EERA
European Energy Research Alliance
Bioenergy

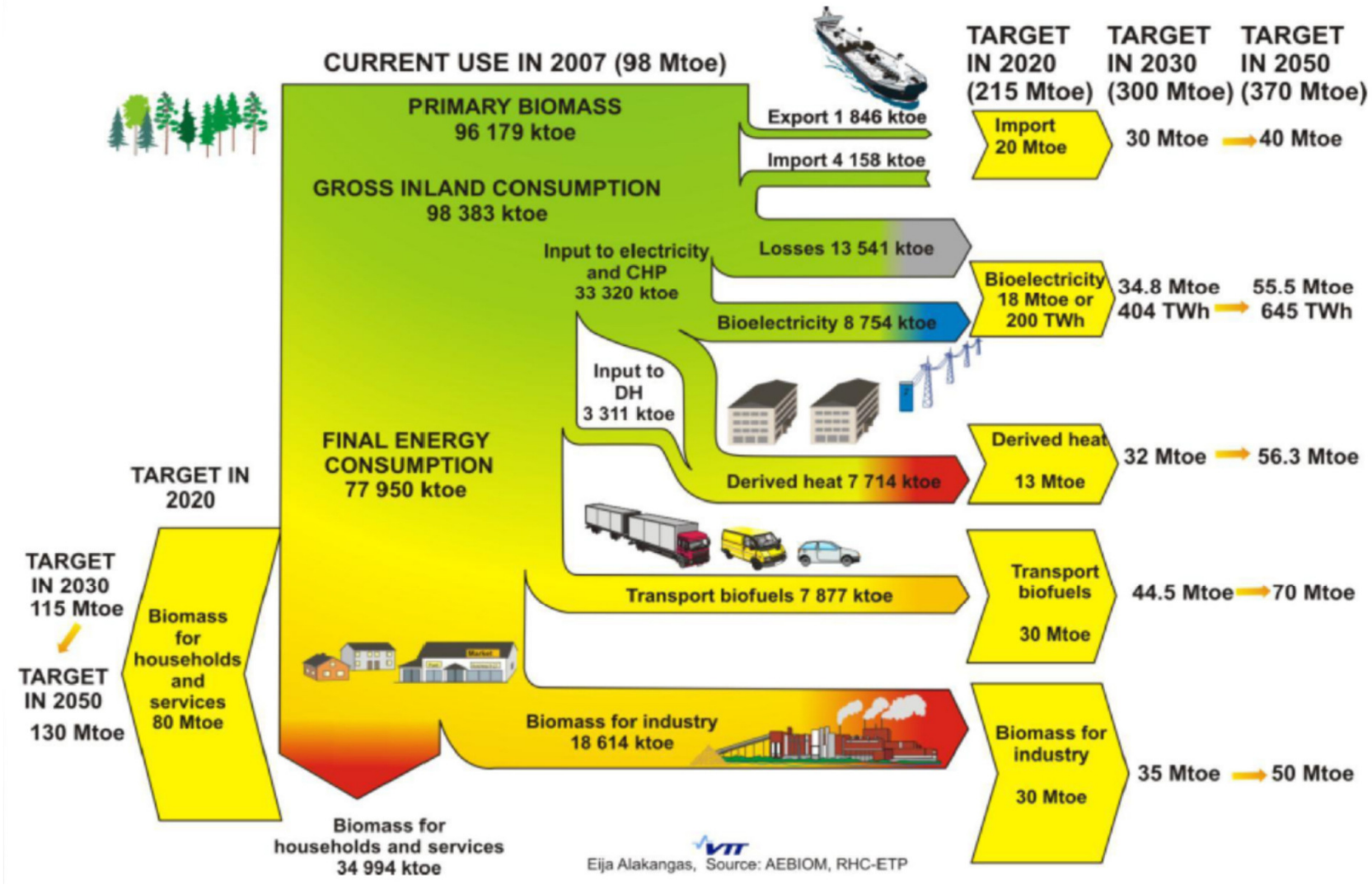
Gas Analysis Workshop

Description of needs (application, parameters, type of task)

