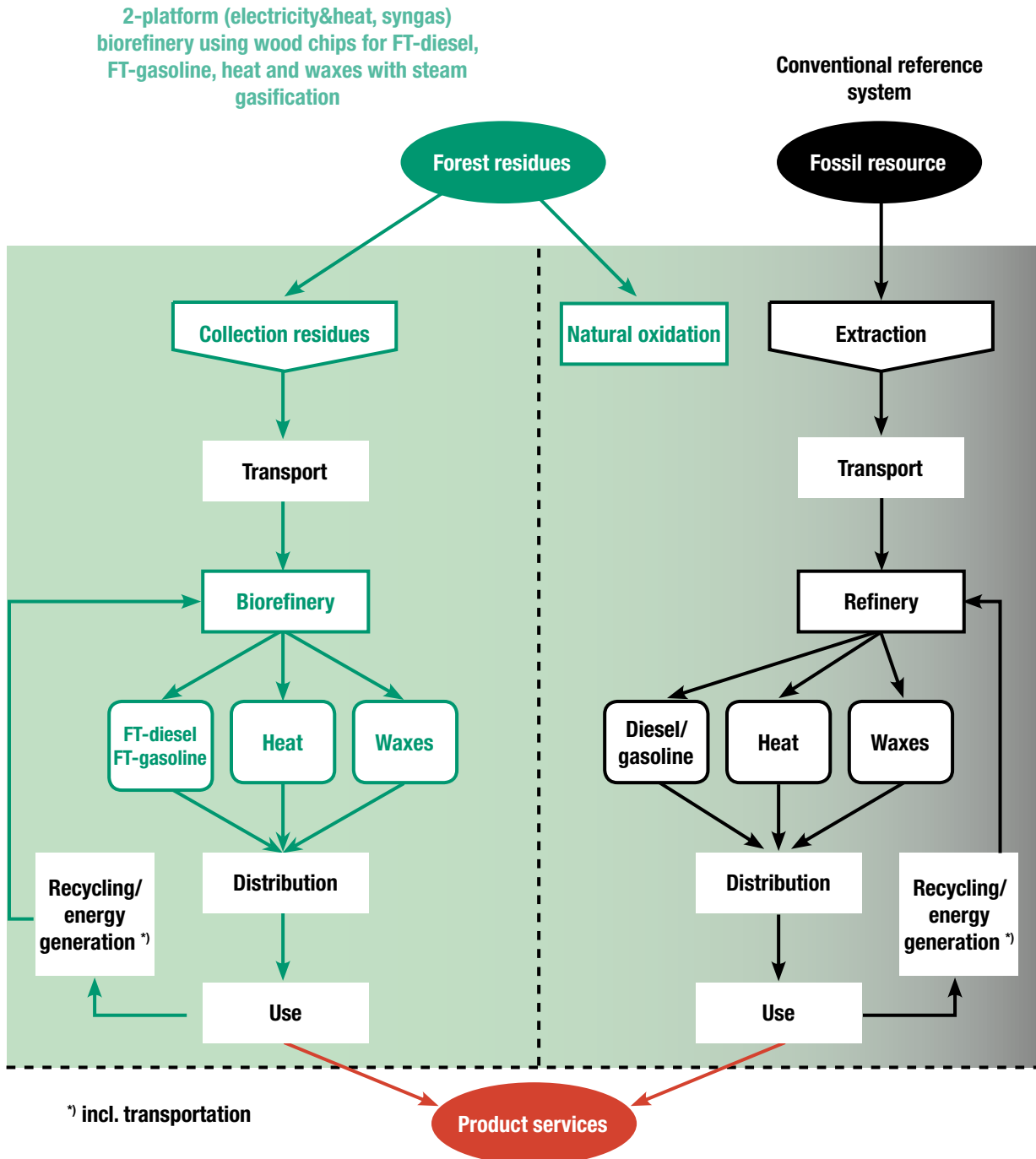


2-platform (electricity&heat, syngas) biorefinery using wood chips for FT-diesel, FT-gasoline, heat and waxes with steam gasification					
State of technology:	commercial 2013	<u>Biorefinery Complexity Index</u>	20 (2/1/9/8)		
Country:	EU 27	<u>(Products/Platform/Feedstock/Processes)</u>			
Main data sources:	BIOGRACE, JOANNEUM RESEARCH				
Products		Auxiliaries (external)			
	FT-diesel	105 [kt/a]	electricity	0.00 [PJ/a]	
	FT-gasoline	70 [kt/a]	heat	0.00 [PJ/a]	
	waxes	10 [kt/a]	others: various	29.2	
	heat	0.3 [PJ/a]			
Feedstock		[kt/a]	water [%]	Costs	
	wood chips 45%	1,459	45.0%	investment costs	500 [Mio €]
				feedstock costs	100 [€/t]
				number of employees	35 [#]
Efficiencies				mass	energy
		input to products		12%	62%
		input to transportation biofuel		7%	34%



Part B: Value Chain Sustainability Assessment

The method of the sustainability assessment - economic and environmental – is given in Annex 1. The main assumptions and modelling choices are documented in Annex 2. The Annexes are available on the webpage of Task 42: www.iea-bioenergy.task42-biorefineries.com



Whole value chain		
Greenhouse gas emissions		
	range	
biorefinery	59 (55 to 68)	[kt CO ₂ -eq/a]
reference system	674 (630 to 770)	[kt CO ₂ -eq/a]
saving	-91% (-85% to -100%)	[%]
Cumulated energy demand		
fossil		
biorefinery	0.7 (0.63 to 0.78)	[PJ/a]
reference system	8.7 (8.1 to 10)	[PJ/a]
saving	-92% (-86% to -100%)	[%]
total		
biorefinery	13.5 (13 to 16)	[PJ/a]
reference system	9.2 (8.5 to 10.5)	[PJ/a]
change	47% (44% to 55%)	[%]
Agricultural area demand		
feedstock	0 (0 to 0)	[ha/a]
Costs		
annual costs	210 (200 to 240)	[Mio €/a]
specific costs	1,137 (1100 to 1300)	[€/t]
Revenues		
annual revenues	218 (200 to 250)	[Mio €/a]
specific revenues	1,180 (1100 to 1400)	[€/t]

