

The Hotspots of the Global Wood Pellet Industry and Trade 2017

Webinar 1. December 2017



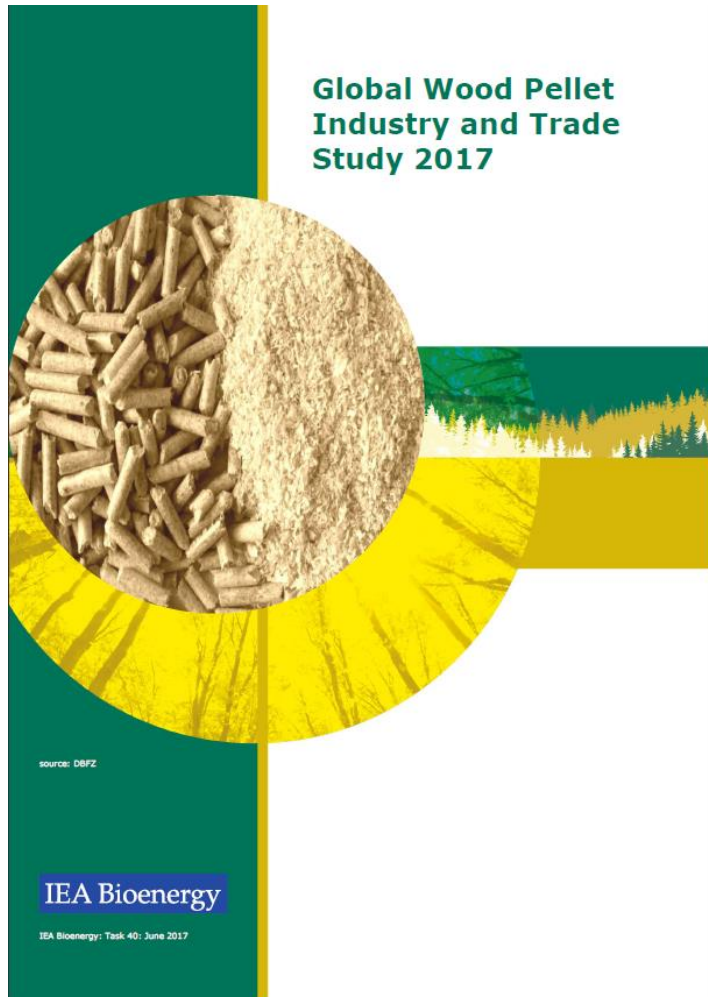
Presented by:

**Martin Junginger, Daniela Thrän,
Kay Schaubach, Fabian Schipfer,
Michael Wild**

Outline of today

15:30	Welcome, intro of the speakers	Martin Junginger
15:40	The global view: hot spots, trade and major issues	Daniela Thrän
15:50	North America – the large exporters	Kay Schaubach
16:00	Europe – the center of consumption	Fabian Schipfer
16:10	Sustainability legislation/criteria for wood pellets	Martin Junginger
16:15	Prospects of torrefaction and advantages	Michael Wild
16:20	Q&A	Martin Junginger (moderation), all
16:50	Summary	Daniela Thrän
17:00	Closure	

The study



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http://task40.ieabioenergy.com/wp-content/uploads/2013/09/IEA-Wood-Pellet-Study_final-july-2017.pdf

The speakers



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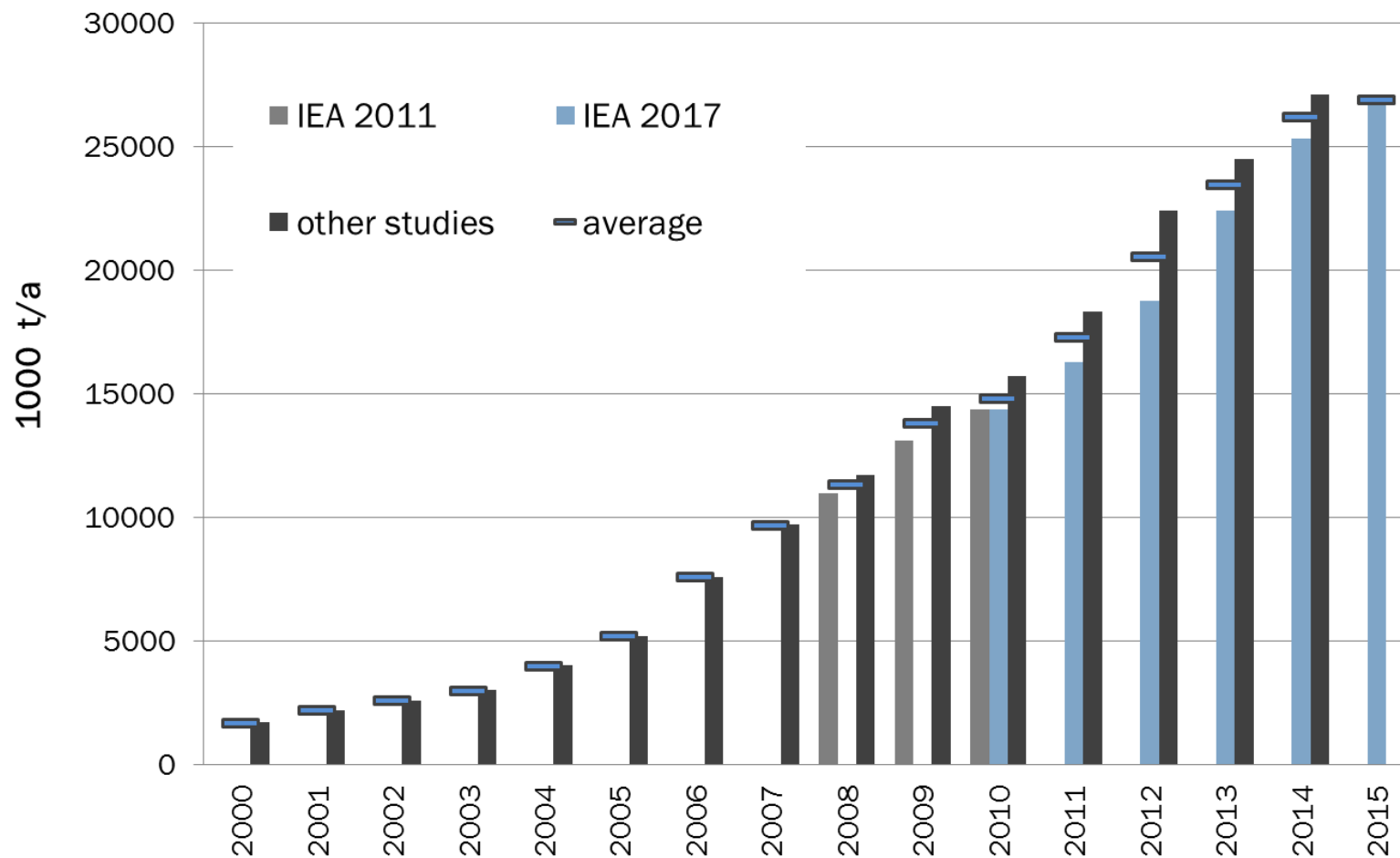
Michael Wild
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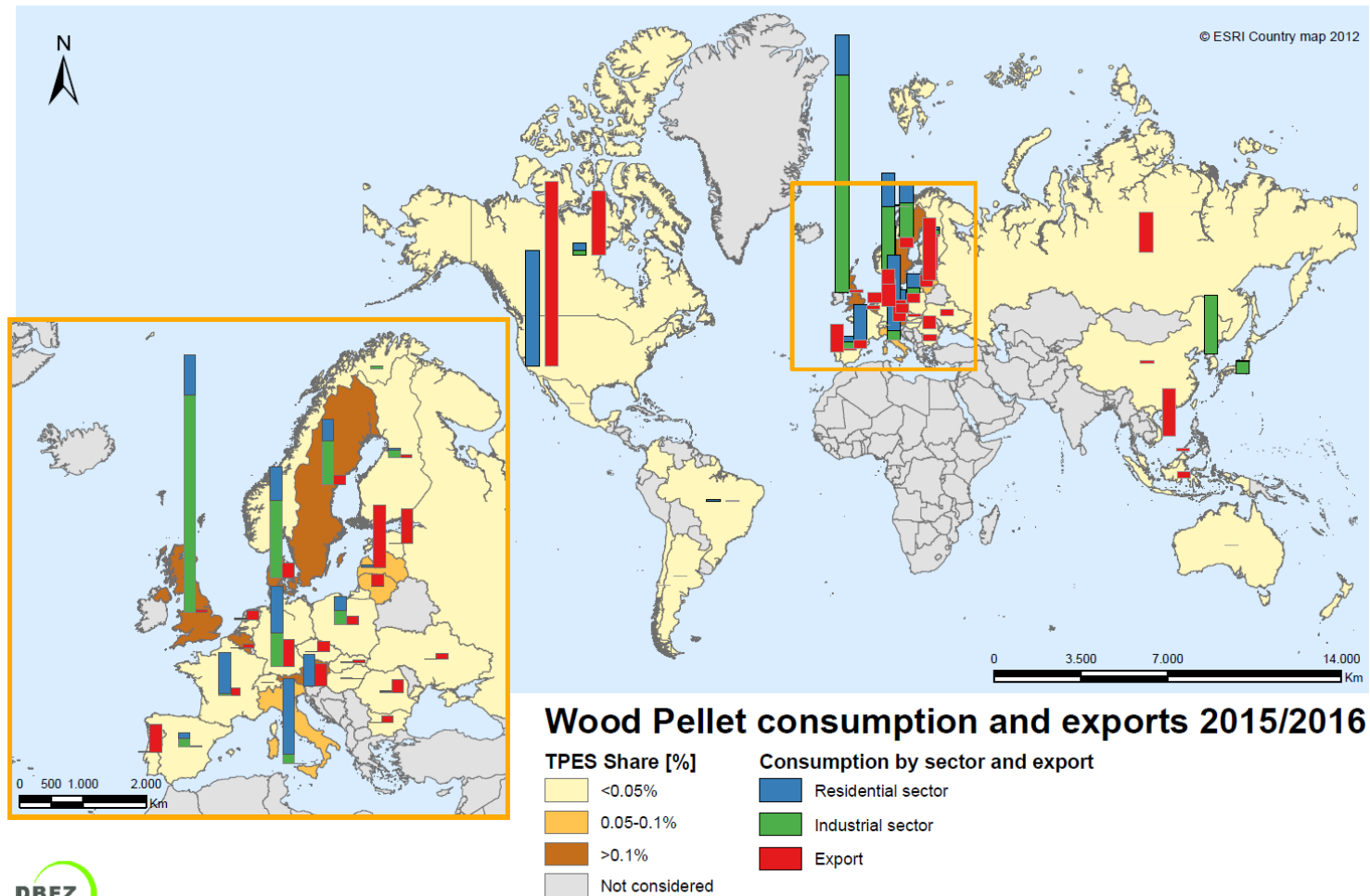
The global view: hot spots, trade and major issues