21-06-2012

Serge Biollaz (PSI)

Biomass use in EU27 and targets

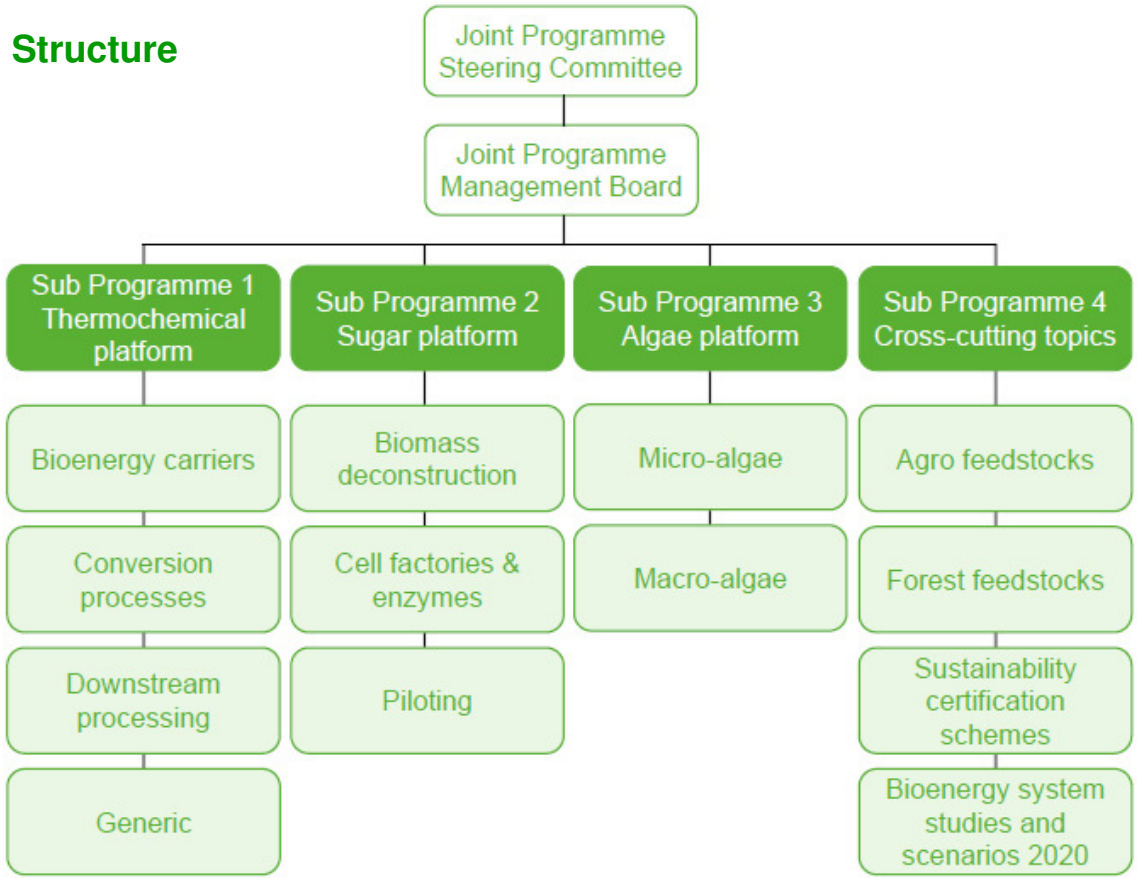


EERA Bioenergy

Objective

Align pre-competitive research activities at EERA member institutes to give a scientific basis to continue developing next generation biofuels.

