

PÖYRY MANAGEMENT CONSULTING



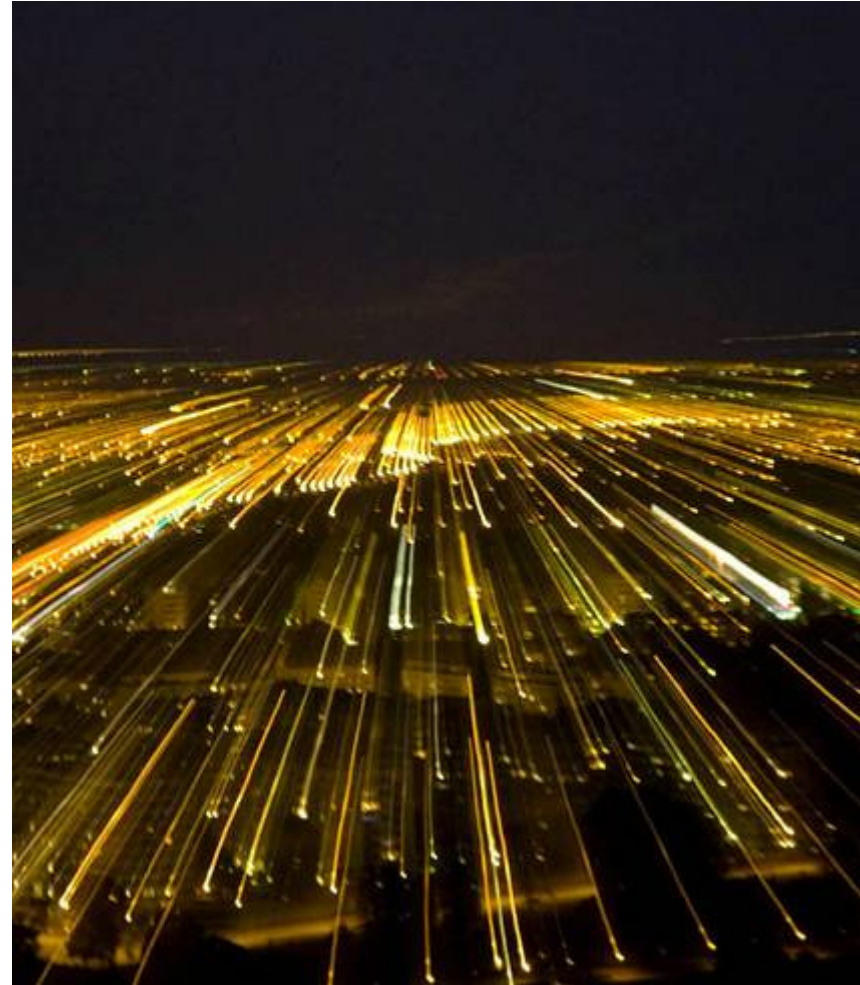
BIOMASS IMPORTS TO EUROPE AND GLOBAL AVAILABILITY

IEA – 2n Workshop – Cofiring biomass with coal

27.03.2012

Global experts in consulting and engineering

- Pöyry Group is a global consulting and engineering company dedicated to balanced sustainability
- 7000 experts in about 50 countries
- Project experience in more than 100 countries
- 17 000 projects annually
- Net sales in 2011 EUR 796 million
- Listed on the NASDAQ OMX Helsinki since 1997



Pöyry Group - Global Presence



Pöyry Management Consulting – Bioenergy

- Bioenergy and managing climate change has developed into a key challenge for the energy sector and energy-intensive industries.
- Pöyry know-how covers all aspects of sustainable feedstock management, supply chains and biomass conversion schemes
- Our expertise in Bioenergy covers
 - *Upstream integration:*
 - *Biomass sourcing and processing*
 - *Supply chain and logistics*
 - *By-products and waste utilisation*
 - *Conversion technologies*
 - *Dedicated biomass plants and co-firing*
 - *Pellets, Torrefaction*
 - *2G Biofuels, Pyrolysis Oil*
 - *Downstream market analysis*
 - *Heat and power*
 - *Biofuels and Biorefining*
 - *Incentive schemes and carbon trade*
 - *Market, Technical, Financial Due Diligence*



Content

- Biomass potentials EU27
- Supply/Demand gap assessment
- Global biomass availability
- Summary
- Contact

Funding:

VGB
RESEARCH

eurelectric
ELECTRICITY FOR EUROPE

2020 Biomass potentials EU27

Executive Summary:

NREAP (Solid and liquid biomass):

Adjusted biomass demand for primary energy use (including bioliquids) is estimated at around 213 Mtoe.

Supply gap: 75 Mtoe for solid and liquid biomass
(NREAP supply: 138 Mtoe).

PÖYRY (only solid biomass):

Solid biomass demand for primary energy use varies between 146 and 158 Mtoe.

Supply gap: 26 to 38 Mtoe for solid biomass
(Pöyry supply calculation: 120 Mtoe).

2020 Biomass potentials EU27: Demand

Estimation of demand for biomass for primary bioenergy use

The amount of primary biomass required to produce a unit of energy will depend on the exact nature of the feedstock and the conversion technology involved.

The NREAPs provide little information on what feed-stocks and conversion technologies are envisaged

To estimate primary biomass requirements we have made simple assumptions about the conversion efficiency for each generic class of biomass and energy end use (as shown left), based on assumed 'typical' technologies in each case.

Note that the conversion efficiency here is the efficiency of the whole conversion process from the feed-stock biomass in its primary form to the output energy.

