BIOMASS FUTURES

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Bioenergy markets: the policy demand for heat, electricity and biofuels, and sustainable biomass supply

Results from alternative bioenergy demand scenarios for 2020 and 2030

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ECN Policy Studies

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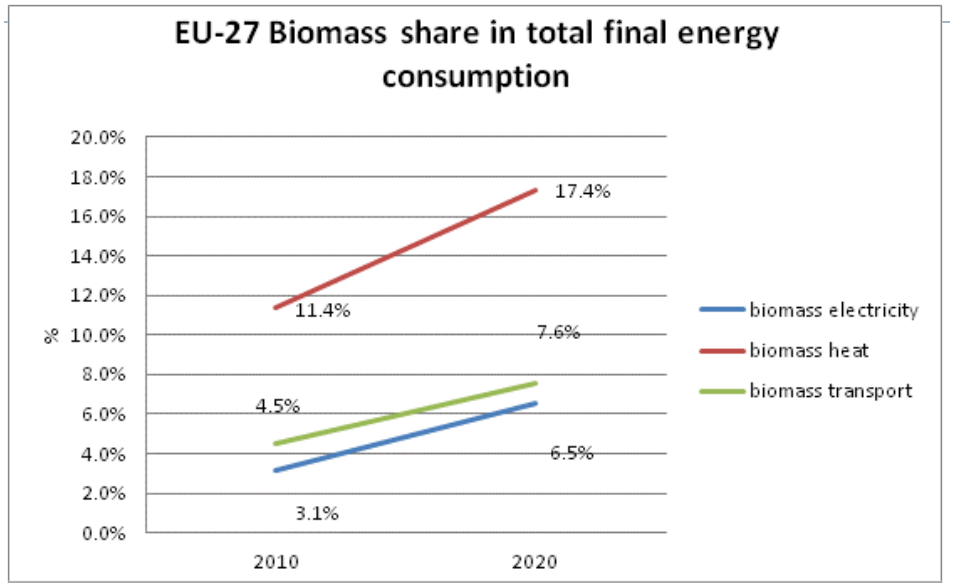
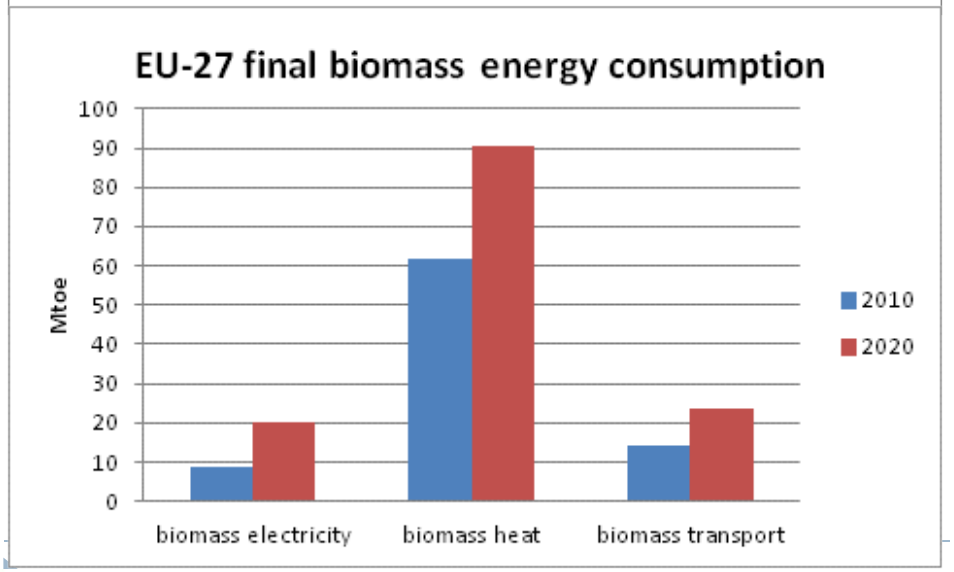
Content

1. Objectives of the modelling activity
2. Results
3. Recommendations

Biomass use in EU27 based on NREAPs





According to the NREAPs

biomass plays a crucial role in MSs reaching their targets

- Around 12% of the total gross energy demand in 2020
- from 85 Mtoe in 2010 to 134 Mtoe in 2020,
- A number of support schemes for RES electricity, heat and transport sector

Pending questions

- Implementation of sustainability criteria ?
- Potential versus demand
- whether proposed actions/policies result in achieving the targets

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Biomass Futures-ECN energy modelling

Set up and quantify scenarios and sensitivity variants addressing the Climate Change and the current EU RE policy , detailed per MSs.

The results

- The share of biomass application in the different sectors
- The percentage or the available (sustainable) biomass supply that is actually used
- Costs (direct and in comparison with fossil competitor),
- GHG emission reductions

- ***ECN RESolve Model Set including a static biomass allocation model, dynamic RE-E and RE-H/C market models.***
  - ***Includes intra- EU trade and biomass/biofuel import***

Scenarios presented

Reference scenario	• Existing RED sustainability criteria (only for biofuels) • No iLUC factor
Global Sustainability (domestic + imports)	• RED sustainability criteria applied to all bioenergy, • mitigation requirement increased to 70% for 2020 and 80% for 2030 • ILUC factor included
Common to both	•In both scenarios the recent policy measures presented in NREAPs and the PRs have been include