Structure

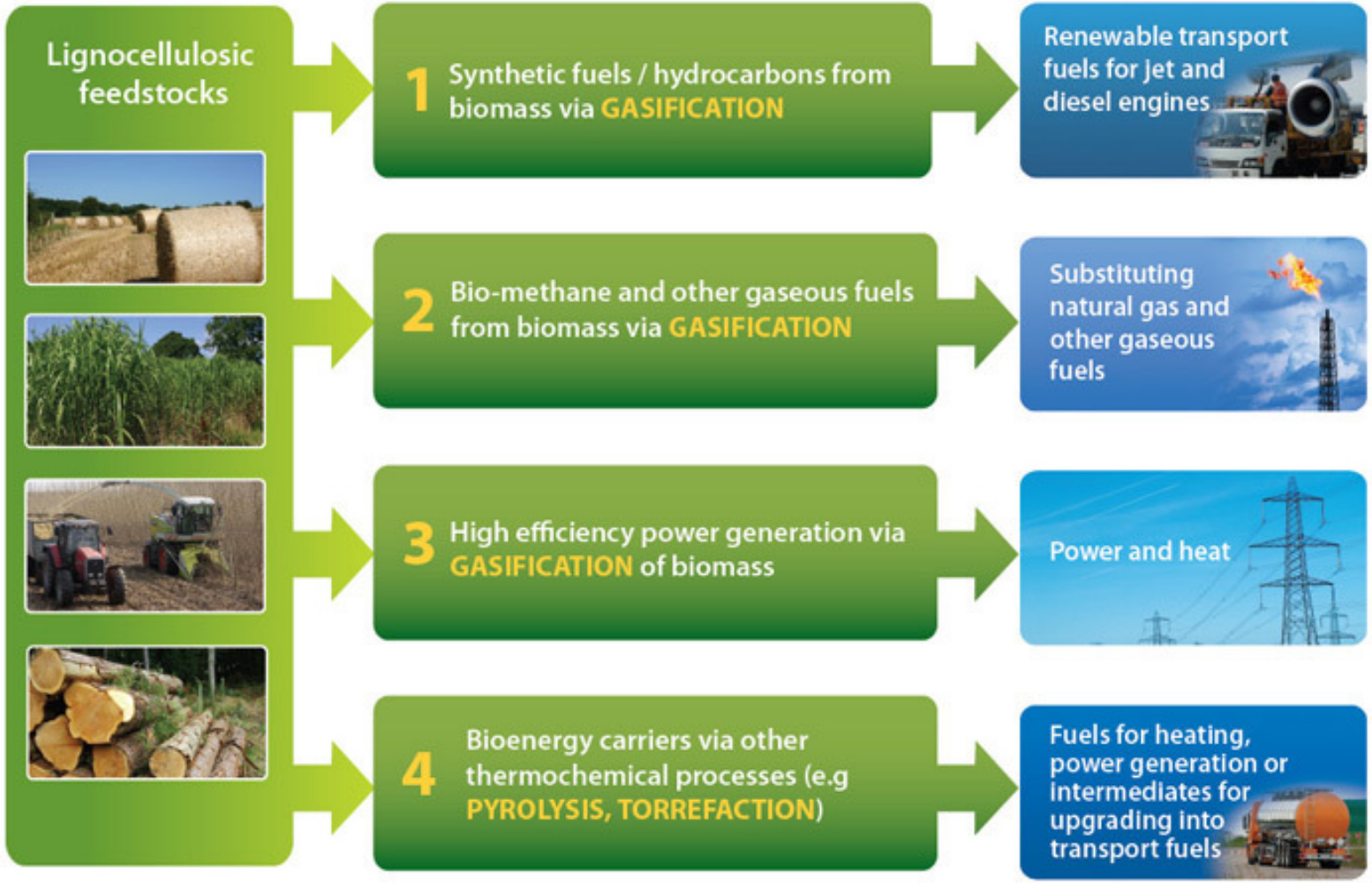


EERA Bioenergy RTD organisations

Organisation	Location	EERA Bioenergy Role
CEA	France	Member
CENER	Spain	Member
CIEMAT	Spain	Member
CNR	Italy	Member
CUT	Poland	Associate Member
DTU	Denmark	SP3 Coordinator
ECN	Netherlands	SP1 Coordinator
ENEA	Italy	Member
FZJ-HGF	Germany	Associate Member
IEN	Poland	Member
IFFMPAS	Poland	Associate Member
IMDEA	Spain	Associate Member
INRA	France	SP4 Coordinator