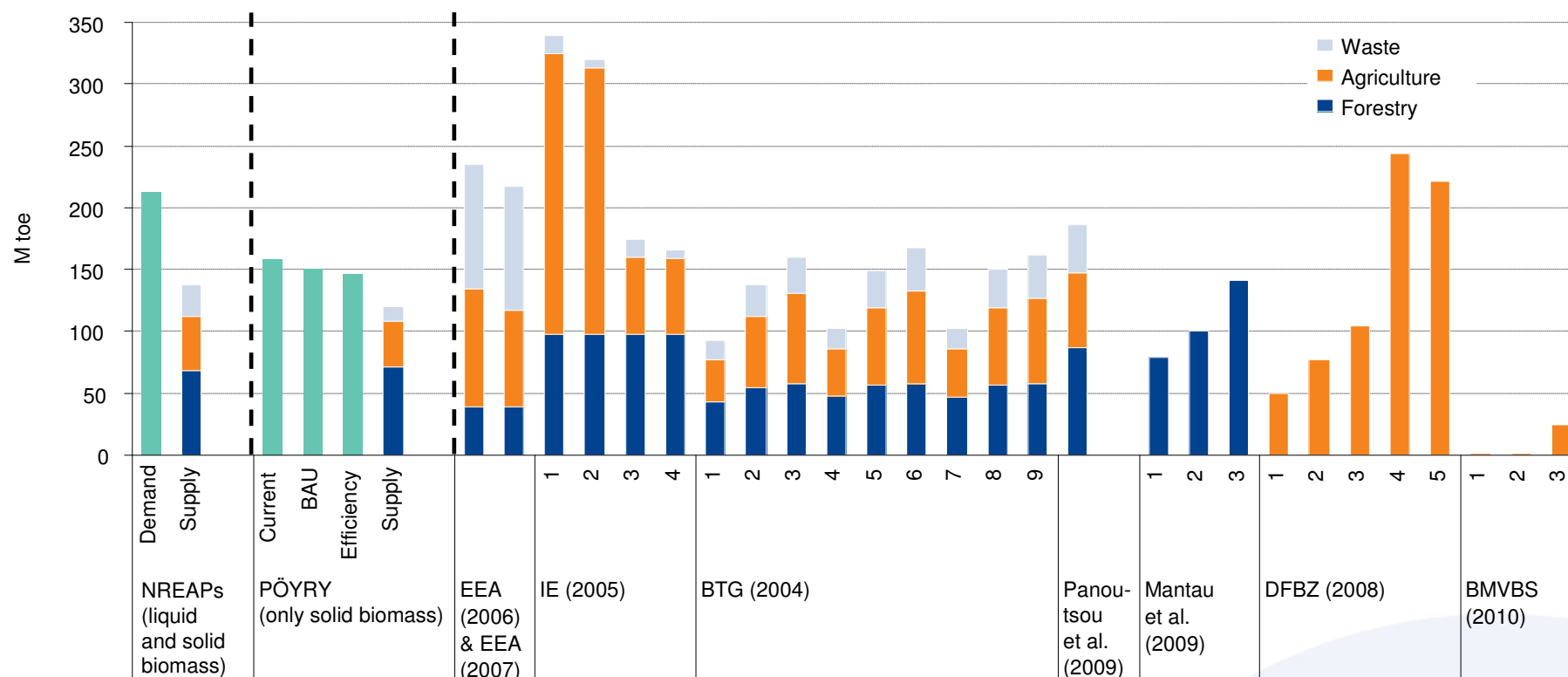
Primary energy to final energy						
Scenario	Current		BAU		Improved Efficiency	
	Electricity	Heating and Cooling	Electricity	Heating and Cooling	Electricity	Heating and Cooling
Solid Biomass	30%	85%	34%	85%	37%	85%
Biogas	26%	67%	30%	67%	33%	67%

Calculation of biomass demand – including bioliquids			
	Electricity	Heating and Cooling	Transport
Solid biomass	30%	85%	-
Bioliquids	30%	60%	-
Biogas	26%	67%	-
Bioethanol	-	-	51%
Biodiesel	-	-	75%

Result: Solid biomass demand for primary energy use varies between 146 and 158 Mtoe.

2020 Biomass potentials EU27

Comparison of supply/demand (Selected studies, NREAPs and Pöyry calculations)



Sources:

PÖYRY
NREAPs
EEA (2006)
EEA (2007)
BMVBS (2010)
BTG (2004)

Mantau et al. (2009)
IE (2005)
DFBZ (2008)
Panoutsou et al. (2009)

Results forestry - Pöyry database; Agriculture and waste - own calculations

Assortment grouping in accordance with 2009/548/EC; Supply information is directly taken from the NREAPs. Where ranges were given the average was taken.

EU 25; black liquor, waste wood, wood processing residues, agricultural residues and manure are included in waste

Forest and waste potentials taken from EEA (2006)

World food supply secured; Manure not considered in the agricultural potential; no predictions for forest and waste potentials available

Assortments regrouped; only forest residues are considered in the forest potential; agricultural potential comprises also biodiesel and bioethanol; waste includes demolition wood, dry manure and black liquor