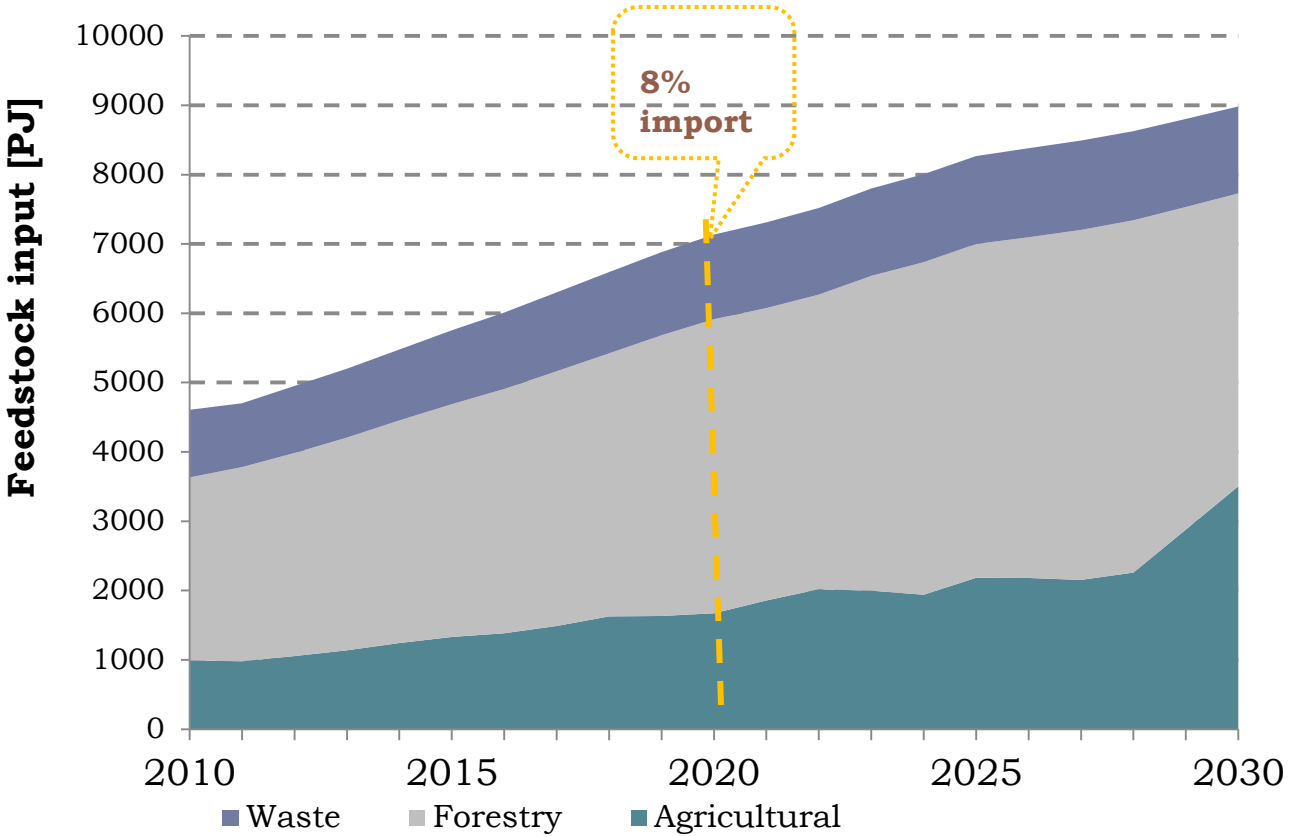
Conclusions

- Europe holds a significant amounts of biomass potential for energy purposes
  - agricultural potential is large but only around 30% is economically and technically feasible to produce energy