Daniela Thrän, DBFZ

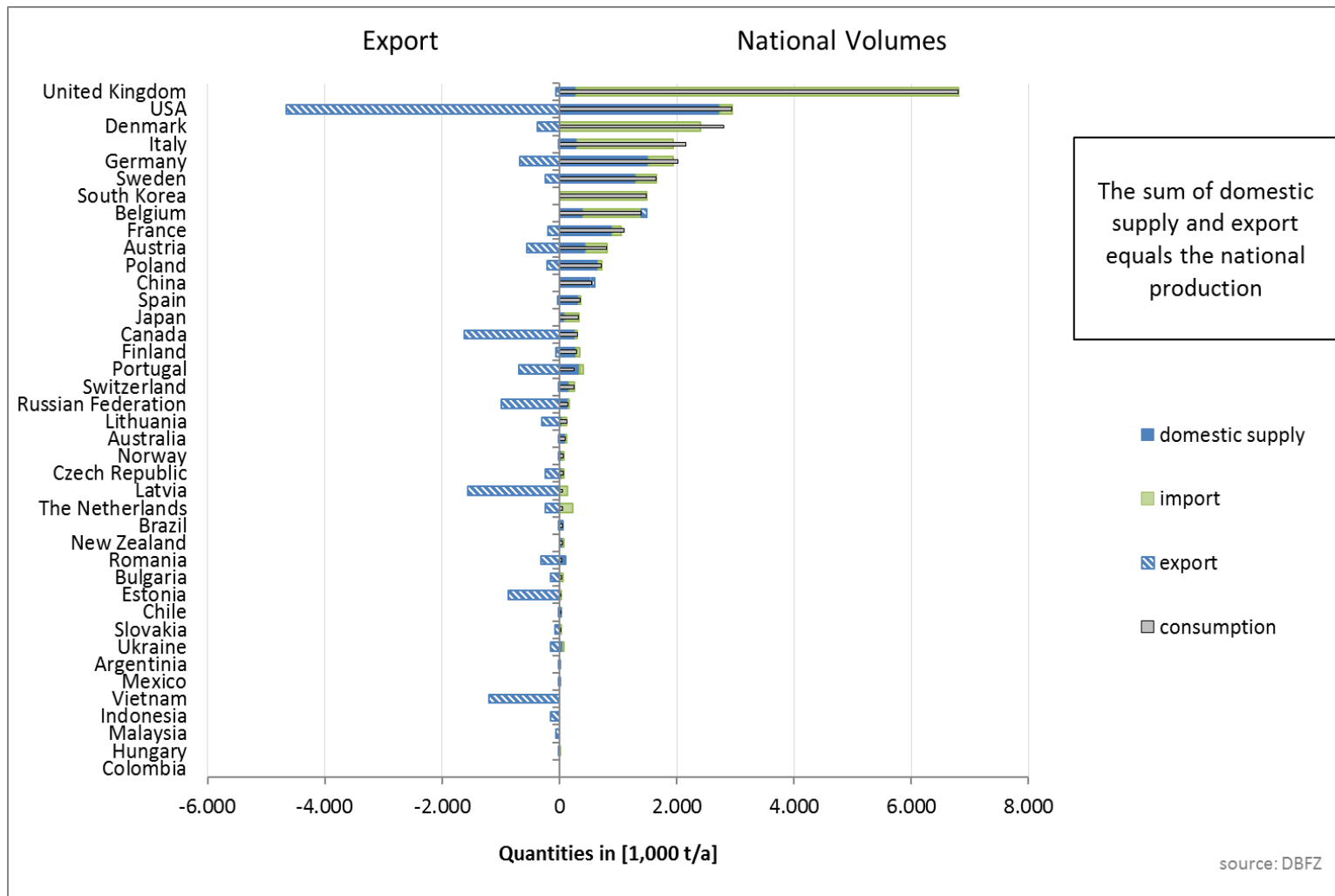
The wood pellet market is continuously growing



The global hotspots – consumption and exports



The countries in detail



The hotspots – continents and sectors

Europe (EU28):

- 75% of global consumption
- 54% of global production
- 64% for heat generation
- 36% for electricity

North America

- 12% of global consumption
- 35% of global production
- Consumption mostly heat

Asia:

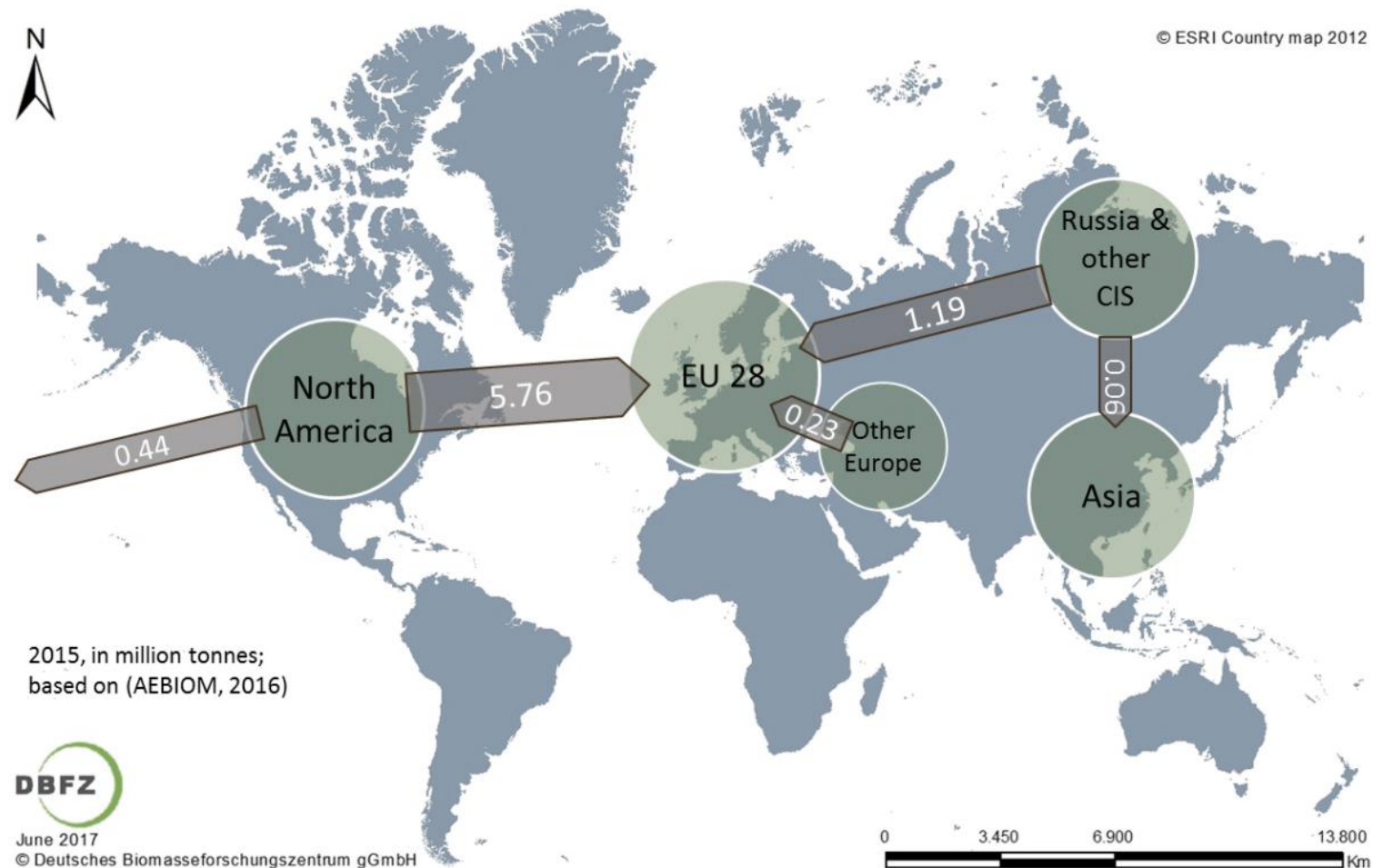
- Rising, with Japan, South Korea
- China is the great unknown

A special relation:

US and UK

- UK largest global consumer with 6.7m t (2015); equals 25% of global demand
- UK has almost no domestic production
- US is the largest producer
- 56% of UK imports come from US
- since 2015, over 84% of US exports are destined for UK

The global trade flows



Major issues – drivers and barriers

- Regulatory framework conditions
- Ensuring sustainability along the value chain
- Transforming wood pellets into a global commodity
- For the future:
new technologies (i.e. upgrading such as torrefaction) and
new markets (i.e. bioeconomy)