IREC	Spain	Associate Member
KIT	Germany	Associate Member
LNEG	Portugal	SP2 Coordinator
METLA	Finland	Associate Member
PSI	Switzerland	Member
SINTEF	Norway	Member
TECNALIA	Spain	Associate Member
UCL	Belgium	Member
UKERC	UK	Member
UNIZAR	Spain	Associate Member
VTT	Finland	JP Coordinator
WUR	Netherlands	Member

EIBI*) value chains: Thermo-chemical processes

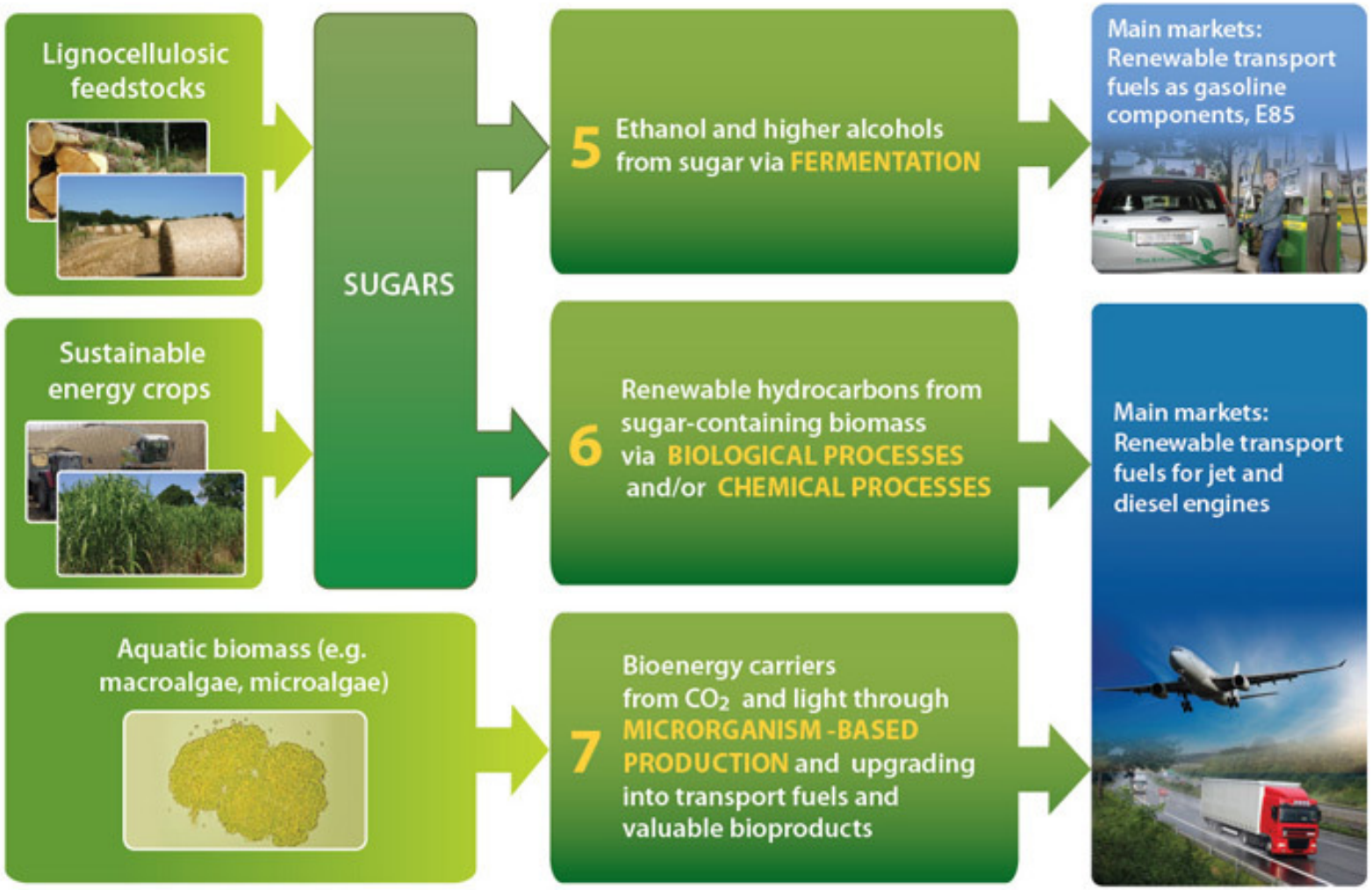
*) European Industrial Bioenergy Initiative: EIBI