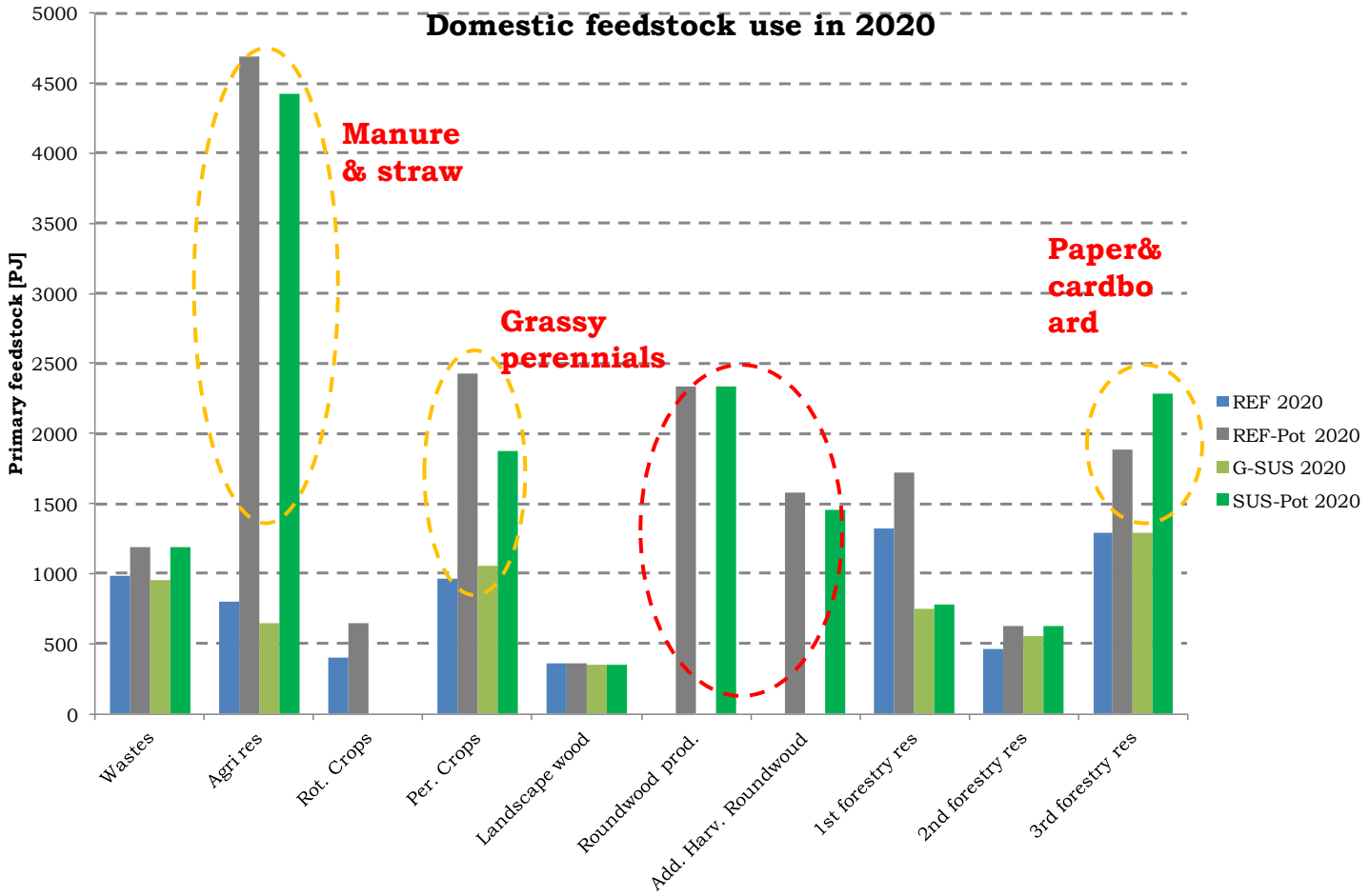
- Current policy initiatives are not sufficient to reach the targets set in NREAPs

- Strengthening sustainability criteria, including the iLUC effects and expanding them to electricity and heat sector result in
  - Difficulty in biogas electricty/heat sector
  - Reduced biofuel production in Europe (bioethanol disappears and biodiesel production limited to used fats and oil)
  - Increased import of wood pellets
  - Urgency for the 2nd gen. technologies
  - Reanalysis of the biofuels role in reaching the renewable transport targets

In 2020 only around 40% of domestic feedstock will be utilised to contribute to the NREAP bioenergy targets.



Feedstock utilisation versus potential in 2020



Utilising the agricultural residues for energy purposes will remain as a challenge.

