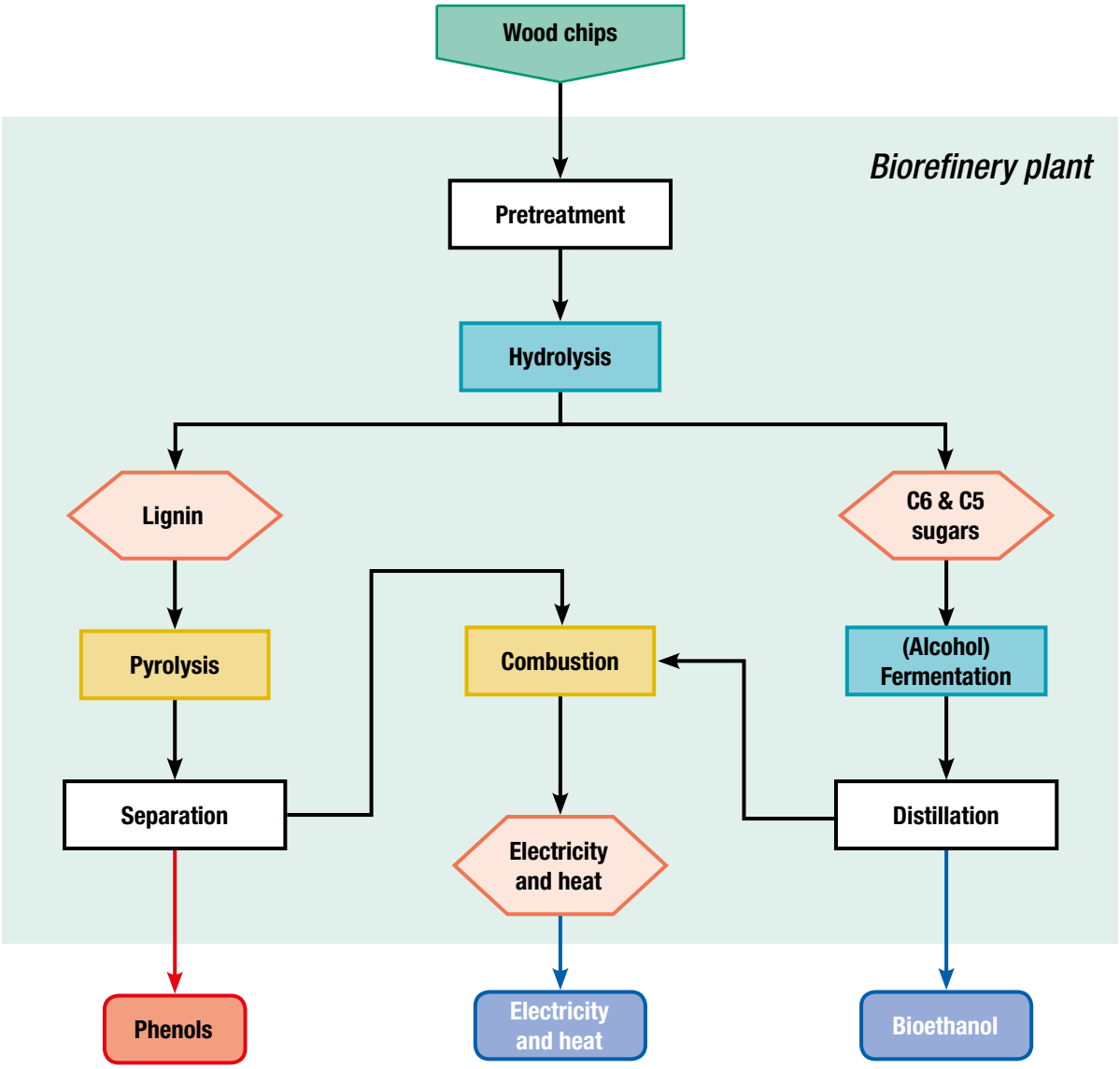
3-platform (C6&C5 sugar, electricity&heat, lignin) biorefinery using wood chips for bioethanol, electricity and phenols

Part A: Biorefinery plant

The energy driven "3-platform (C6&C5 sugar, electricity&heat, lignin) biorefinery using wood chips for bioethanol, electricity and phenols" converts wood to bioethanol. The wood chips (without bark) are transported to the biorefinery, where after the pretreatment the wood chips are hydrolysed to gain the sugars and the lignin. The C6&C5 sugars are fermented to bioethanol and the lignin is used to produce bio-oil via a pyrolysis step. The phenols from the bio-oil are separated and the residues are combusted to produce electricity and heat.
This biorefinery system is partly demonstrated, the production of bioethanol is demonstrated in Sweden (and other locations) and the pyrolysis of the lignin was tested on laboratory scale. So far the production of bioethanol from hard wood is easier to be developed than from soft wood. Recent R&D results show that the integration of a bioethanol production from wood in a pulp and paper production plant offers promising synergies like handling and logistic of wood, water and waste water treatment, electricity and steam infrastructure and personal. Realising these synergies would enable a commercial bioethanol production from wood by 2025.