No changes; no predictions for agricultural and waste potentials available

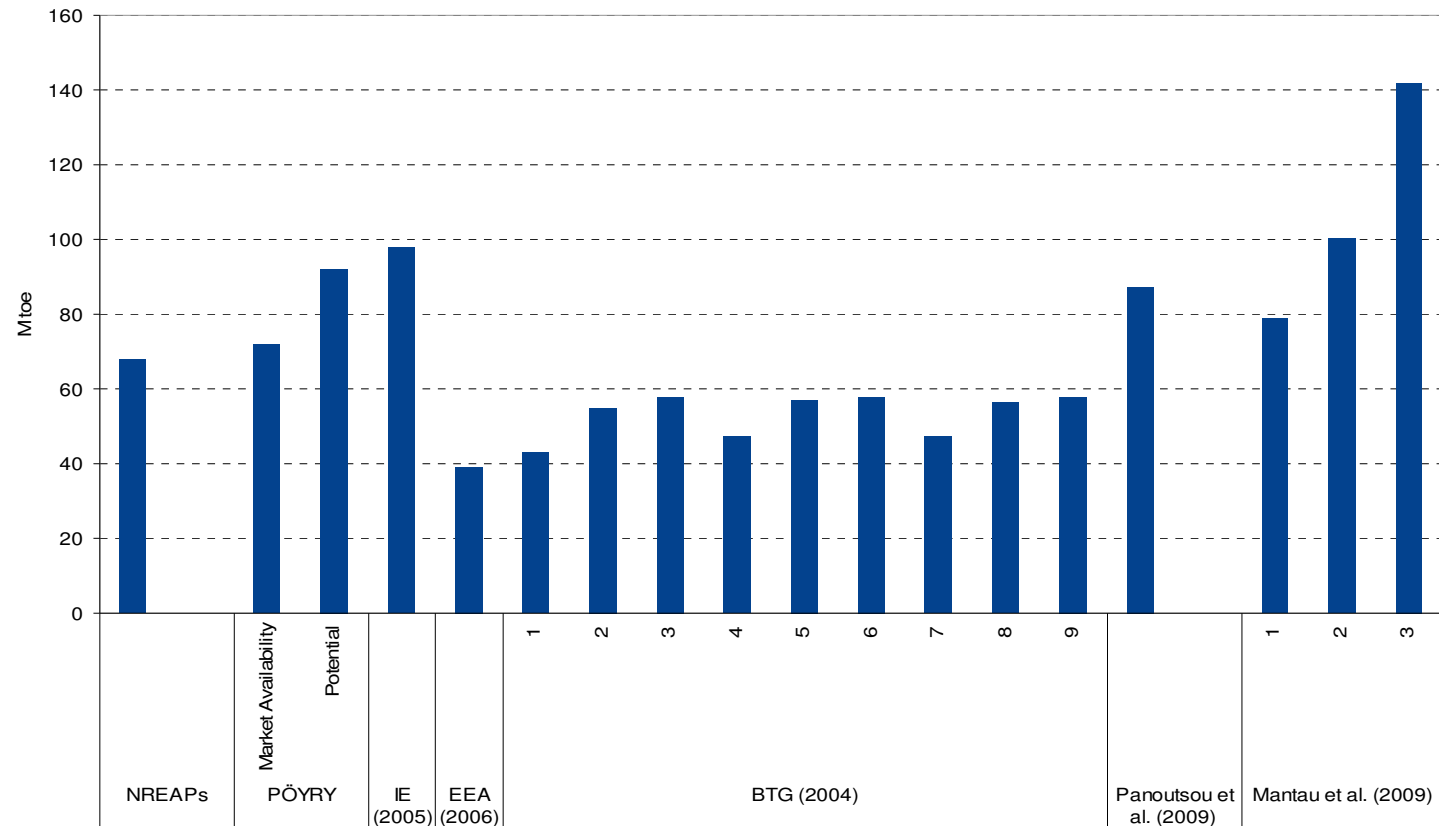
Assortments regrouped, historic data for waste are kept constant in 2020; high and low conversion paths considered

No changes; no predictions for forest and waste potentials available

Assortments regrouped

Plausibility assessment: Forestry 2020

Pöyry results are on a level with Mantau et al. (2009, Scenario 1). Restrictions in market availability lead to comparable level as stated in NREAPs



Sources:

Only studies are considered that take into account as many or less assortments as defined in 2009/548/EC

EEA (2006)

BTG (2004)

Panoutsou et al. (2009)

Black liquor, waste wood and wood processing residues are included in waste
Assortments regrouped; only forest residues are considered in the forest potential; waste includes demolition wood and black liquor

Assortments regrouped

Mantau et al. (2009):