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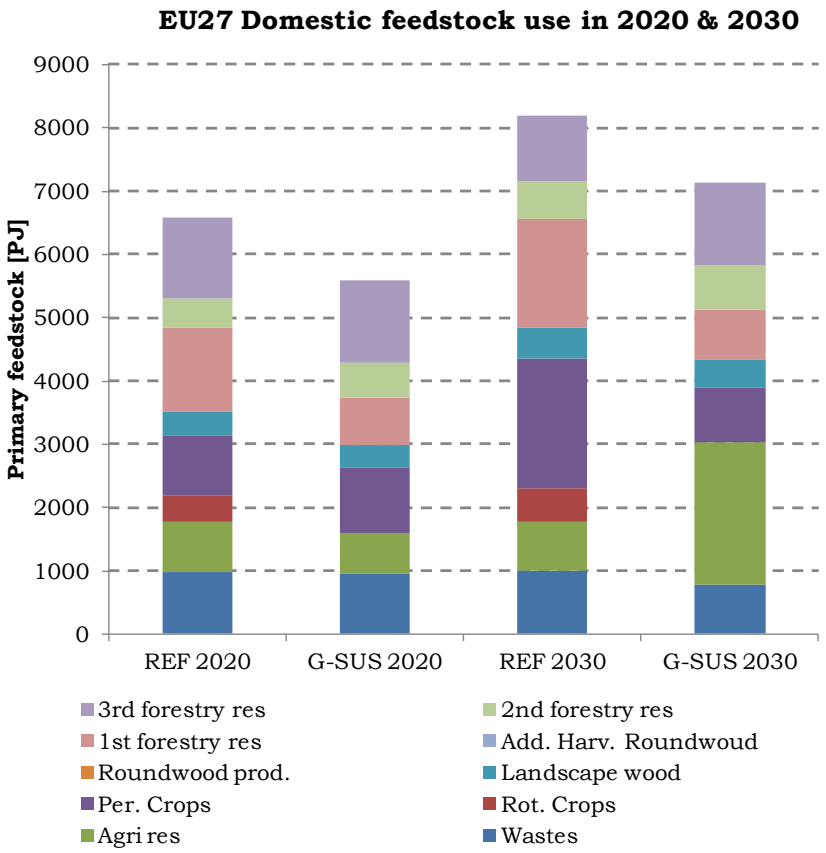
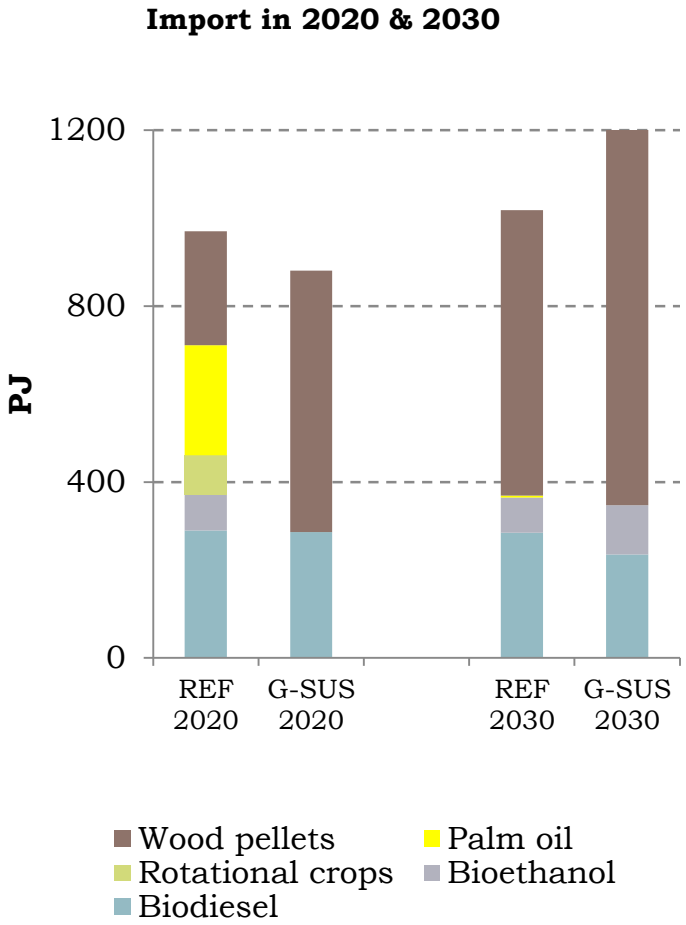
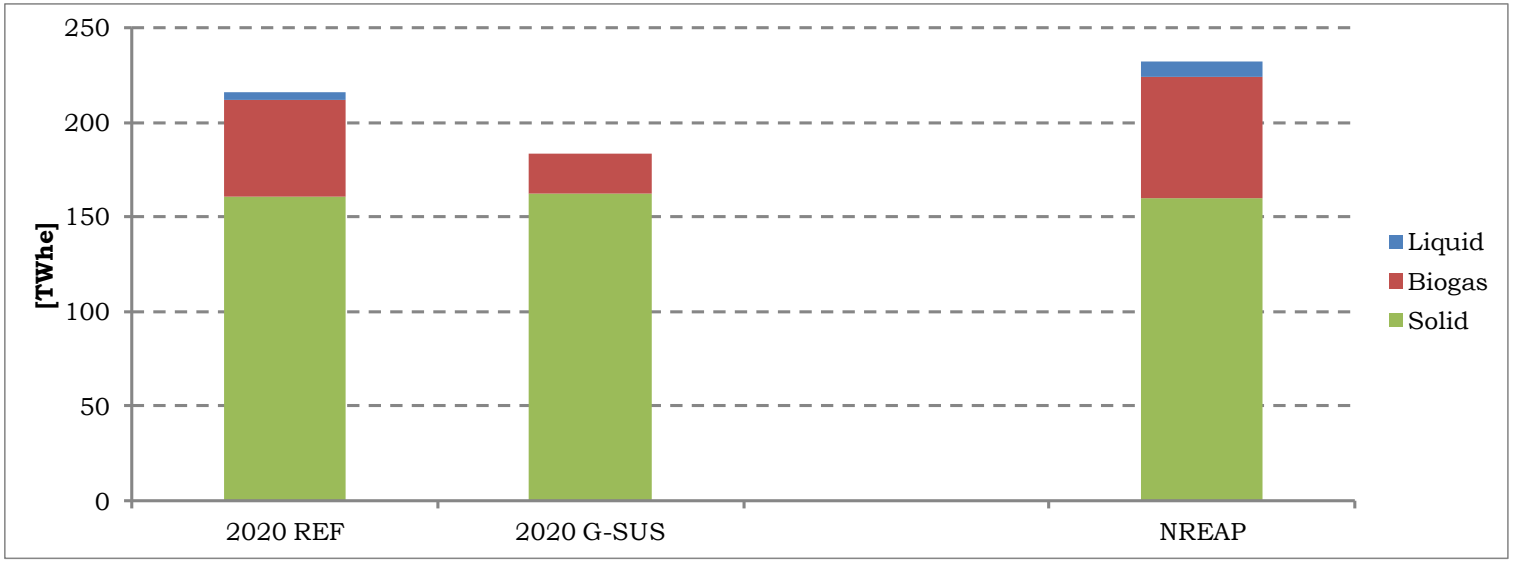
Import - Reference v.s. Global sustainability scenario