JOANNEUM RESEARCH LIFE

IEA Bioenergy Task 42 Biorefining

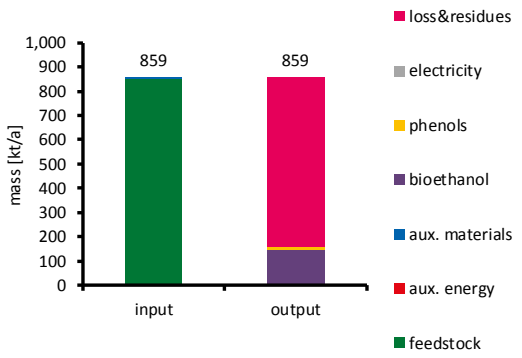
3-platform (C6&C5 sugar, electricity&heat, lignin) biorefinery using wood chips for bioethanol, electricity and phenols

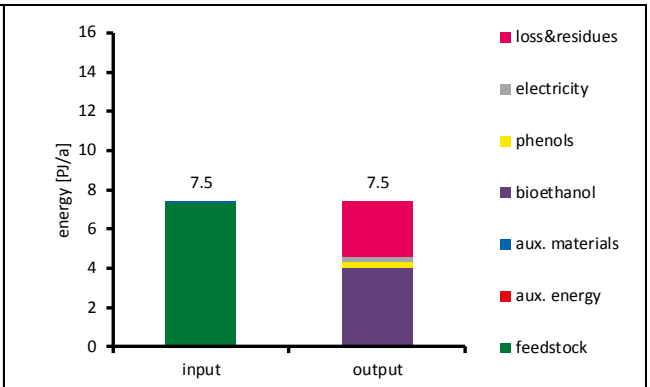
State of technology:	Concept	Biorefinery Complexity Index (Products/Platform/Feedstock/Processes)	34 (8/1/6/19)
Country:	AUSTRIA		
Main data sources:	JOANNEUM RESEARCH		

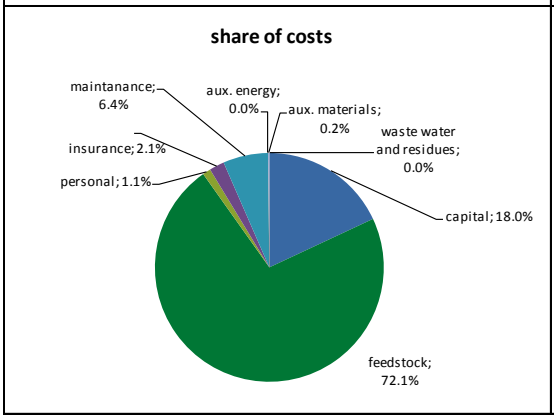
Products		**Auxiliaries (external)**	
bioethanol	150 [kt/a]	electricity	0.00 [PJ/a]
phenols	8 [kt/a]	heat	0.00 [PJ/a]
electricity	0.3 [PJ/a]		
		others: various	8.5

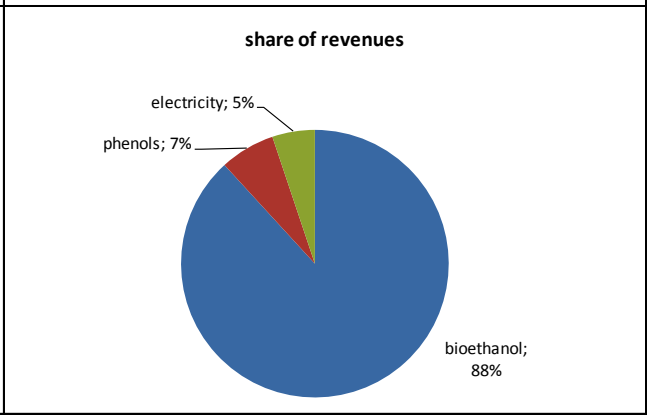
Feedstock	**[kt/a]**	**water [%]**	**Costs**	
wood chips 45%	850	45.0%	investment costs	250 [Mio €]
			feedstock costs	100 [€/t]
			number of employees	30 [#]

Efficiencies	**mass**	**energy**
input to products	18%	62%
input to transportation biofuel	17%	54%