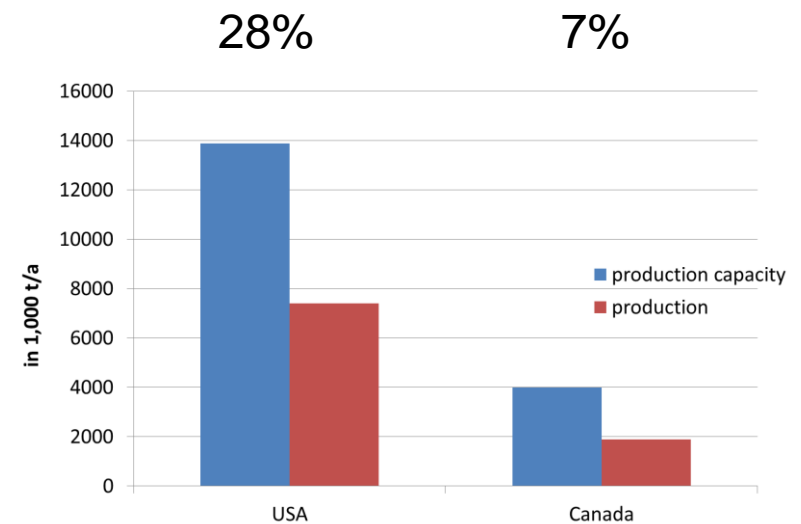
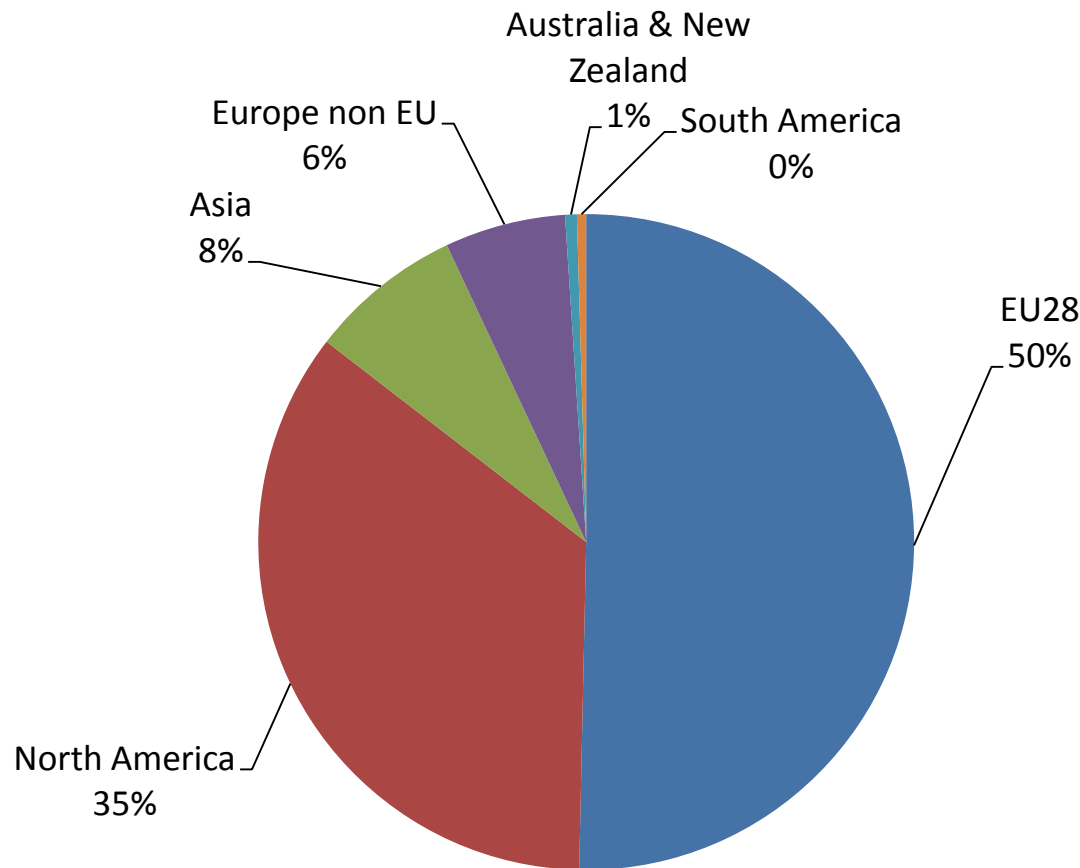
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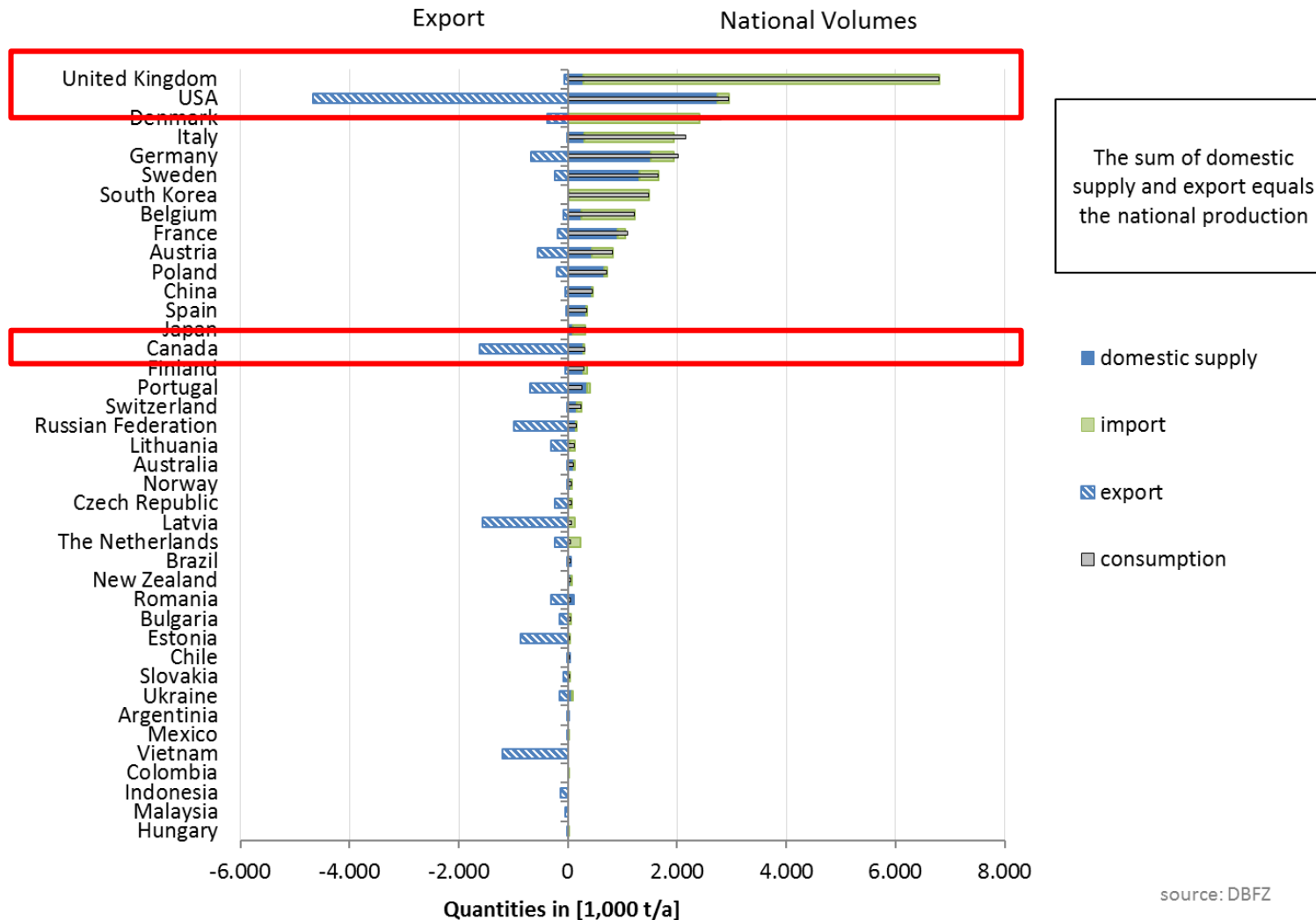
North America – the large exporters

Kay Schaubach, DBFZ

Shares of global pellet production



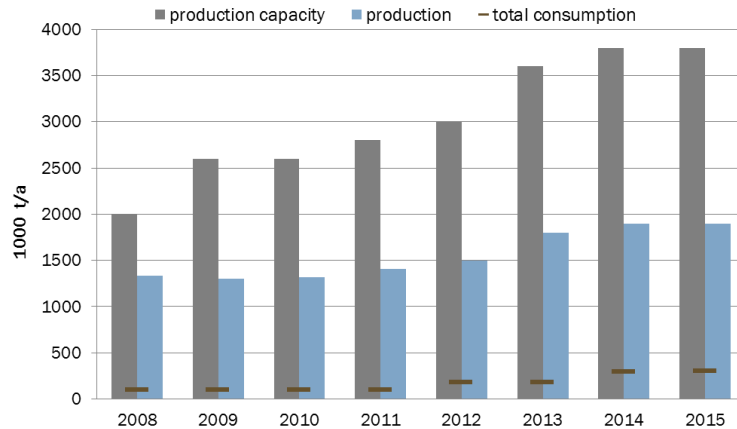
North America in global perspective



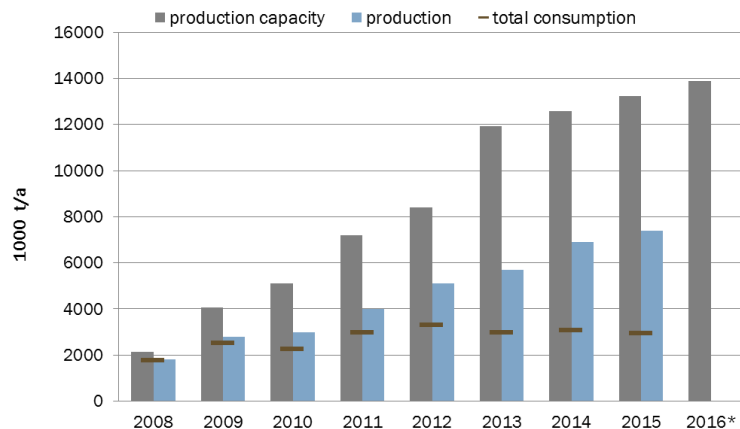
source: DBFZ

Canada and US in comparison

Canada



US



Exports

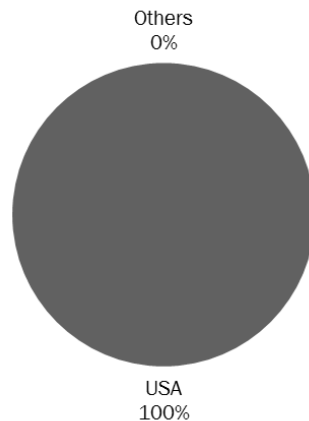
<i>metric tonnes</i>	2012	2013	2014	2015
United Kingdom	794,379	1,026,527	982,809	1,205,928
United States	86,665	152,271	218,889	205,743
Italy	85,238	219,551	204,528	85,513
Japan	105,640	76,018	61,807	80,203
South Korea	2,084	113,077	150,004	49,029
OTHER	295,171	52,787	19,355	1,366
TOTAL	1,369,177	1,640,231	1,637,393	1,627,784

<i>metric tonnes</i>	2012	2013	2014	2015
United Kingdom	672,977	1,682,244	2,962,786	3,914,785
Belgium (and Luxembourg)	495,553	534,668	472,272	610,044
Netherlands	499,162	178,414	299,631	63,617
France	0	90	1,019	48,821
Canada	32,705	21,579	22,869	22,352
South Korea	26	33,600	54,956	3,797
Italy	13,580	150,319	119,736	1,792
Denmark	29,201	195,589	105,108	1,343
Sweden	45,932	22,352	14,768	0
Other	108,983	63,568	2,544	2,000
Total exports	1,898,117	2,882,423	4,055,689	4,668,552
<i>of which to EU28</i>	<i>93%</i>	<i>98%</i>	<i>98%</i>	<i>99%</i>