Scenario 1

Scenario 2

Scenario 3

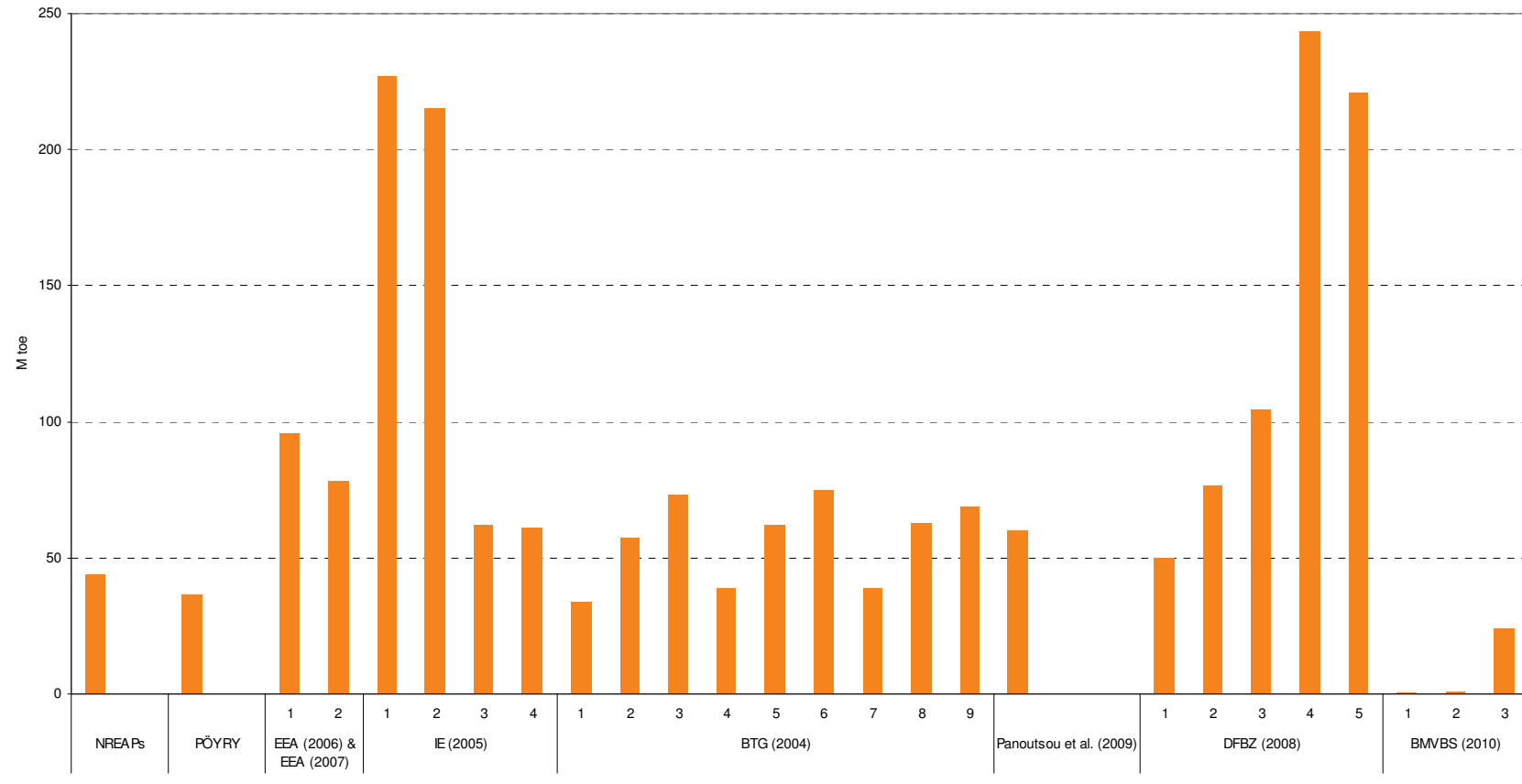
High Demand – Low mobilisation

Medium Demand – Medium Mobilisation

Low Demand - High mobilisation

Plausibility assessment: Agriculture 2020

Pöyry calculations are on a level with BMVBS (2010, by DBFZ). Current initiatives to increase supply don't seem to work to the expected extend.



Sources:

Only studies are considered that take into account as many or less assortments as defined in 2009/548/EC

BMVBS (2010)

BTG (2004)

IE (2005)

Panoutsou et al. (2009)

World food supply secured; Manure not considered in the agricultural potential
agricultural potential comprises also biodiesel and bioethanol; waste includes dry manure
Assortments regrouped
Assortments regrouped

BMVBS (2010)

World food security is assumed.

Scenario 1

Scenario 2

Scenario 3

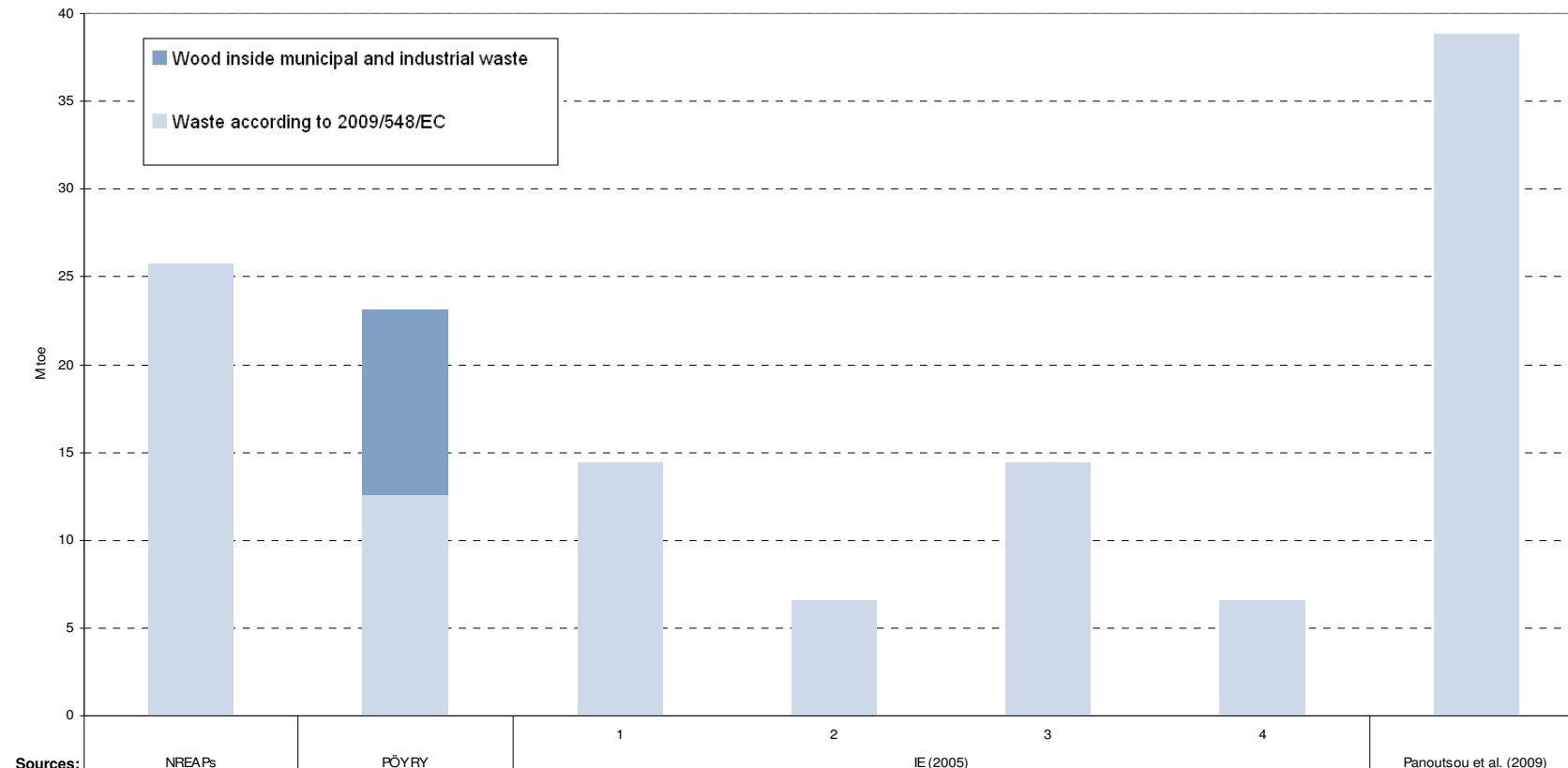
Business as usual (BAU)

Bioenergy under tightened environmental and conservational restrictions (B&U)

Bioenergy (B)

Plausibility assessment: Waste 2020

Pöyry calculations are on a level with IE (2005) under high energetic yield assumptions and are comparable to NREAP figures.