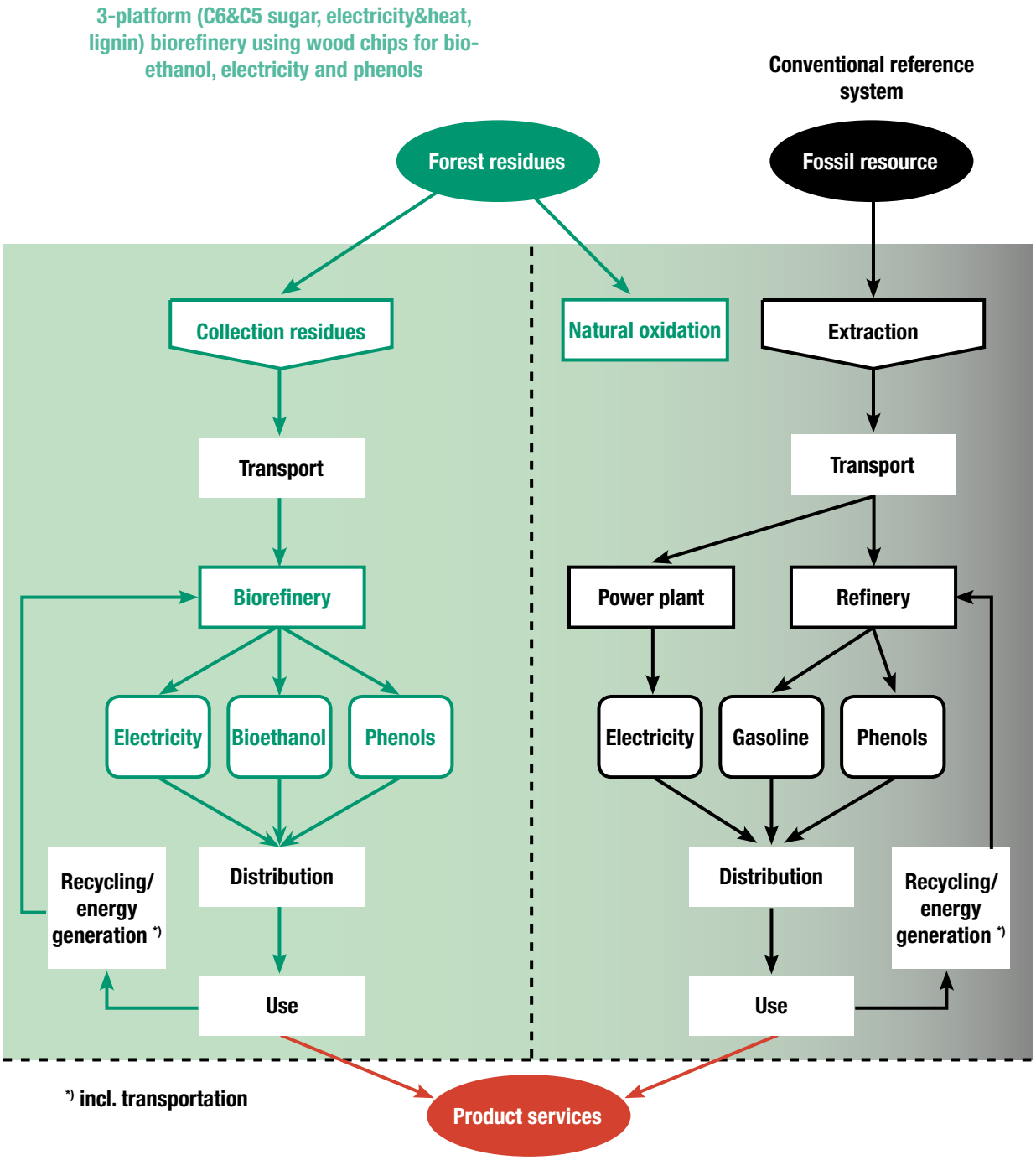






Part B: Value Chain Sustainability Assessment

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	32	(30 to 37)	[kt CO_2-eq/a]
reference system	403	(370 to 460)	[kt CO_2-eq/a]
saving	-92%	(-86% to -100%)	[%]
Cumulated energy demand			
fossil			
biorefinery	0.4	(0.37 to 0.46)	[PJ/a]
reference system	5.6	(5.2 to 6.4)	[PJ/a]
saving	-93%	(-86% to -100%)	[%]
total			
biorefinery	7.9	(7.3 to 9.1)	[PJ/a]
reference system	5.9	(5.5 to 6.8)	[PJ/a]
change	34%	(31% to 39%)	[%]
Agricultural area demand			
feedstock	0	(0 to 0)	[ha/a]
Costs			
annual costs	118	(110 to 140)	[Mio €/a]
specific costs	748	(700 to 860)	[€/t]
Revenues			
annual revenues	130	(120 to 150)	[Mio €/a]
specific revenues	822	(760 to 950)	[€/t]