Reference: http://www.biofuelstp.eu/eibi.html

EIBI*) value chains: Bio-chemical processes

*) European Industrial Bioenergy Initiative: EIBI



Reference: http://www.biofuelstp.eu/eibi.html

Key Performance Indicators (KPI) for EIBI

Value Chain	Ethanol (or equivalent)	Diesel (or equivalent)	Biomethane	Heat	Electricity	Other Product
1 (2015)		*<€1,05/litre*		*35 €/MWh*	*75 €/MWh*	
1 (2020)		*<€0,75/litre*		*30 €/MWh*	*70 €/MWh*	
2 (2015)			*45 €/MWh*	*<35 €/MWh*	*<75 €/MWh*	
2 (2020)			*30 €/MWh*	*<30 €/MWh*	*<70 €/MWh*	
3 (2015)				*<35 €/MWh*	*<75 €/MWh*	
3 (2020)				*<30 €/MWh*	*<70 €/MWh*	
4 (2015)						*<€60/MWh ** <€50/MWh **
4 (2020)						*<€50/MWh ** <€30/MWh **
5 (2015)	*<€0.70/litre*					
5 (2020)	*<€0.50/litre*					
6 (2015)		*<€1,05/litre*				
6 (2020)		*<€0.75/litre*				
7 (2015)		*<€1,0/litre*				
7 (2020)		*<€0,70/litre*				

** Pyrolysis oil ** Torrefied product*

EIBI Team Approved Version: 14-12-2011

Targets: Total price when Economic Value Added (EVA) =0

Price of bioenergy products (e.g. €/litre, €/MWh) per Value Chain at point of sale to customer.

Economic Value Added (EVA) calculation for a project using Weighted Average Cost of Capital (WACC)-method and setting:

- EVA as 0
- Cost of equity as 15% (post tax)
- Cost of debt as 5%
- Share of equity as 45 %
- Project life time as 15y
- Residual value as 0
- Tax scheme as 30 %
- Tax depreciation Linear 15 years
- Production cost is at plant gate
- Annual Inflation 0%
- Working capital 20% of turn-over
- All by-products earnings valued in EVA calculation as quoted in the ARA (Amsterdam-Rotterdam-Antwerp)- market or in the absence of this, to be based on relevant market analysis.

WACC calculation gives a value of 10.68%.

Market prices 2011:

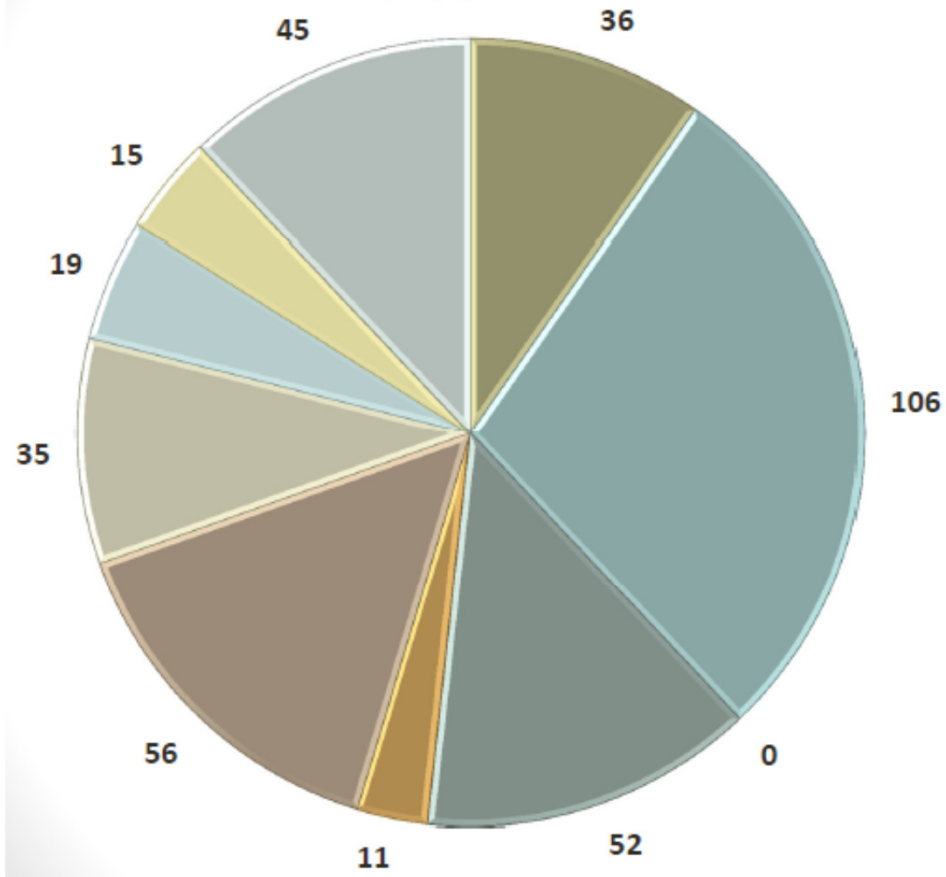
- Diesel: 1.2 – 1.66 €/l (incl. tax)
- NG: 21.9 – 94.5 €/MWh
- Electricity: 80 - 290 €/MWh

Reference:

http://setis.ec.europa.eu/activities/eii-key-performance-indicators/KPIs_EIBI

Potential 2020 in EU27 (reference scenario)