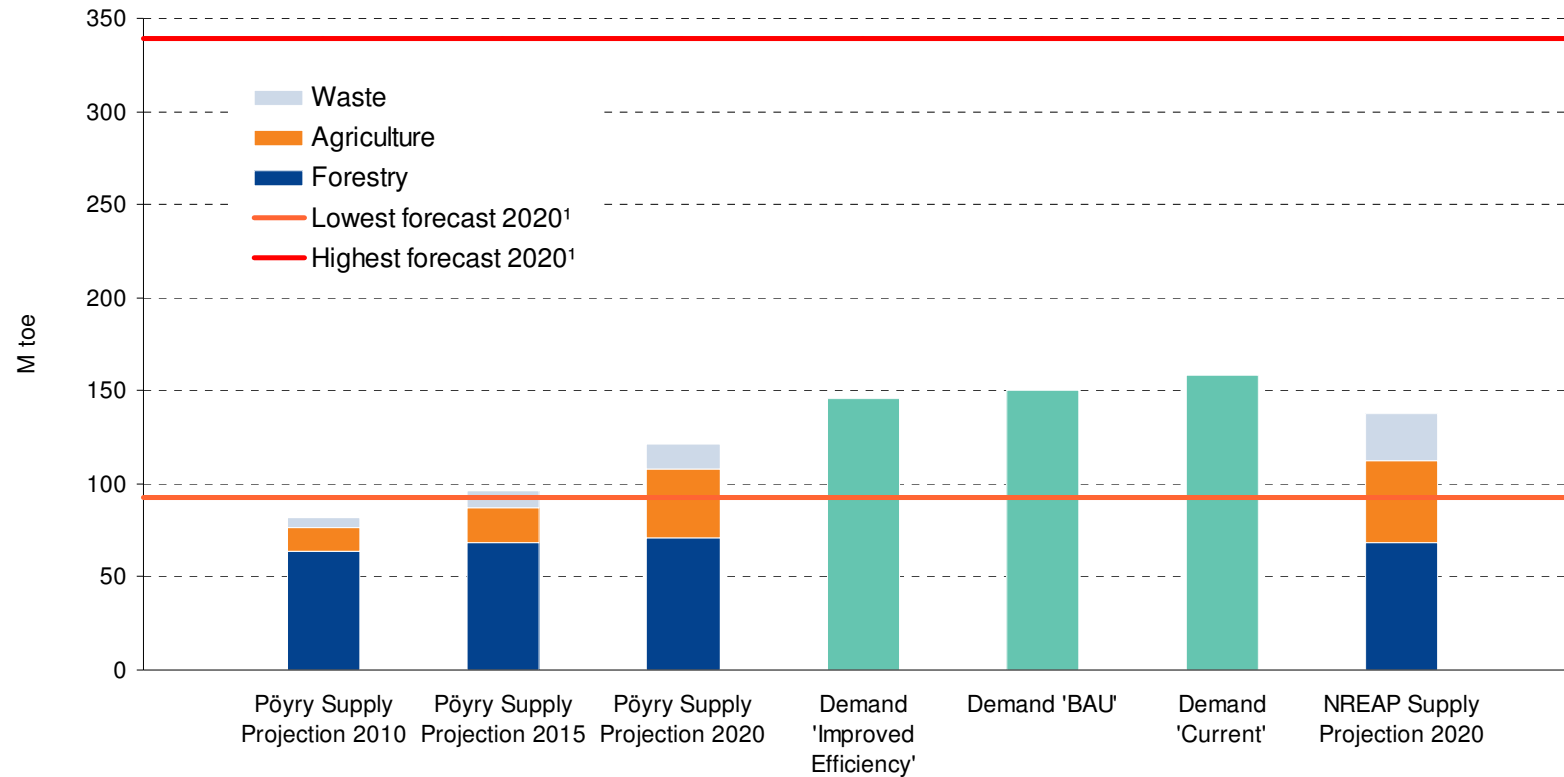


Sources: NREAPs, PÖYRY, IE (2005) 1, 2, 3, 4, Panoutsou et al. (2009)
Only studies are considered that take into account as many or less assortments as defined in 2009/548/EC (post consumer wood not included in waste)

NREAPs: Assortment grouping officially in accordance with 2009/548/EC, post consumer wood seems to be included
IE (2005): Assortments regrouped; historic data for waste are kept constant in 2020
Panoutsou et al. (2009): Assortments regrouped

Plausibility assessment (1/2)

Projection of biomass supply volumes 2010 - 2020



¹ Forecasts taken from analysed studies (see slide 8)

Plausibility assessment (2/2)