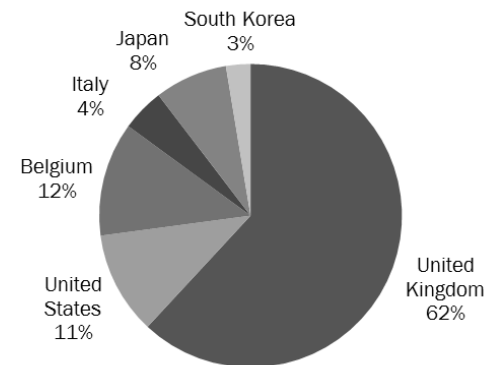
Exports – UK as center of gravity

Canada

Wood pellets import 2015

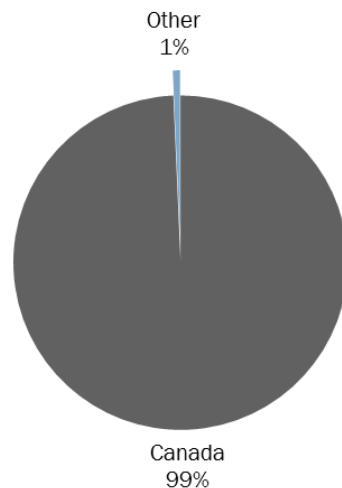


Wood pellets export 2015

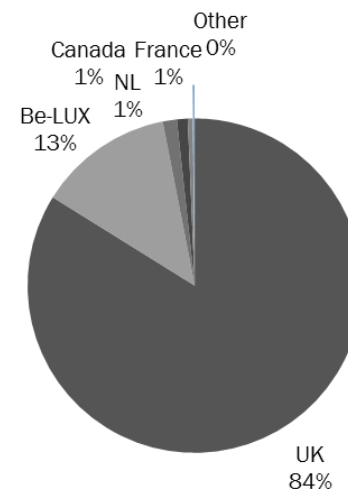


US

Wood pellets import 2015

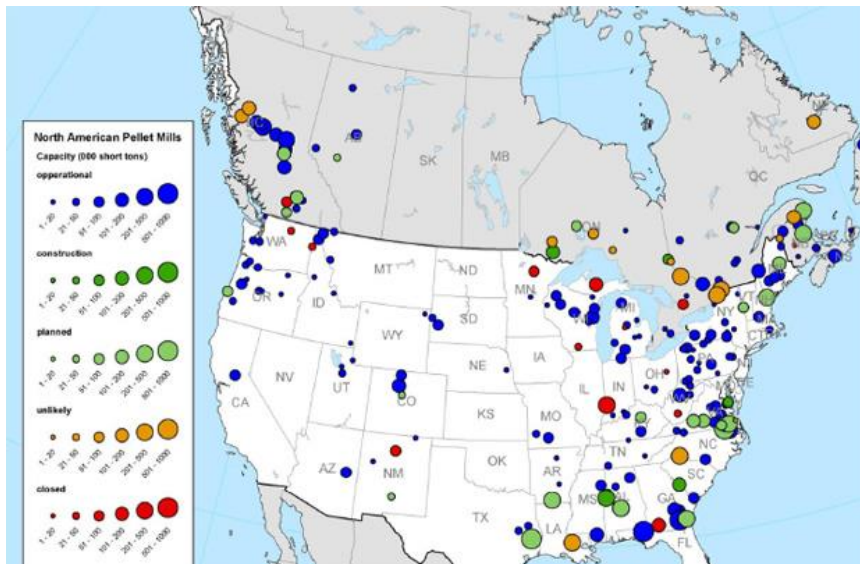


Wood pellets export 2015

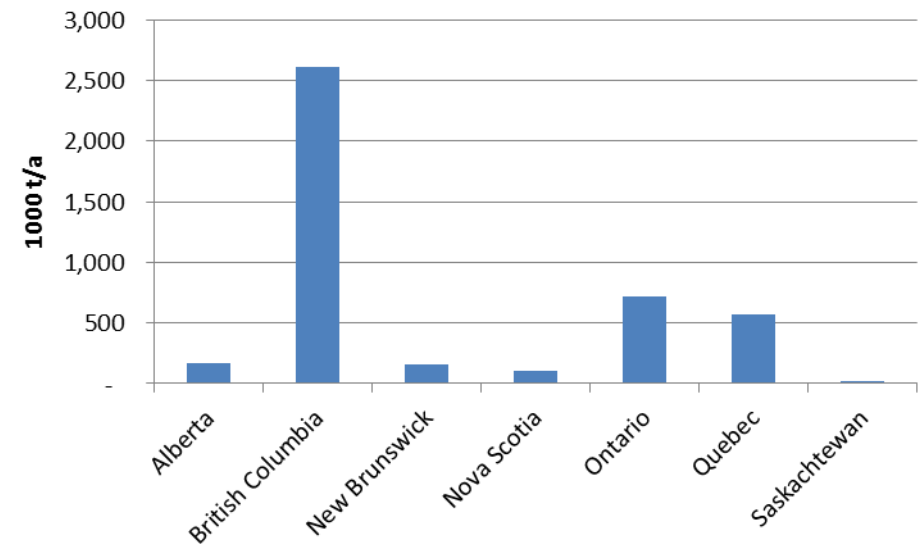


Location of pellet mills

US



Canada



Capacity distribution across Canadian provinces.

Source: Global Wood Pellet Industry and Trade Study 2017

Projections, drivers and barriers in Canada

- Export markets continue to dominate
 - Japan and South Korea might be growth markets
- Domestic demand might increase through
 - Co-firing: competition with other biomass options critical
 - Residential heating will be stable unless increase in prices for crude oil and heating
 - Industrial application (e.g. concrete) is potential pathway, but advantages of pellets not yet perceived there

Projections, drivers and barriers in the US

- Export markets continue to dominate, esp. UK
- Domestic demand is impacted by
 - No incentives for industrial use
 - Heating depends on fossil fuel prices and advantages in comfort
 - Small incentives for residential heating
 - Statewise renewable portfolio standards (quotas) for utilities, biomass one option to provide power
- U.S. Southeast pellet production partially fills wood demand void created by closure of pulp and paper mills

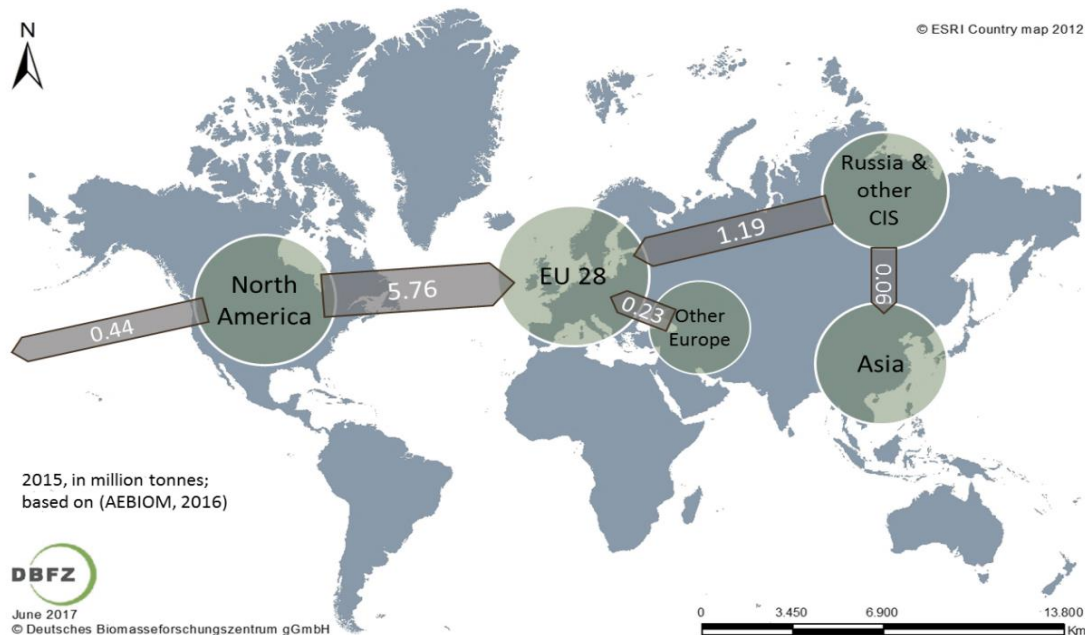
Thank you!



Europe – the center of consumption

Fabian Schipfer, TU Vienna

Europe – the context



- What's driving EU's wood pellet consumption?
- For what are they used?
- How is the market developing within Europe?
- Current prices?
- Where does the market go?

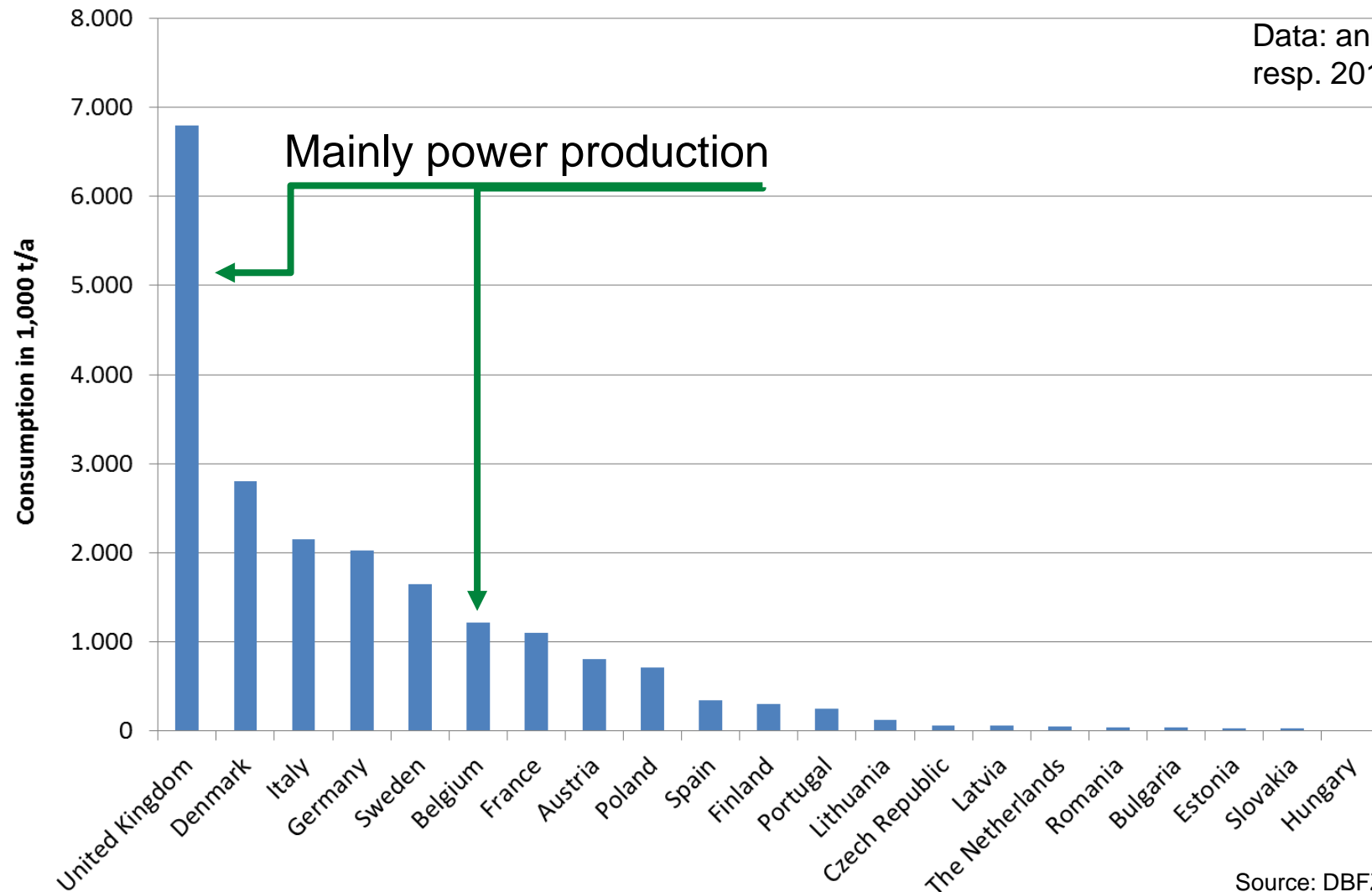
Consumer portfolio

Types of consumers

- Small-scale heating (single family houses) – Stoves and Boilers
- Smaller medium-scale heating (multi family houses, schools, hospitals)
- Small-scale combined heat and power (rare, with Stirling-engine)
- Medium-scale heating (district heating or, rare, process-heat in industry)
- Medium- to large-scale combined heat and power (district heating and power provision/feed-in)
- Large-scale power (formerly coal-fired power plants)