Current use 2007: 98 Mtoe, Target 2050: 370 Mtoe



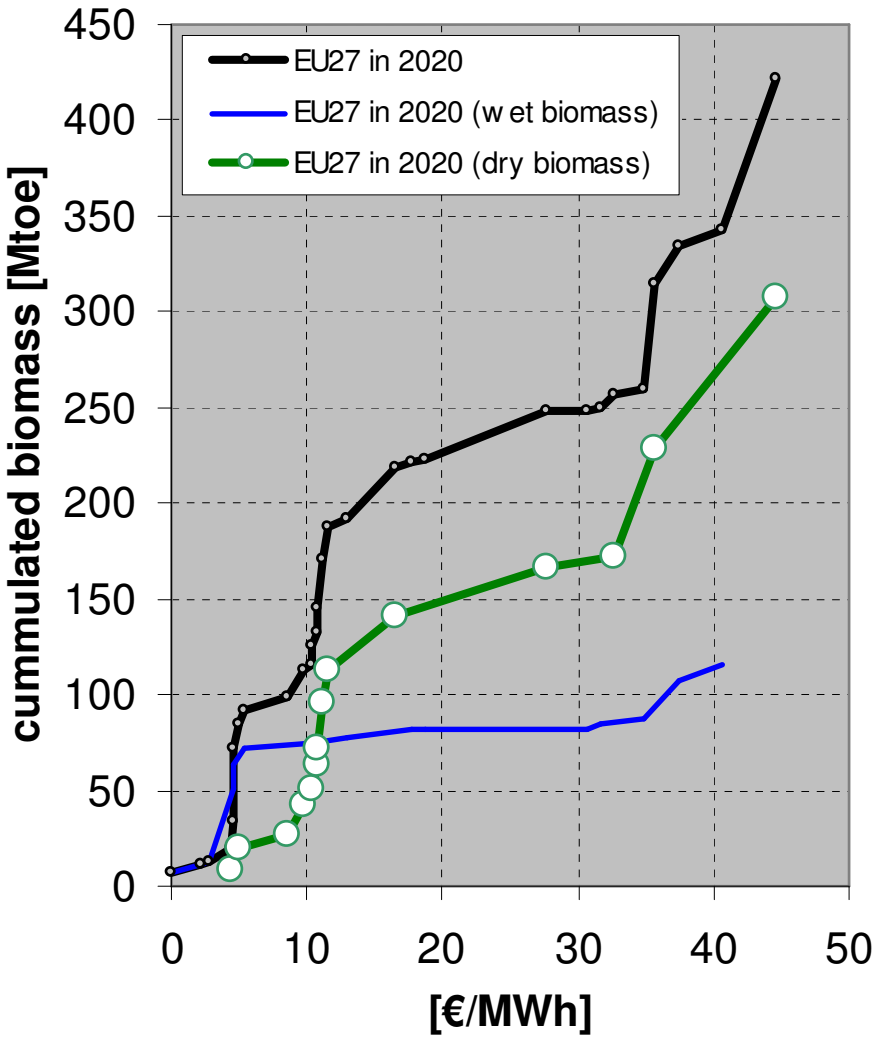
BIOMASS FUTURES

50% of potential is woody biomass, but a broad range of qualities & costs

- Secondary forestry residues
  - Saw mill by-products
  - Saw dust
- Tertiary forestry residues
  - Black liquor
  - Other industrial wood
  - Post-consumer wood
  - Used paper and cardboard

Reference: www.biomassfutures.eu

Biomass potentials and costs



Data from EU Project "Biomass futures" presented Berlin, June 6th 2011

EU27 in 2020 (dry biomass)	€/MWh	Mtoe/Biomass
Landscape care wood	4.3	8
Post consumer wood	5.0	12
saw-dust	8.6	7
Perennials: woody crops	9.7	15
MSW (Not landfill, composting, recycling)	10.4	9
Sawmill by-products (excl saw dust)	10.8	13
Other industrial wood residues	10.8	7
Perennials: grassy crops	11.2	25
straw	11.5	17
Primary Forestry Residues	16.6	27
paper cardboard	27.7	26
Cereals (wheat+barley)	32.8	6
Additional Harvestable Roundwood	35.6	56
Current Roundwood Production	44.6	79

EU27 in 2020 (wet biomass)	€/MWh	Mtoe/Biomass
black liquor	0.0	7
common sludges	2.2	4
verge gras	2.9	1
dry manure	4.7	38
MSW (Landfill)	4.7	13
prunings (fruit trees, vineyards, olives, citrus, nuts)	5.4	7
animal waste	10.4	3
Grassland cuttings abandoned grasslands	13.0	4
Forage maize (biogas)	17.6	3
Maize/corn (bioethanol)	18.7	1
Sunflower	30.6	0
Used oils and fats	31.7	2
Rape	34.9	2
Sugarbeet	37.4	20
wet manure	40.7	8