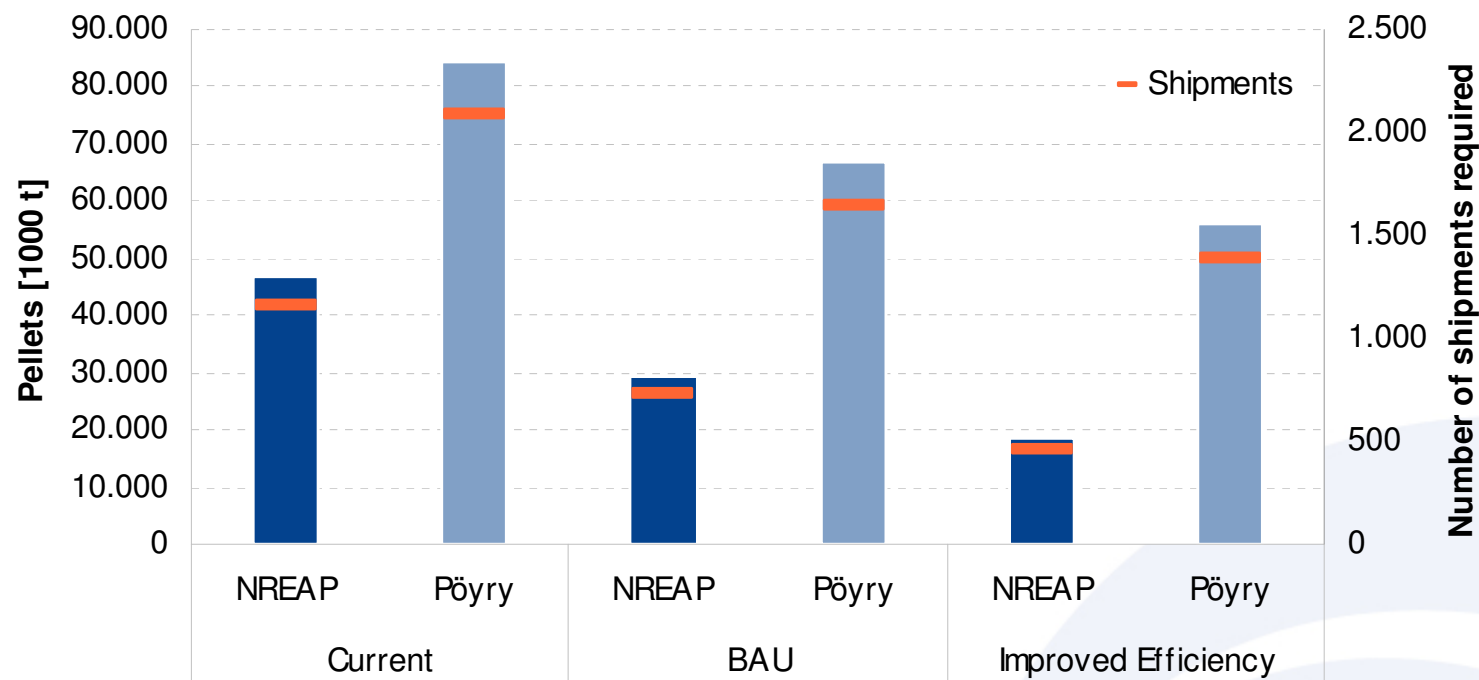
Pöyry estimates that 82 Mtoe of domestic resource were available in the year 2010. This is lower than the reported 2006 NREAP Potential with 86,98 Mtoe. To explain this gap it has to be noted that in reported NREAP sums 2006 imports (solid and liquid) were included and Pöyry does only include domestic solid biomass and biogas supply.

For the time 2010 to 2015 Pöyry expects a compound annual growth rate of around 3,3 %, for the time 2015 to 2020 anticipated growth speeds up to 4,7 %.

To reach the NREAP goal an overall growth rate of 5,2 % is required. To reach this objective heavy investments are needed - which would be linked to further incentive schemes.

Import options

Filling the full 2020 supply gap of European markets with imports of solid biomass would require significant volumes. Wood pellets would be an option and 55 – 85 Mio. t of pellet imports would be required. (For comparison: 2010 global pellet market is 16 Mio. t and Imports to Europe account for ~ 3 Mio. t.). Pöyry's ViewPoint* expect realistic ~11 Mio. t of Pellet imports to Europe 2020.



* Pellets – Becoming a Global Commodity? Pöyry Multiclient Study 2011

Used conversion factors: pellet heating value: 18 GJ/ tatro (mix woody and agricultural pellets); 40.500 t/ shipment
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Global Biomass availability