Consumers in EU28

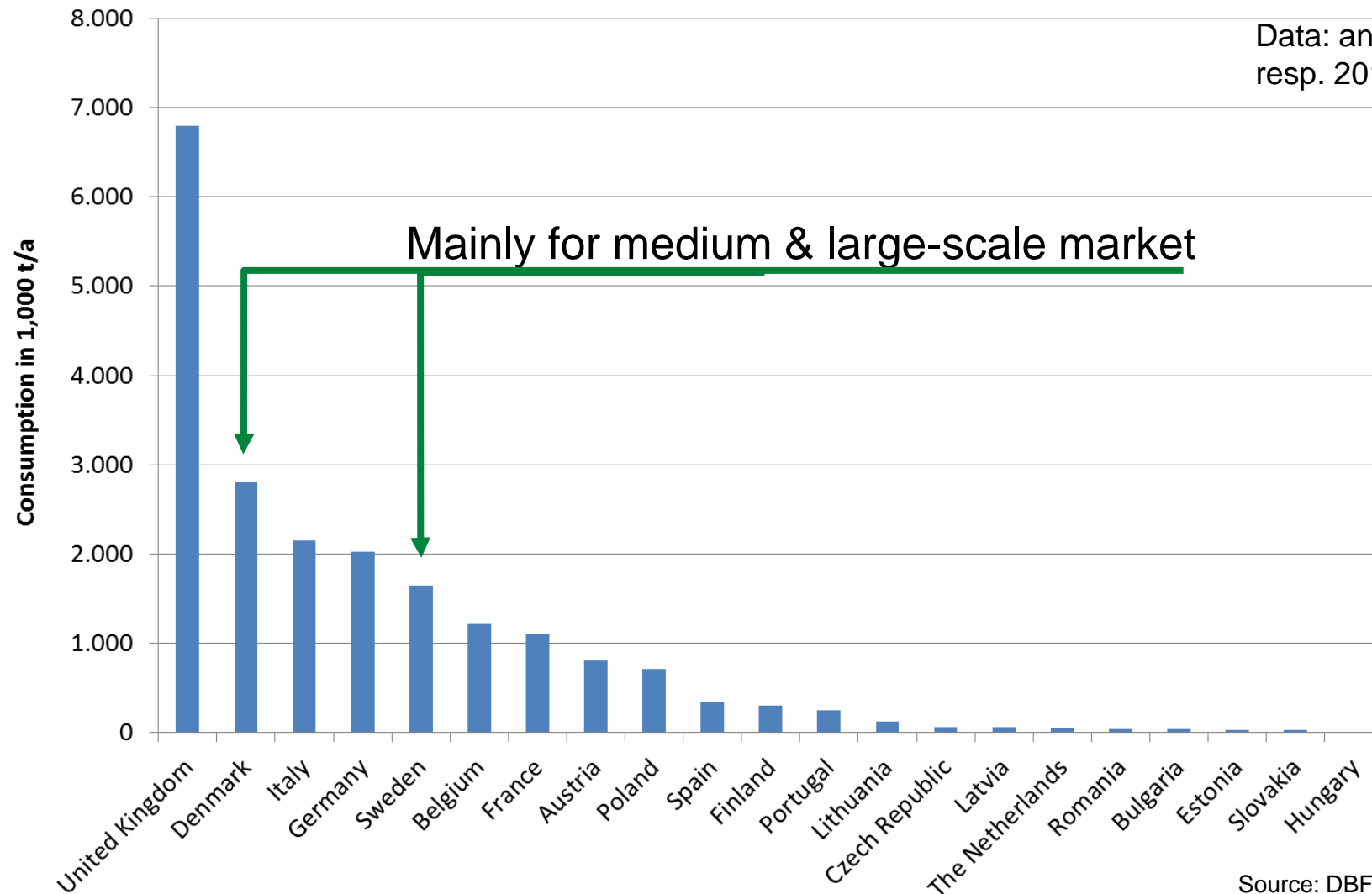
Data: annual 2015
resp. 2016



Source: DBFZ

Consumers in EU28

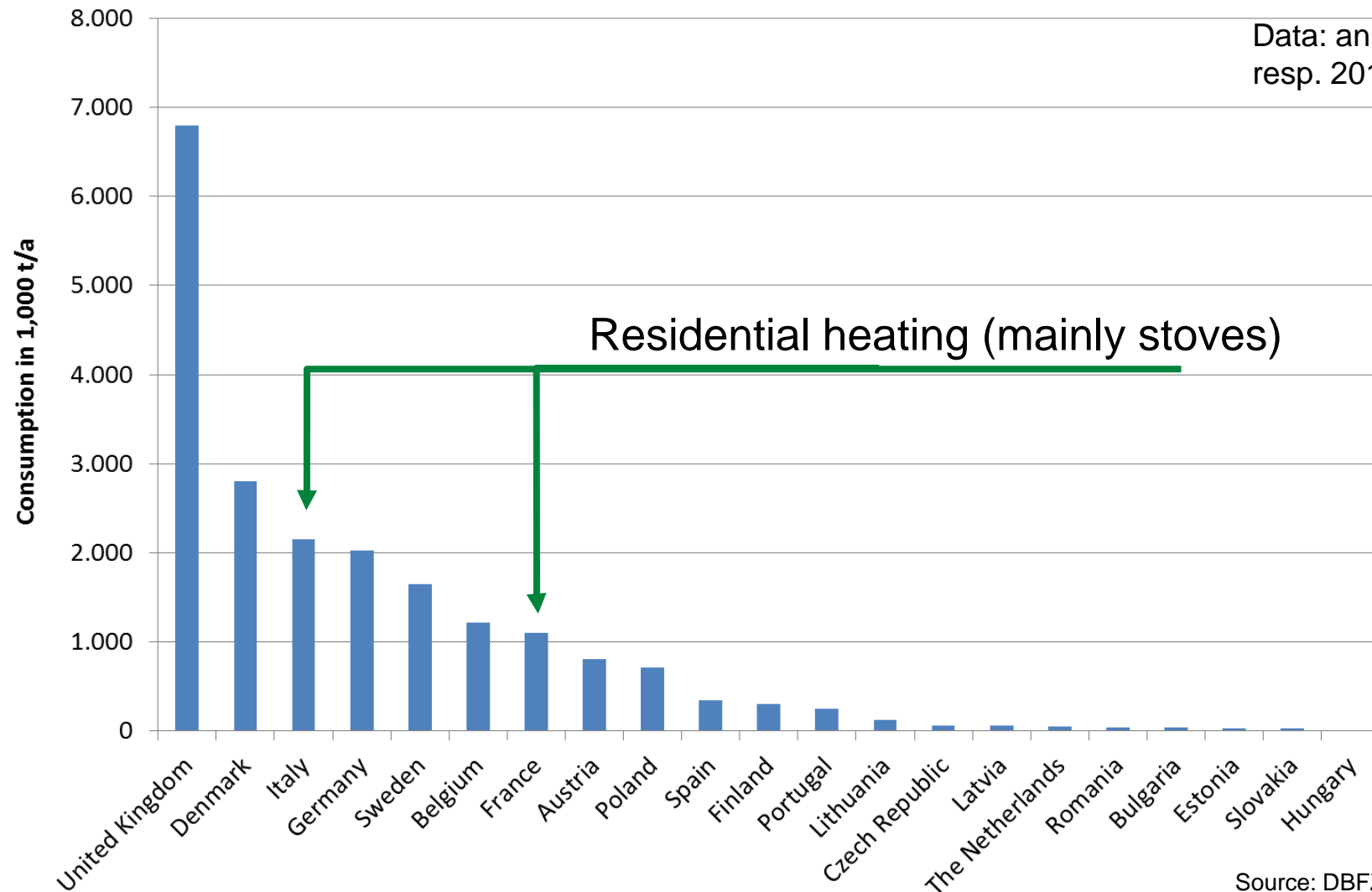
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Source: DBFZ