Electricity sector –biomass uptake

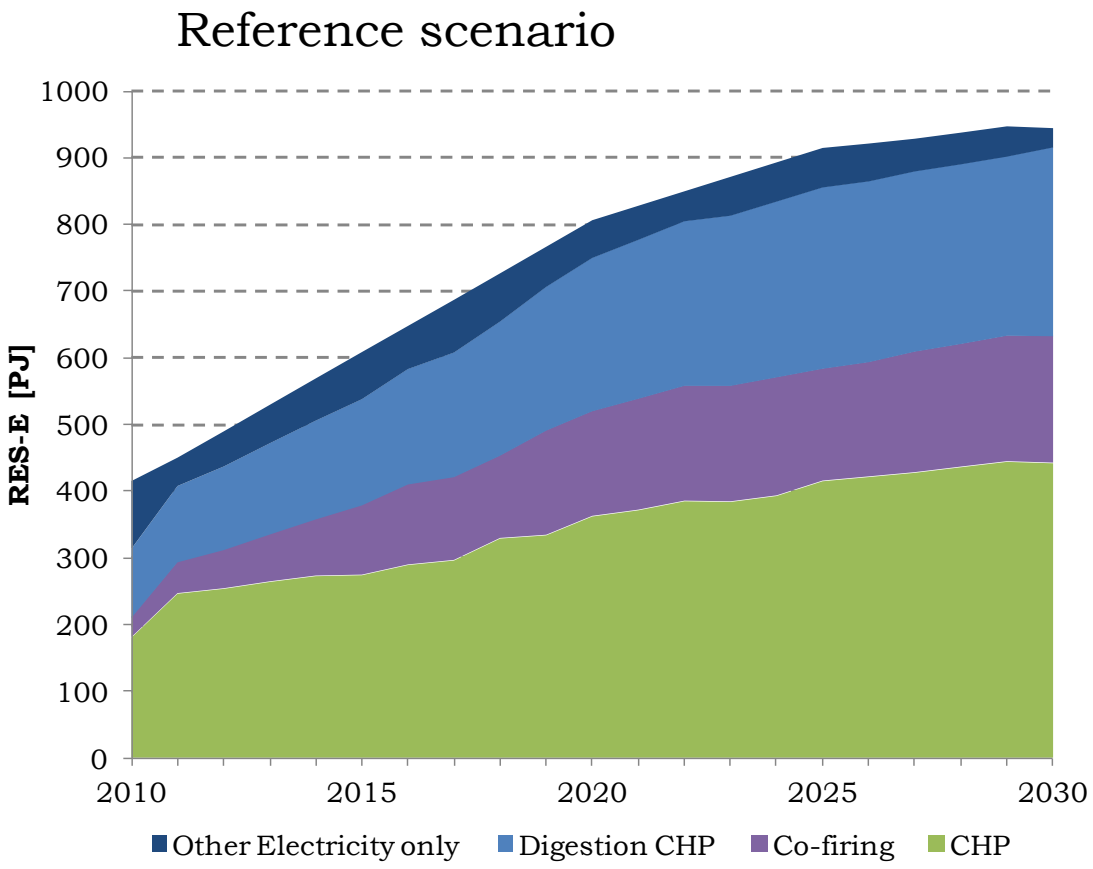
EU 27 total electricity production from biomass in 2020



Deviation between the reference scenario and NREAPs is 7%, increasing to 21% when the sustainability criteria are strengthened (and iLUC included) and expanded.

- **Biogas sector is the most effected.**

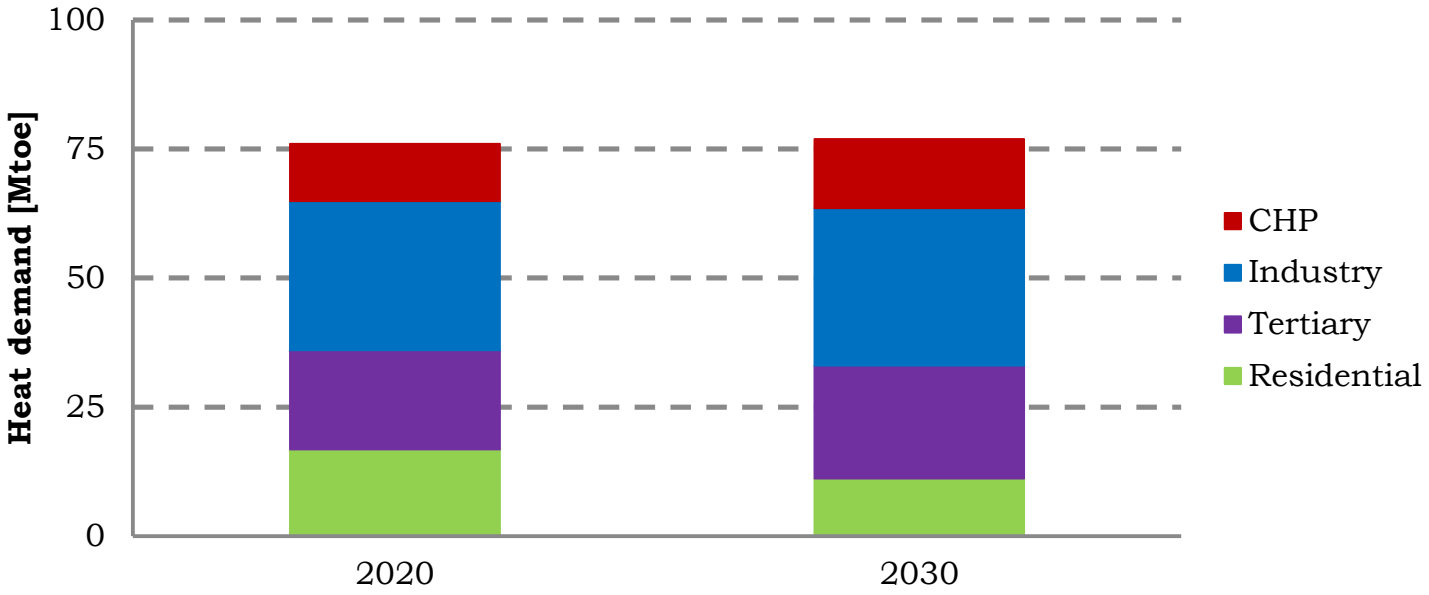
Electricity sector-biomass technology uptake



- biomass-CHP plays an important role –around 5 % of the total electricity production in 2020.