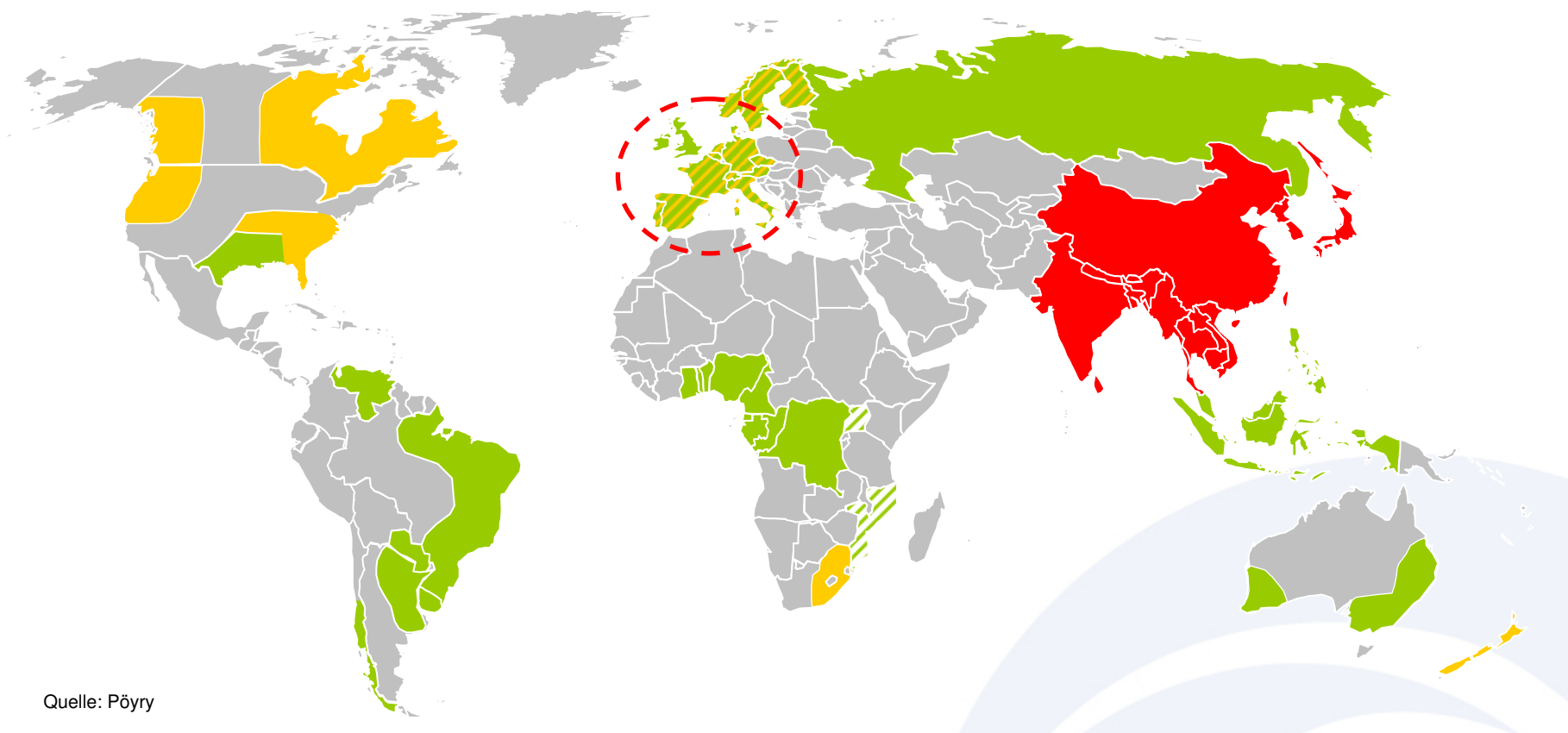
Global Wood Supply

Wood supply in central Europe remains more or less stable. Regions with significant growth are mainly Russia, US South, South America and Africa. In the short run Canada has to be considered due to insect calamities.