Consumers in EU28

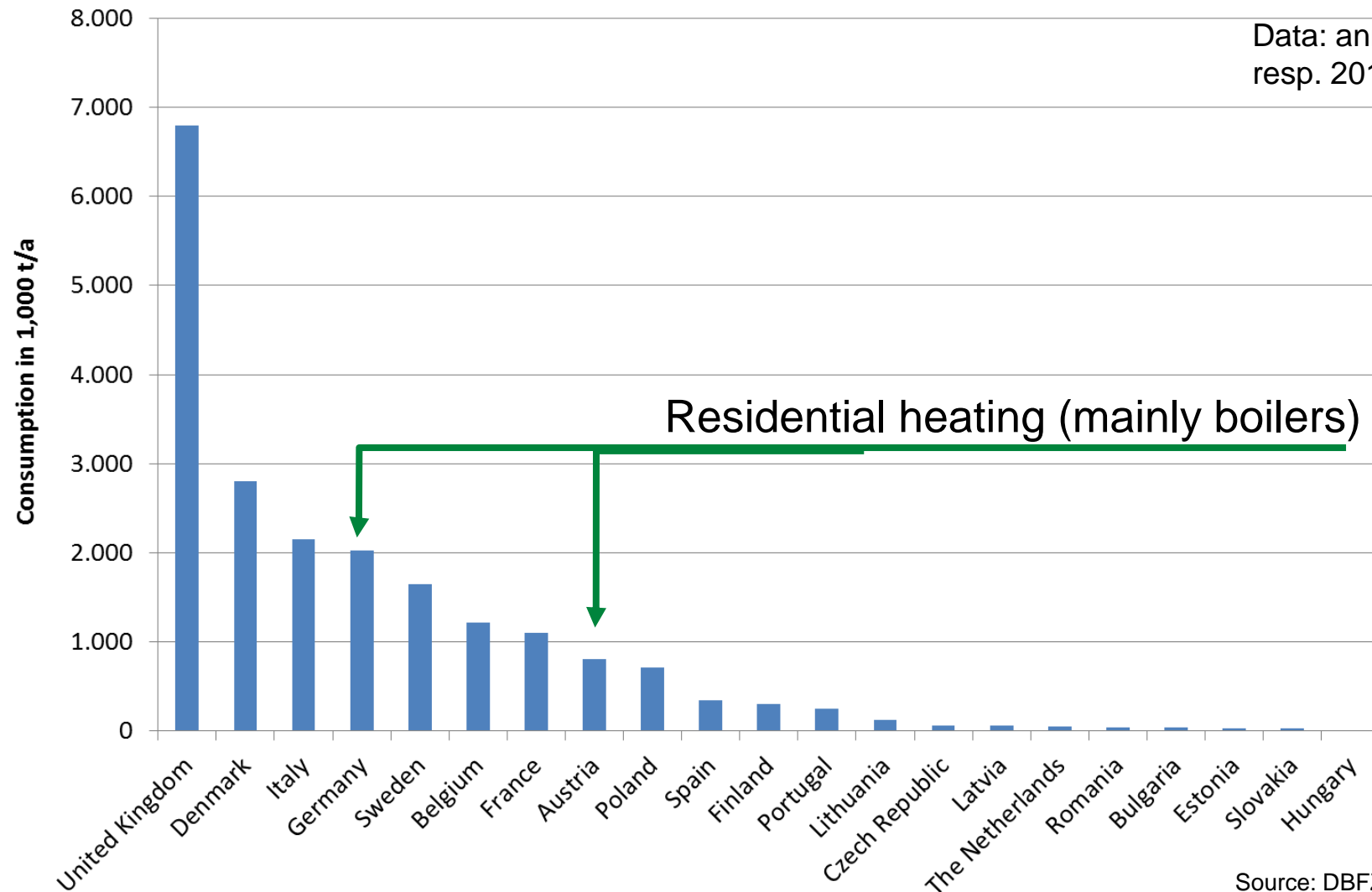
Data: annual 2015
resp. 2016



Source: DBFZ

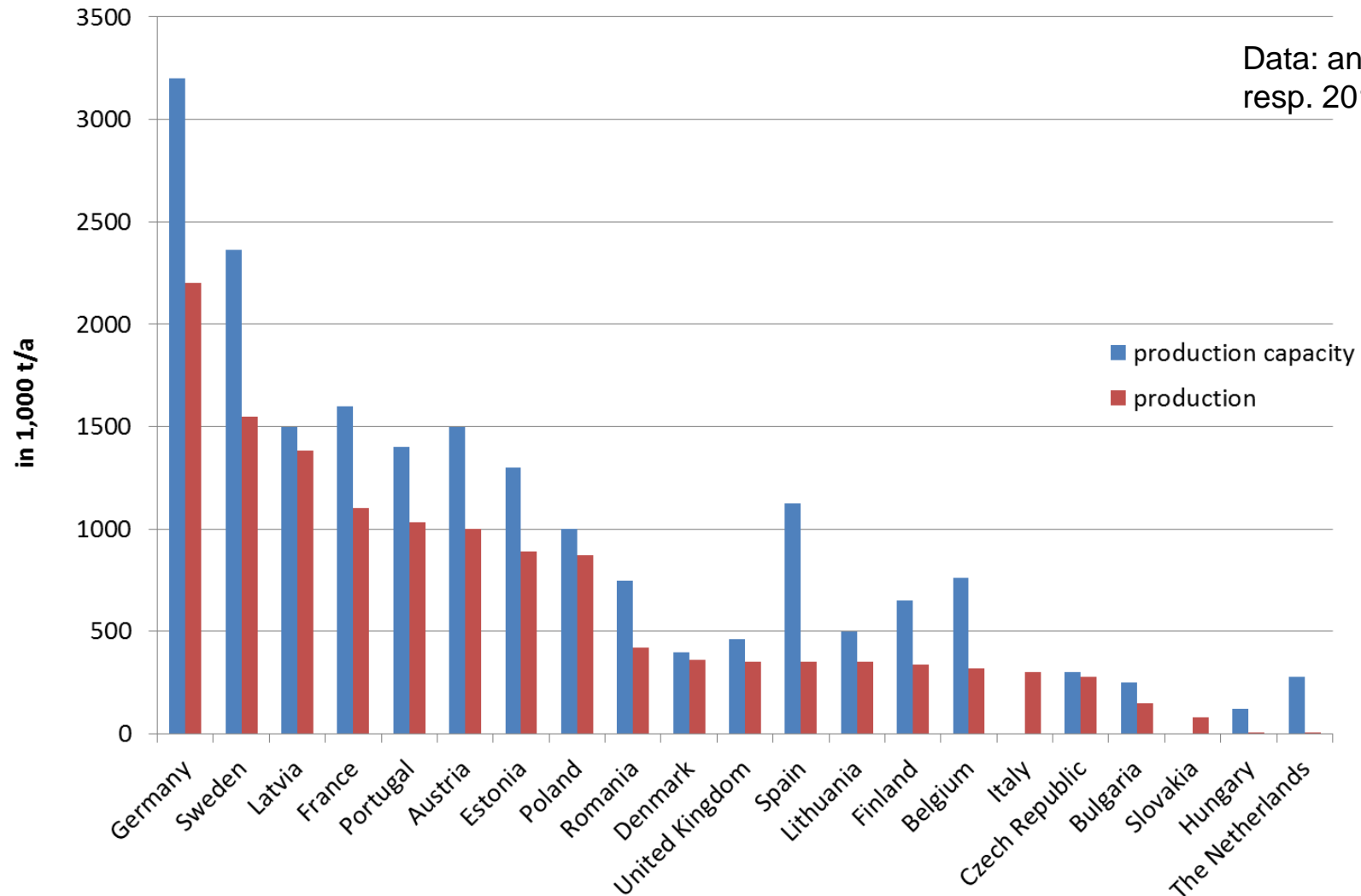
Consumers in EU28

Data: annual 2015
resp. 2016



Source: DBFZ

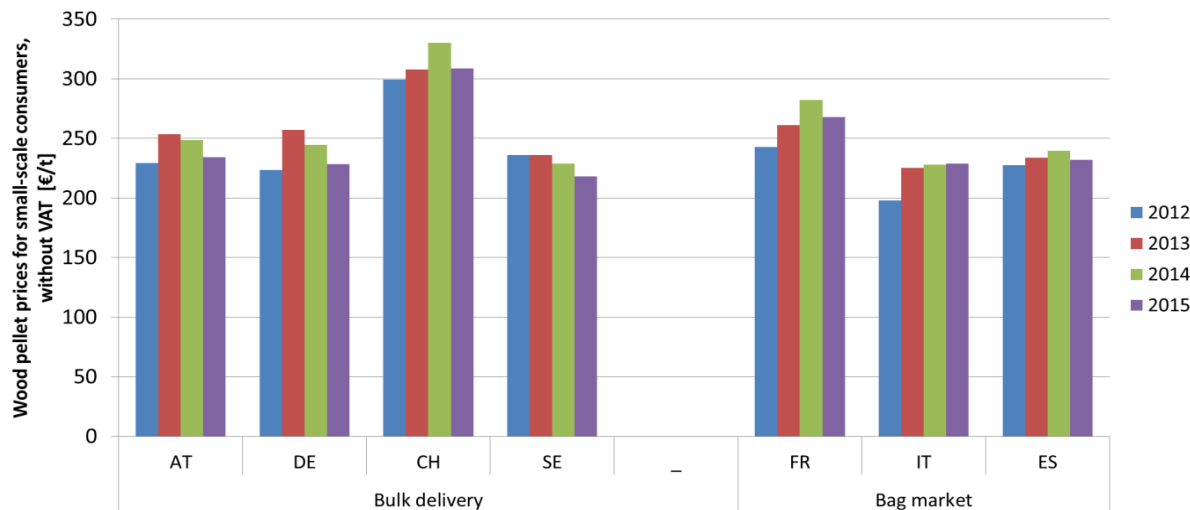
Producers in EU28



Source: DBFZ

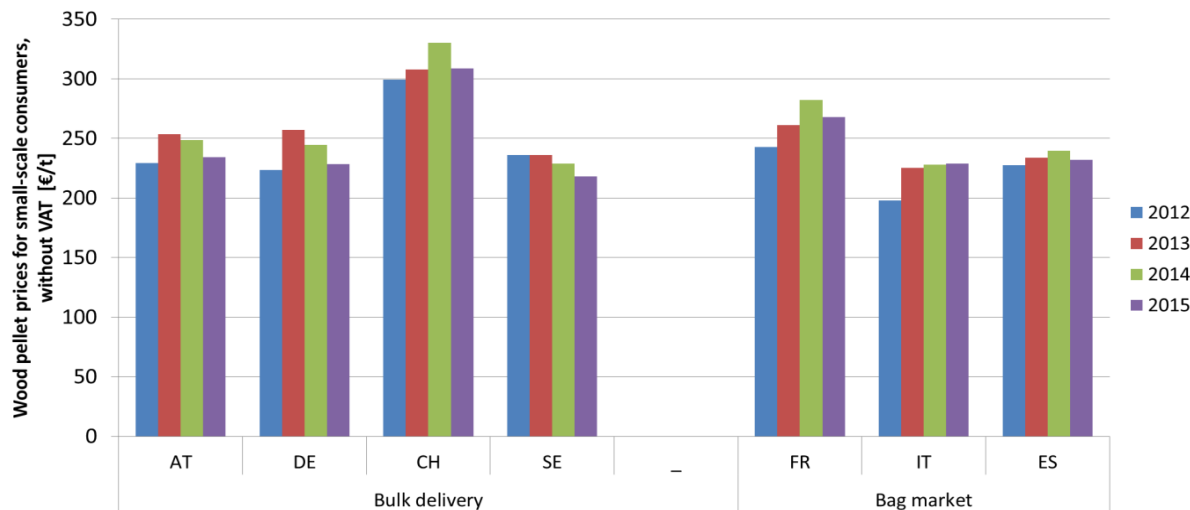
Prices

- Prices for residential consumers between 200-250€/t
- Price drop during 2016 due to oversupply
- Different consumer types & countries – different price data & quality
- Seasonality (monthly development) important
- Co-movement of DE, IT, AT pellet prices (!?)



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Price data quality/comparability

- No harmonised methodology
- Collected for different purchase quantities
- Only in a few cases on more than country level
- Different delivery distances and additional costs (in-blowing)
- At least monthly basis important

Outlook

- Europe: Most likely also in the future defined by local consumption
- Wild cards (positive or negative impact on pellet consumption):
Policy impact on large-scale consumers like DRAX, RWE, Hofer

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Factors that could have an impact on ...

... pellet consumption increase	... pellet consumption decrease
Pellet commodity market transition to adulthood/maturity	Better isolation of buildings
Utilisation of pellets for process-heat in European industries	Increased utilisation of excess industry heat
Micro-CHP parity	Increasing use of heat pumps for excess wind- and PV-power
Biorefineries for 2 nd -gen biofuels (gasification)	Global warming

Thank you!



Sustainability legislation - criteria for wood pellets

Martin Junginger, University Utrecht

Overview

- No mandatory sustainability criteria known for residential / non-industrial use of wood pellets in any country
- Contrary to liquid & gaseous transport biofuels, no uniform sustainability criteria apply to solid biomass use for energy in the EU
- Four EU countries have developed national schemes: UK, Netherlands, Belgium and Denmark, with similar but slightly different criteria
- Currently, no sustainability criteria in Japan, situation unclear in South Korea, but concerns about sustainability of feedstocks are increasing

Table 3. Summary of sustainability requirements and possibilities for harmonization.

	RO, RHI, CfDs RTFO - UK	GCs Wallonia-BE	GCs Flanders - BE	IA - DK	SDE+ - NL	Current Harmonization Level	Harmonization Possibilities	Note
I. Level of requirements	Legally binding to receive support	Legally binding to receive support	Legally binding to receive support	Voluntary	Legally binding to receive support	Low	±	Harmonization possible between the Netherlands and the UK
II. Timeline of implementation	March 2016	Already implemented	Already implemented	January 2016	To be determined	Medium	±	Harmonization possible between four countries
III. Sustainability Requirements Coverage								
Greenhouse Gas Emission:								
- Calculation method	✓	✓	✓	✓	✓	Medium	±	Harmonization possible between four countries
- Limit compared with 1990 level	✓	✓	✓	✓	✓	Medium	→	Harmonization possible between four countries
- Time of implementation	✓	✓	✓	✓	✓	High	→	Harmonization possible between four countries
Land Use:								
Sustainable forest management:								
Legal, sustainable sourcing & certification	✓	±	±	✓	✓	Low	→	Harmonization possible between the four countries
Forest productivity and well-functioning	✓	±	±	✓	✓	High	✓	Harmonization possible between four countries
Biodiversity protection	✓	±	±	✓	✓	Medium	✓	Harmonization possible between four countries
Ecosystems conservation	✓	±	±	✓	✓	High	✓	Harmonization possible between four countries
Feedstock categories	✓	±	±	✓	×	Low	→	Harmonization rarely possible between four countries
iLUC	×	×	×	×	✓		×	

Harmonisation

- Harmonisation of sustainability criteria/systems will be important to ensure fungibility / tradability of wood pellets as a commodity
- However, with different types of criteria (iLUC, carbon debt), different indicators and threshold levels, this is anything but easy
- Implementation of systems also ongoing in the Netherlands / under review in Denmark
- Currently, the Sustainable Biomass Program is aiming to meet the sustainability requirements in all four countries

The near future: Ongoing RED-II discussions

- The recast of the EU-Renewable Energy Directive (RED-II) is currently discussed between the commission, the parliament and the council
 - Initial proposal by the EC included a feedstock approach, supports a Risk Based Approach, and requires GHG savings of 80% (2021) going to 85% (in 2026, tough!) in efficient CHP plants
 - New proposals include amongst others
 - No imports from countries not ratifying the Paris agreement
 - Waste hierarchy: proving no significant distortion of markets
 - Possibility for individual member states to set additional criteria
- > Discussion likely to continue well into 2018

Some thoughts

- Uniform EU sustainability criteria could in principal provide clear security and guidance to the industry and facilitate trade of wood pellets
- Different criteria for use of wood for different end-uses and/or in different member states remain problematic
- Ultimately, with biorefineries also producing 2nd generation biofuels and biochemicals from woody biomass, a single set of criteria for all woody biomass regardless of the end use would be preferable
- These should also be aligned on a global level (e.g. with other regions such as East Asia) to avoid leakage effects and to facilitate global trade of wood pellets

Thank you!