Task: On-line / off-line gas measurements

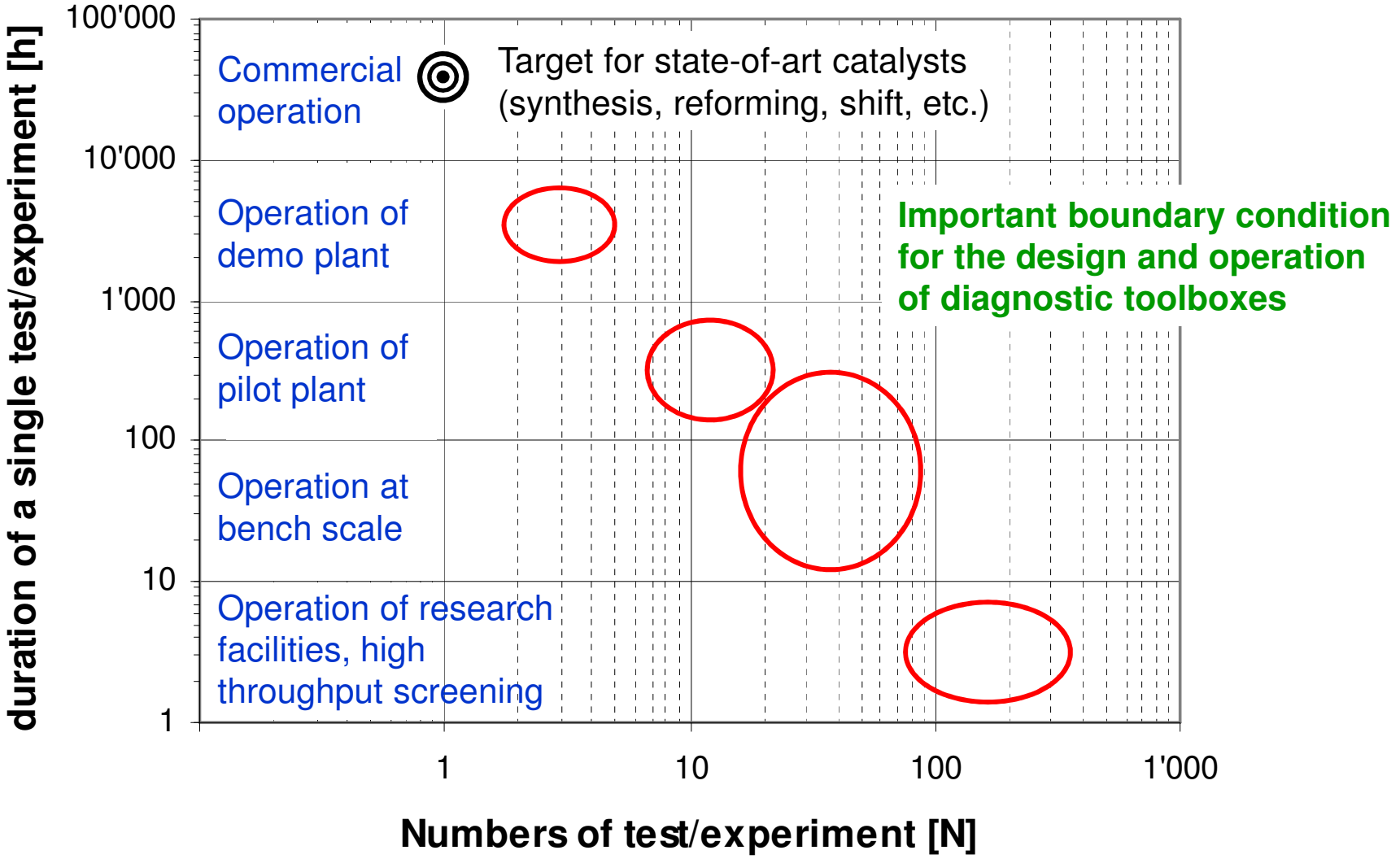
Contaminants of interest:

- particulates
- C-species (tar, soot, hydrocarbons)
- S-species
- N-species
- Cl-species
- alkalis
- metals

EERA RTD organisation willing to participate in this task:

PSI, ECN, SINTEF, KIT, Risø-DTU, CEA, ENEA, CIEMAT, Supergen (Cranfield)

Application of diagnostic toolboxes



Summary

- There is a need for pre-competitive research activities in the field of “gas analysis”
- There are multiple applications of gas analysis toolboxes:
  - Species of interest (C, S, N, Cl, …)
  - Conversion processes
  - Maturity of technology/phase of technology implementation: R&D (TRL 1 – 9), technology deployment, full commercial
  - Biomass feedstock applied

- Defining of very specific actions in the field of “gas analysis” is ongoing within EERA Bioenergy.

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Task: On-line / off-line gas measurements

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