■ Growing supply

■ Stable/Decreasing supply

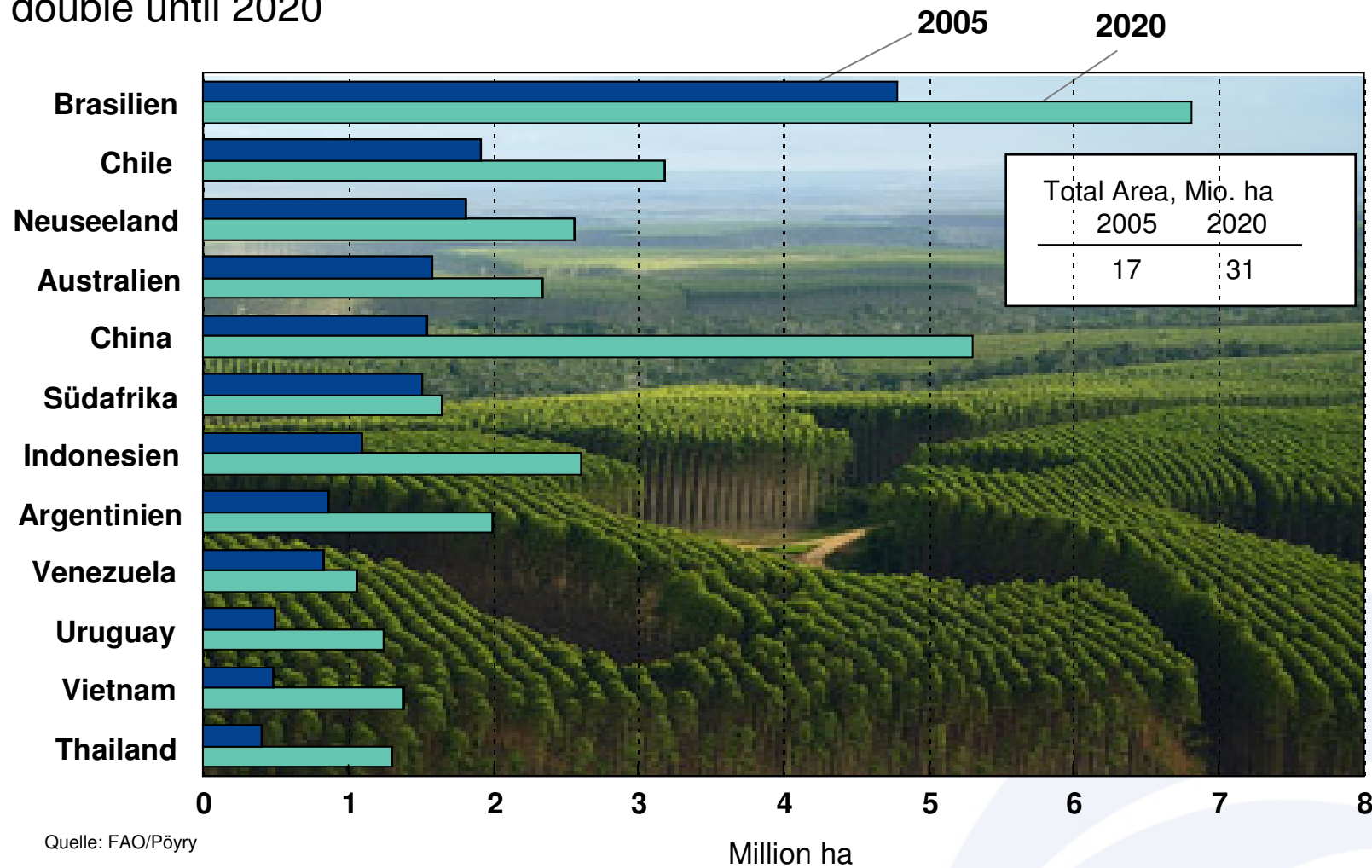
■ Growing deficit



Quelle: Pöry

Plantations

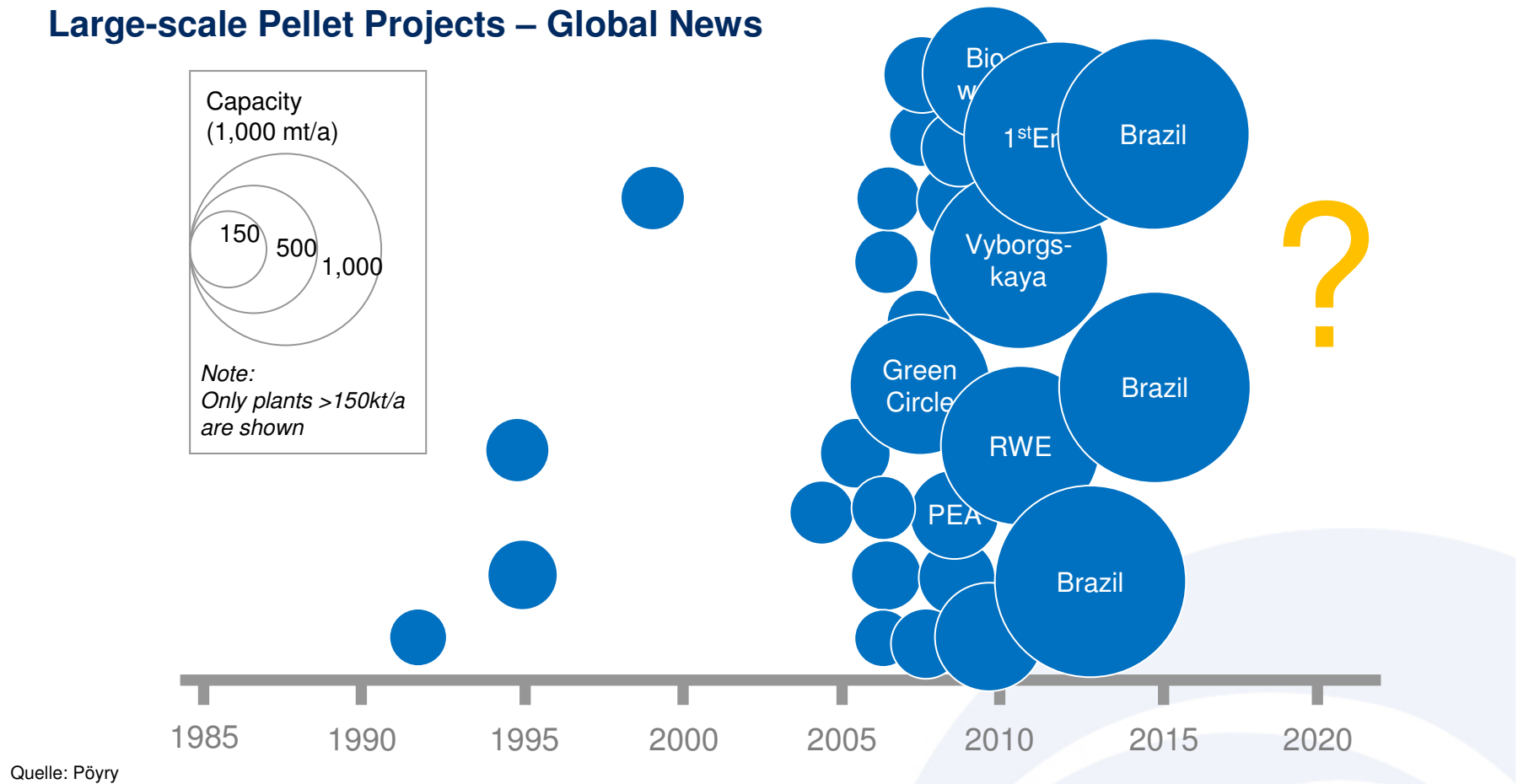
On the southern hemisphere area of fast growing plantations is expected to double until 2020



Global Pellet Production – New Facilities

Capacities of pellet producers have grown clearly in the recent years. New plants in Brazil are announced to start production until 2015 – with capacities of 1 Mio. t/a each.

Large-scale Pellet Projects – Global News



Chips and Pellets Oversea shipment

Pellet imports are especially of interest for overseas transports with downstream inland logistics. Chips from overseas sources usually are directly consumed at port of destination. A regular dry bulk carrier can carry up to 30-40% higher energy content than special designed woodchip carriers.

Woodchip Carrier



Cargo Hold Capacity	110,000 m ³
Deadweight (Dwt)	53,600 mt

Regular Dry Bulk Carrier



Cargo Hold Capacity	60,000 m ³
Deadweight (Dwt)	53,500 mt

	Density (kg/m ³)	Net calorific value (GJ/gmt)	Vessel type	Load weight (tons/shipment)	Energy transported (GJ/shipment)
Woodchips	385	12.3*	Woodchip carrier	42,300 tons	520,000 GJ
Wood Pellets	650	17.0**	Dry bulk carrier	40,500 tons	689,000 GJ

Summary

- Liquid and solid Biomass demand in Europe is higher than stated in the NREAPS (213 Mtoe).
- The NREAP **supply of woody biomass** in 2020 **seems plausible**, if existing programs for mobilisation will work.
- The NREAP **supply of biomass from agriculture** show strong variation and potentials. **Development would require additional incentives.**
- Without major changes, there is a solid biomass supply gap in Europe to be expected in 2020: **(26 to 38 Mtoe)**.
- Global availability (technical potentials) exists to supply these volumes from global markets.
- Impact on European Bioenergy markets should be assessed.



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