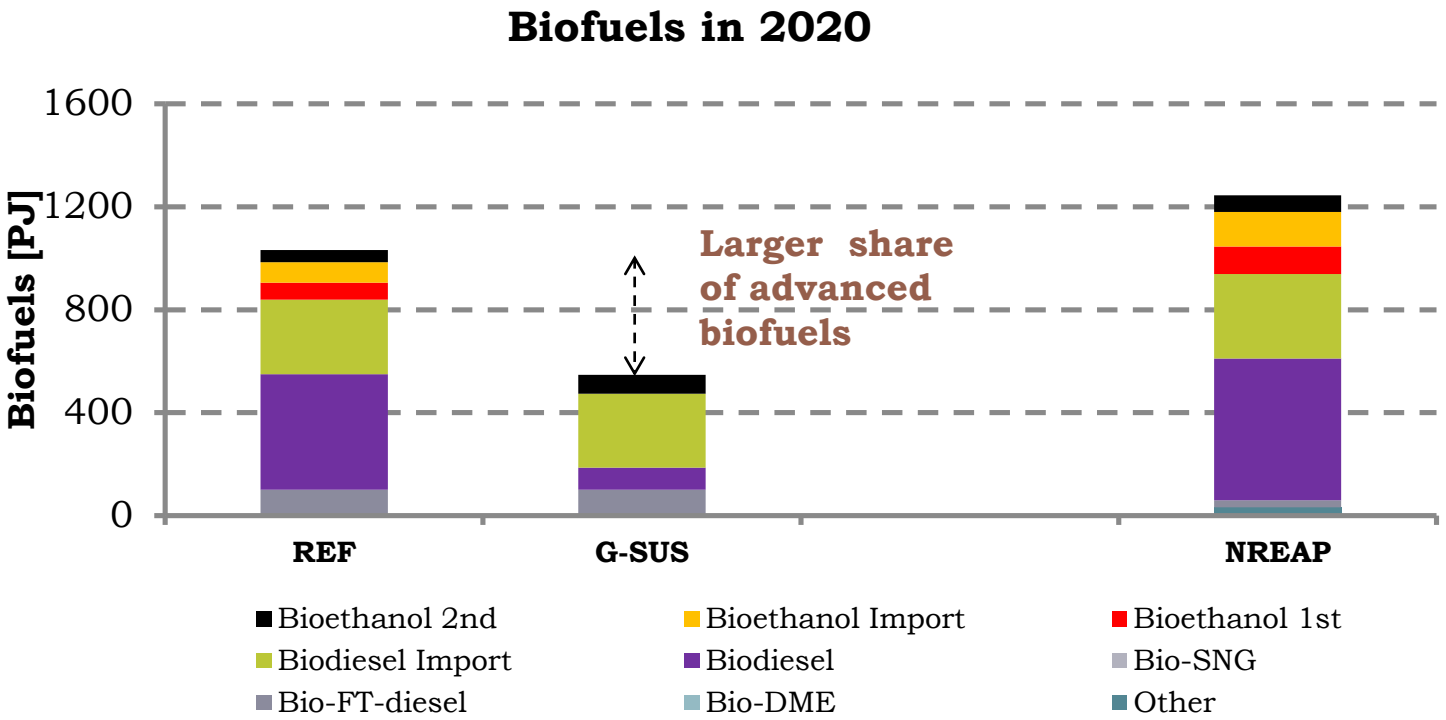
- However its' development depends on the local heat demand and the existing infrastructures.

Reference scenario heat production from biomass



	2010 Share	2020 Share	2030 Share
Residential	47%	22%	15%
Tertiary	14%	25%	28%
Industry	28%	38%	40%
CHP	11%	15%	17%

Biofuels production Reference versus G. sustainability scenario



Stronger GHG mitigation targets combined with the iLUC criteria can result in

- No domestic bioethanol production
- Significantly decreased biodiesel production (only used fats and oils)
- Ambitious 2nd generation technology growth rates

Conclusions

- Europe holds a significant amounts of biomass potential for energy purposes
  - agricultural potential is large but only around 30% is economically and technically feasible to produce energy

- Current policy initiatives are not sufficient to reach the targets set in NREAPs

- Strengthening sustainability criteria, including the iLUC effects and expanding them to electricity and heat sector result in
  - Difficulty in biogas electricty/heat sector
  - Reduced biofuel production in Europe
  - Increased imports (wood pellets)
  - Urgency for the 2nd gen. technologies
  - Reconsider the biofuel role in reaching the renewable transport targets

Recommendations

❑ Policy initiatives should be tailored to pull previously unused biomass from the forests and gather post-consumer residues and promote the most efficient technologies

❑Agricultural residues need to be utilised - through enhancing use of straw and prunnings and help to find sustainable co-substrates for the manure digestion for biogas.

❑While CHP plays an important role its efficient use should be ensured through investments into the district heating systems

❑Current policy initiatives should be strengthened to achieve the targets.

❑Application of sustainability criteria not only to domestic resources but to imports shall be safeguarded.

❑2nd generation technologies need to be brought to the market asap.

❑Current work considers intra-trade of biomass and biofuels but do not consider statistical transfer of electricity and/or heat in reaching the targets. Thus, the role of cooperation mechanisms should be further researched.

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www.biomassfutures.eu

Thank you!