Prospects of torrefaction and its advantages

Michael Wild, IBTC

Quality - Standardisation

ISO 17225 Solid biofuels – Fuel specifications and classes

ISO TS 17225 - 8:

Part 8: Graded thermally treated and densified biomass fuels

Different Classes

- Woody and Non Woody;
- NCV, Durability, Bulk Density, Volatile Matter etc.

Additional parameters in ISO working group:

- Grindability
- Water resistance
- Energy balance

ISO/TS 17225-8:2016

Table 2 – Specification of graded pellets produced by thermal processing of non-woody biomass

Property class, Analysis method	Unit	TA1	TA2	TA3
1.1 Biomass biomass from agriculture and horticulture				
2.1 By-products and residues from food and horticulture processing industry, chemically untreated biomass				
3.1 By-products and residues from food and fruit processing industry, chemically untreated fruit residues				
4. Aquatic biomass				
Diameter, D ¹ and Length, L ¹	mm	D10 to D25, D ≤ 1; 3.15 ≤ L ≤ 40	D10 to D25, D ≤ 1; 3.15 ≤ L ≤ 40	D10 to D25, D ≤ 1; 3.15 ≤ L ≤ 40
Moisture, M ¹	w-%	From D10 to D100	From D10 to D100	From D10 to D100
Mechanical durability, MD	w-%	From D10 to D100	From D10 to D100	From D10 to D100
Flame, F ¹	w-%	From D10 to D100	From D10 to D100	From D10 to D100
Additives ¹	w-%	From D10 to D100	From D10 to D100	From D10 to D100
Net calorific value, Q _{net}	MJ/kg or kWh/kg	From D10 to D100	From D10 to D100	From D10 to D100
Bulk density, BD	kg/m ³	From D10 to D100	From D10 to D100	From D10 to D100
Carbon, C	w-%	From D10 to D100	From D10 to D100	From D10 to D100
Nitrogen, N	w-%	From D10 to D100	From D10 to D100	From D10 to D100
Sulfur, S	w-%	From D10 to D100	From D10 to D100	From D10 to D100
Chlorine, Cl	w-%	From D10 to D100	From D10 to D100	From D10 to D100
Artenin, Ar	w-%	From D10 to D100	From D10 to D100	From D10 to D100
Cadmium, Cd	w-%	From D10 to D100	From D10 to D100	From D10 to D100
Chromium, Cr	w-%	From D10 to D100	From D10 to D100	From D10 to D100
Copper, Cu	w-%	From D10 to D100	From D10 to D100	From D10 to D100
Lead, Pb	w-%	From D10 to D100	From D10 to D100	From D10 to D100
Mercury, Hg	w-%	From D10 to D100	From D10 to D100	From D10 to D100
Nickel, Ni	w-%	From D10 to D100	From D10 to D100	From D10 to D100
Zinc, Zn	w-%	From D10 to D100	From D10 to D100	From D10 to D100

ISO/TS 17225-8:2016

Table 1 – Specification of graded pellets produced by thermal processing of woody biomass

Property class, Analysis method	Unit	TW1H	TW1L	TW2H	TW2L	TW3H	TW3L
1.1 Whole trees without roots							
1.2 By-products and residues from wood processing industry							
1.3 Chemically untreated wood							
1.4 Chemically treated wood							
Diameter, D ¹ and Length, L ¹	mm	D10 to D25, D ≤ 1; 3.15 ≤ L ≤ 40	D10 to D25, D ≤ 1; 3.15 ≤ L ≤ 40	D10 to D25, D ≤ 1; 3.15 ≤ L ≤ 40	D10 to D25, D ≤ 1; 3.15 ≤ L ≤ 40	D10 to D25, D ≤ 1; 3.15 ≤ L ≤ 40	D10 to D25, D ≤ 1; 3.15 ≤ L ≤ 40
Moisture, M ¹	w-%	From D10 to D100	From D10 to D100	From D10 to D100	From D10 to D100	From D10 to D100	From D10 to D100
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Flame, F ¹	w-%	From D10 to D100	From D10 to D100	From D10 to D100	From D10 to D100	From D10 to D100	From D10 to D100
Additives ¹	w-%	From D10 to D100	From D10 to D100	From D10 to D100	From D10 to D100	From D10 to D100	From D10 to D100
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Carbon, C	w-%	From D10 to D100	From D10 to D100	From D10 to D100	From D10 to D100	From D10 to D100	From D10 to D100
Nitrogen, N	w-%	From D10 to D100	From D10 to D100	From D10 to D100	From D10 to D100	From D10 to D100	From D10 to D100
Sulfur, S	w-%	From D10 to D100	From D10 to D100	From D10 to D100	From D10 to D100	From D10 to D100	From D10 to D100
Chlorine, Cl	w-%	From D10 to D100	From D10 to D100	From D10 to D100	From D10 to D100	From D10 to D100	From D10 to D100
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Cadmium, Cd	w-%	From D10 to D100	From D10 to D100	From D10 to D100	From D10 to D100	From D10 to D100	From D10 to D100
Chromium, Cr	w-%	From D10 to D100	From D10 to D100	From D10 to D100	From D10 to D100	From D10 to D100	From D10 to D100
Copper, Cu	w-%	From D10 to D100	From D10 to D100	From D10 to D100	From D10 to D100	From D10 to D100	From D10 to D100
Lead, Pb	w-%	From D10 to D100	From D10 to D100	From D10 to D100	From D10 to D100	From D10 to D100	From D10 to D100
Mercury, Hg	w-%	From D10 to D100	From D10 to D100	From D10 to D100	From D10 to D100	From D10 to D100	From D10 to D100
Nickel, Ni	w-%	From D10 to D100	From D10 to D100	From D10 to D100	From D10 to D100	From D10 to D100	From D10 to D100
Zinc, Zn	w-%	From D10 to D100	From D10 to D100	From D10 to D100	From D10 to D100	From D10 to D100	From D10 to D100
Volatiles matter, VM	w-%	From D10 to D100	From D10 to D100	From D10 to D100	From D10 to D100	From D10 to D100	From D10 to D100
Ash melting behaviour ¹		From D10 to D100	From D10 to D100	From D10 to D100	From D10 to D100	From D10 to D100	From D10 to D100

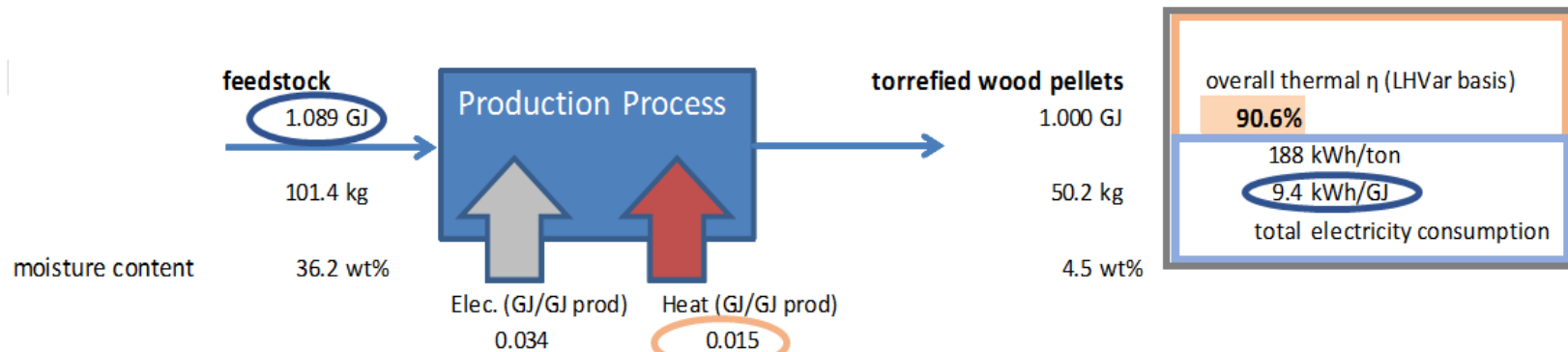
Torrefied Biomass in its field

		White Wood Pellets	Steam Exploded Pellets	Torrefied Pellets	Steam Coal
feedstock Wood		x	x	x	
feedstock Agro				x	
Bulk Density	kg/m3	650	750	700-800	700-750
Moisture	%	7	8	5	
NCV	GJ/mt	16,5-17-5	18-19	21-25	21-27
NCV uplift vs WWP	GJ/mt	0	0,5-1,5	3,5-8	
shipping density	GJ/m3	11,38	14,25	av. 17	av. 18
storeable at coal yard		no	yes	yes	yes
grindable in coal mill		no	no	yes	yes
pneumatic transport like coal		no	no	yes	-

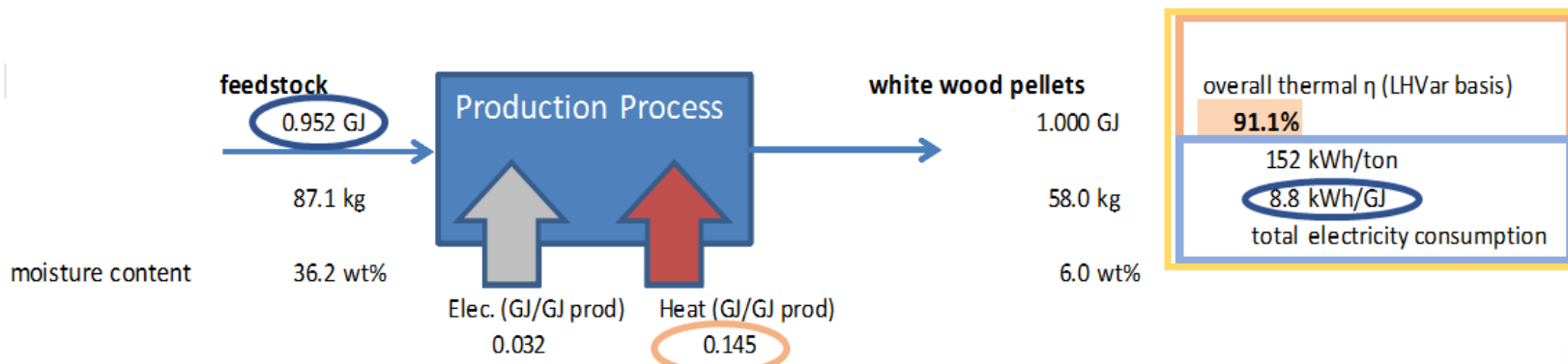
Sources: Futuremetrics, Valmet, Arbaflame, ECN, IBTC, brighthubengineering