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Sustainability criteria

	Reference	Sustainability
GHG mitigation criteria 2020	Only for biofuels & bioliquids ➢ GHG emission mitigation : 50% Excludes iLUC	For all bioenergy consumption in the EU ➢ Biofuels/bioliquids: 70% mitigation ➢ Bioelectricity and heat: 70% mitigation as compared to 2020 fossil energy mix Compensation for iLUC related GHG emissions.
GHG mitigation criteria 2030	Only for biofuels & bioliquids ➢ GHG emission mitigation : 50% Excludes iLUC	For all bioenergy consumed in the EU ➢ Biofuel/bioliquids: 80% mitigation ➢ Bioelectricity and heat: 80% mitigation as compared to country specific fossil mix) This includes compensation for iLUC related GHG emissions.
Other sustainability constraints	Only for biofuel and bioliquids consumed in Europe the use of biomass from biodiverse land or land with high carbon stock	For all bioenergy consumed in EU limitations on the use of biomass from biodiverse land or land with high carbon stock.

In the RESolve model from 2017 onward the GHG emission reduction criterion is set to 50% and from 2018 onwards to 60% for installations that become operational on or after 2017.

ILUC-GHG emissions per crop (gr. CO2eq/MJ bioenergy) based on the review of studies used in the assessment of storylines in this report and from the ATLASS (2011) study

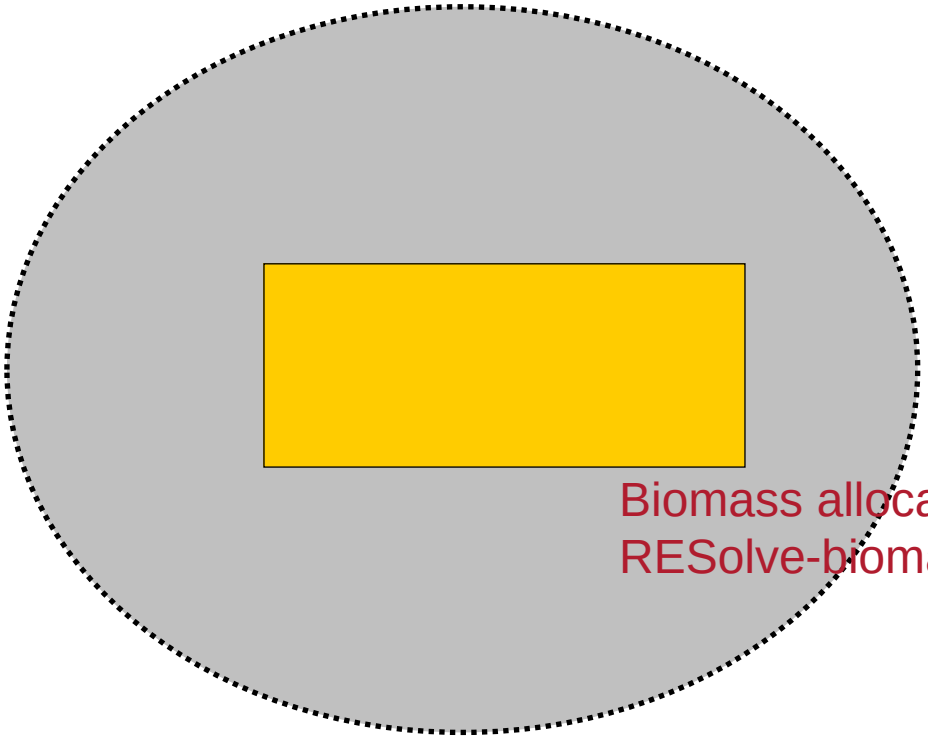
Type of biofuel	Median iLUC values reported in inventory of studies in this report (see Chapter 4)	Average ILUC emissions from ATLASS (2011) in	% difference
Rapeseed	77	55	71%
Wheat	73	14	19%
Sugar beet	85	7	8%
Palm oil	77	54	70%
Soybean (from Latin America)*	140	56	40%
Soybean (from US)*	65	56	86%
Sugar cane	60	54	90%
Maize	60	10	17%
Ligno-cellulosic based land using 2nd generation ethanol**	52	15	29%
Ligno-cellulosic based land using 2nd generation biodiesel**	52	15	29%

*Atlass (2011) does not distinguish between the two
**In this study this refers only to the 2nd generation biofuels produced from dedicated crops. In the ATLASS this includes a much wider range of ligno-cellulosic feedstock, including waste, which is probably one of the reasons for this lower iLUC factor.

RESolve models

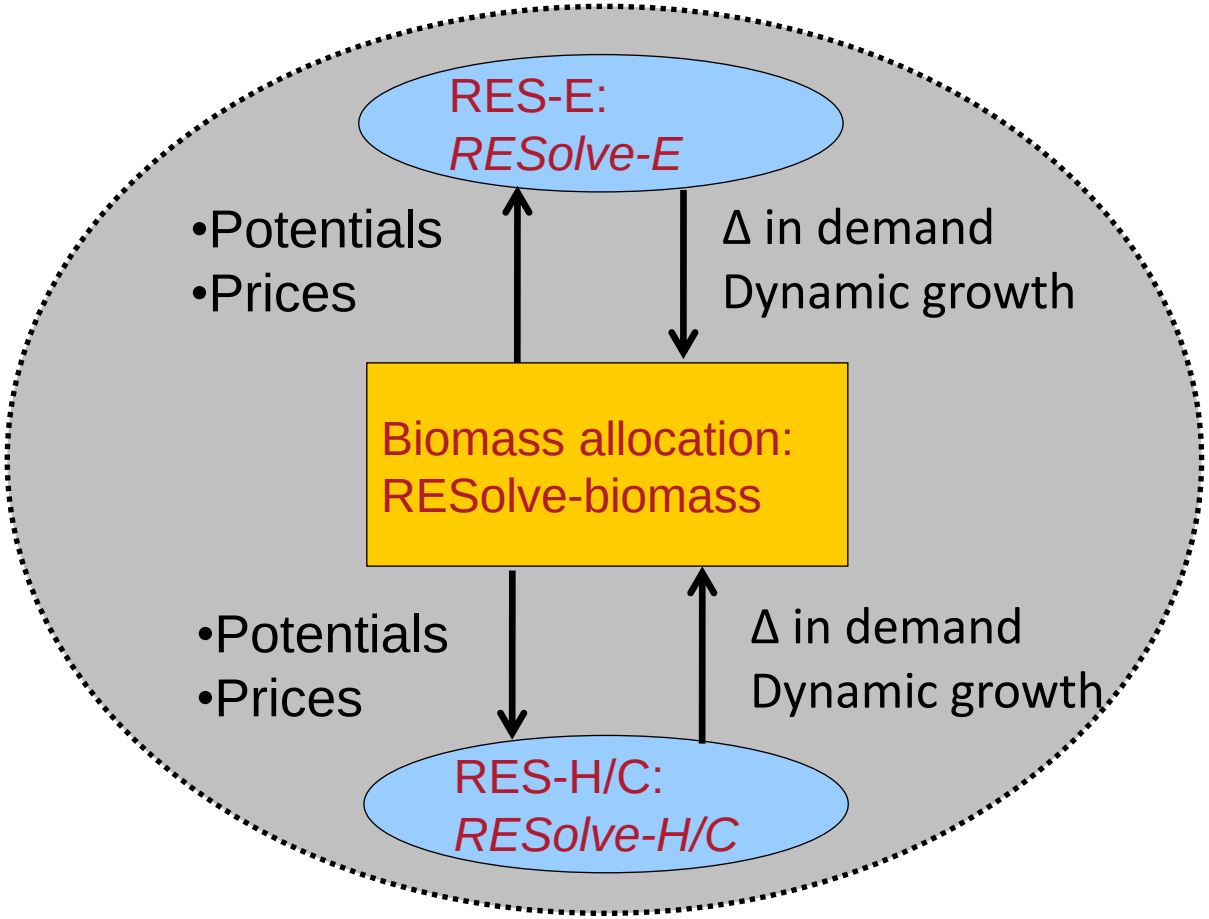
- **General:** RES only; up to 2030; on a yearly basis; EU27 (country level)
- **RESolve-E:** RES-E + heat from CHP; simulation (projection);policies important
- **RESolve-H:** RES-H; simulation (projection)
- **RESolve-biomass:** biofuels + bio part of RES-E and –H; optimization

RESolve: linkage between models



STATIC

RESolve: linkage between models



Dynamic

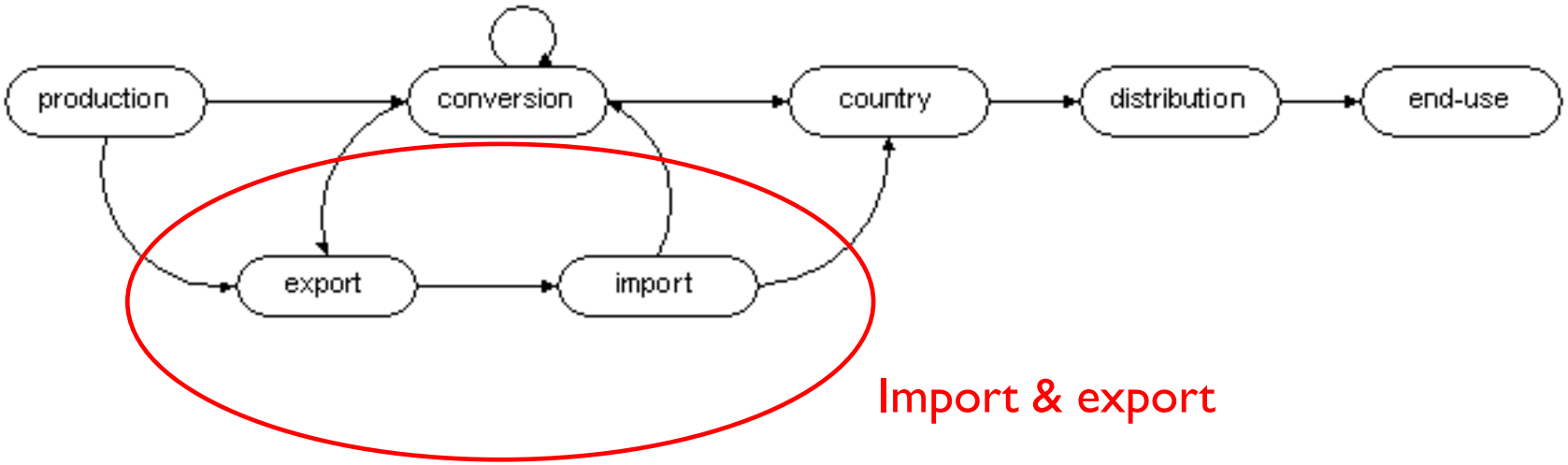
Biomass allocation in RESolve-Biomass

Find the minimal additional cost allocations along the bio-energy supply chain in the EU, given projections of demand, potentials and technological progress

with respect to reference commodities

biofuel target, bio-electricity and -heat

RESolve-Biomass: how does it work?



Import & export

GHG constraints included

RESolve-E: how does it work?