Comparison torrefaction vs. white wood pellet production (same feedstock, 1 GJ)

Torrefaction Pellets (from aggregated averages survey entries)



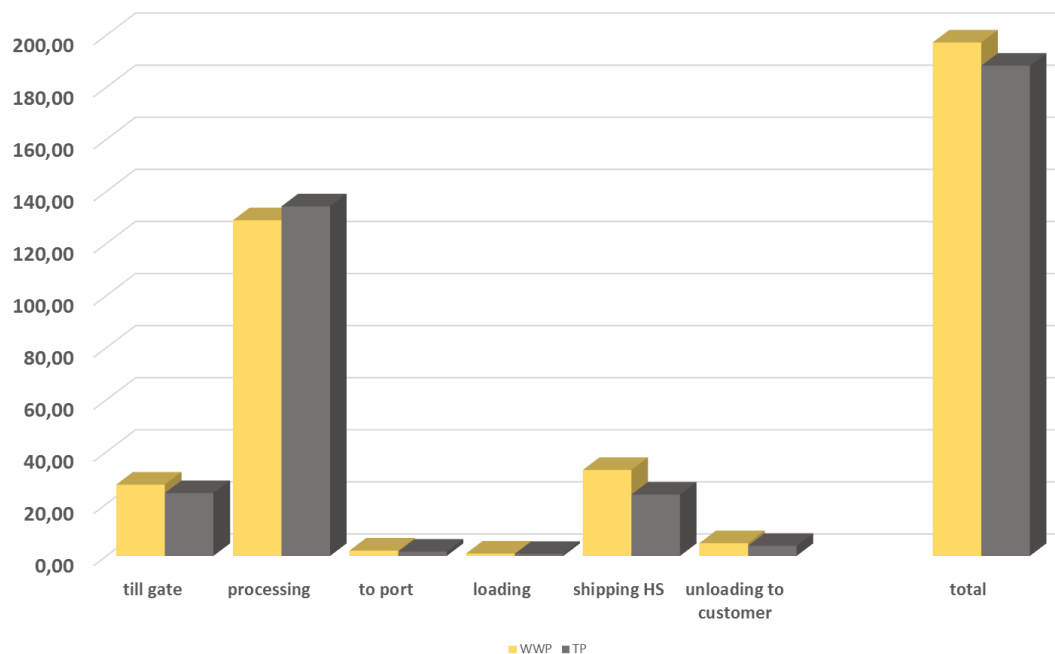
White Pellets (from average data compilation)



ECN for IBTC

WWP versus TP - Energy consumed in MJ per GJ energy delivered – Full Chain Comparison

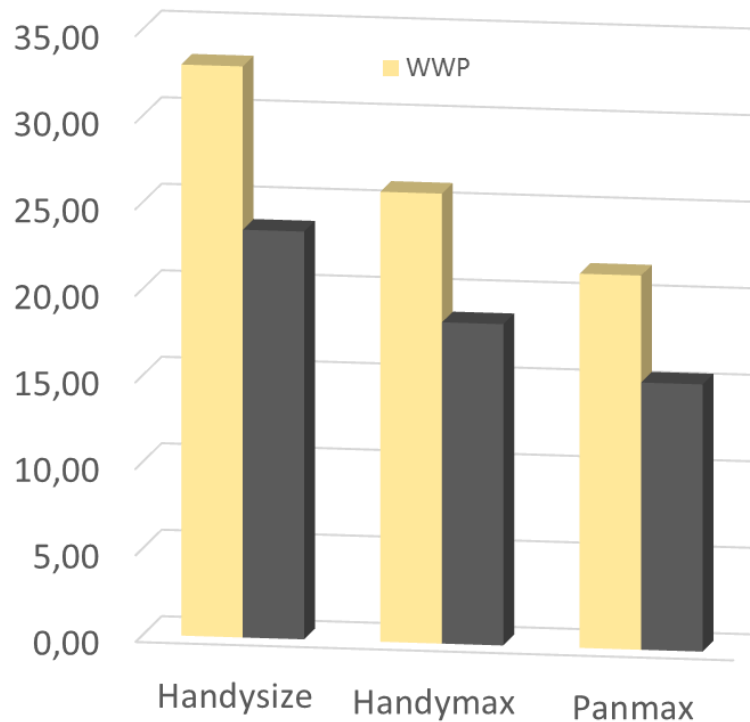
WWP versus TP - Energy consumed in MJ per GJ energy delivered to Consumer stockpile



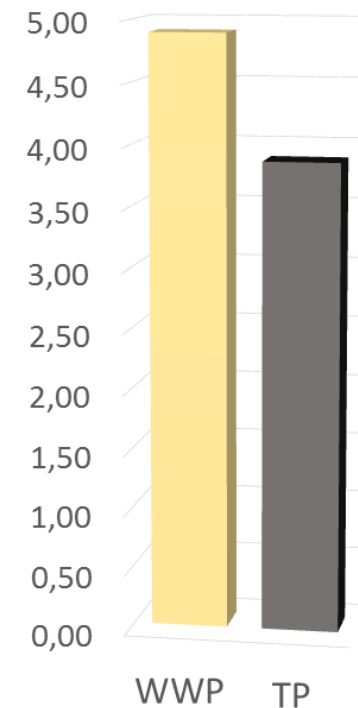
Transported	Normalised WWP MJ/GJ	Normalised TP MJ/GJ	Energy consumed TP/WWP	Advantage TP %
full chain of pellets				
Handysize	197,162	188,211	95,46%	4,54%
downstream logistics only				
Handysize	68,305	53,971	79,01%	20,99%
full chain on WWP and torrefied briquettes				
Handysize	197,162	179,971	91,28%	8,72%

Advantages along chain from FOB

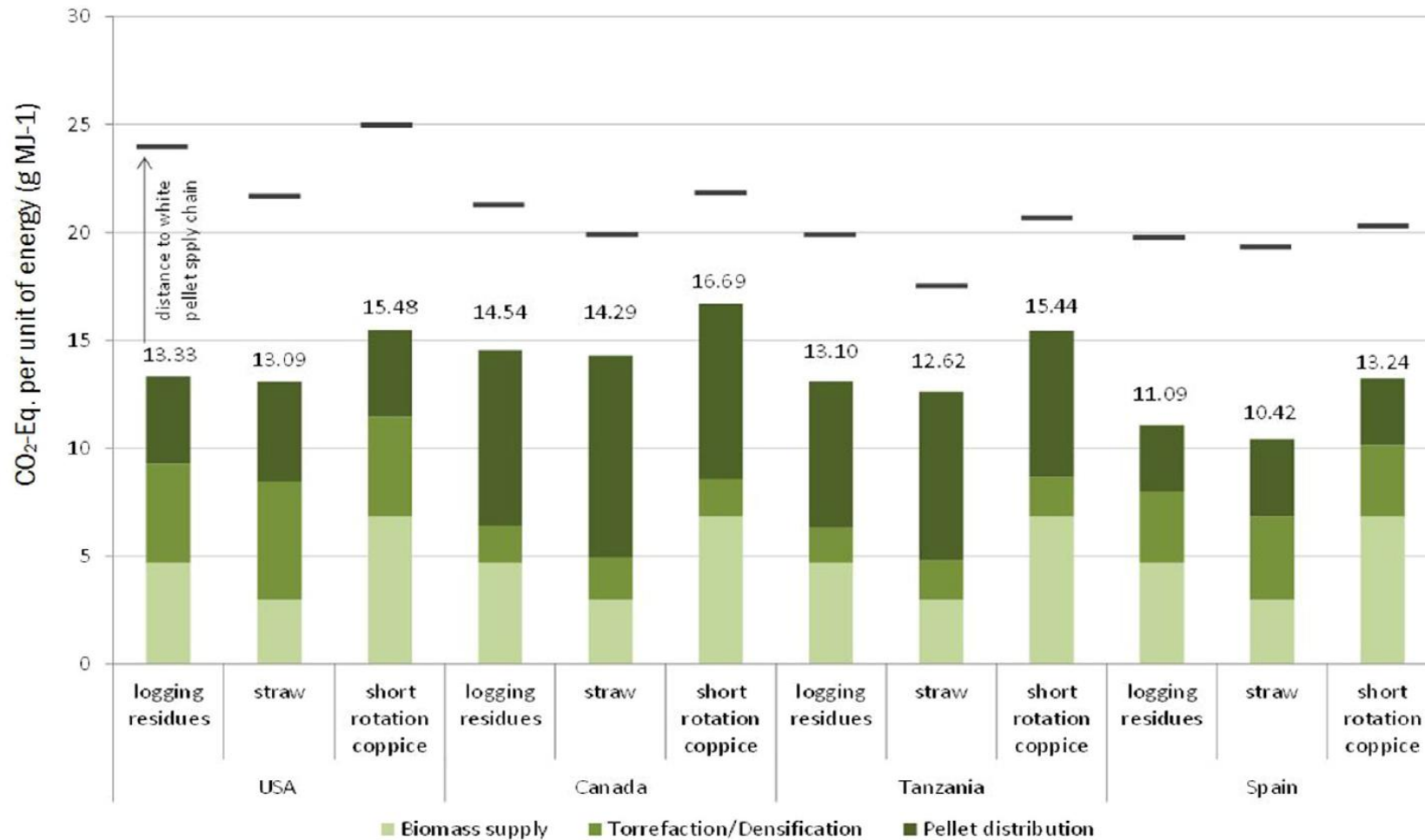
WWP versus TP: Energy consumed in shipping in MJ/GJ shipped



Energy Consumption from vessel to plant stockyard in MJ/GJ



GHG Comparison



Source: D. Thrän, DBFZ

Torrefaction Implementation Indicator

Torr-gas Handling and Utilisation			done
Continuous torrefaction			done
Predictability and consistency of product			for most feedstock
Densification			done
Feedstock flexibility			done
Plant Safety			done
Indoor storage			done
Outdoor storage			in optimisation
Standardisation of product			ISO TS 17225-8
Safety along supply chain			in progress
Trade Registrations and Permissions			in progress
Co-firing trials			done in EU
Co-firing burn tests			several done
Co-firing full scale			several done
Heat application trials			in progress
Further industrial applications trials			in progress
			MW 08 2017

Torrefied Biomass Capacity of Selected Producers

	Project	Project Size mt/a	Country	Feedstock	
Existing	White Castle, LA	15.000	US	Sugar Cane Harvest residue	
	Dilsen Stokkem	28.000	B	Wood	
	Derby	30.000	UK	Wood	
	Umea	16.000	Swe	Wood	
	Quitman	30.000	US	Wood	
	Beauncur	15.000	Can	Wood	
	Project	Project Size	Country	Feedstock	Commision date
Committed to	White Castle, LA	200.000	US	Sugar cane harvest residue	Q4/18
	Quitman	200.000	US	Wood	Q4/18
	HW NorthWest	150.000	US	Wood	Q1/19
	CEG Baltania	200.000	Estonia	Wood	Q1/19
	Finland	200.000	Finland	Wood	Q4/19
	Jacques Cartier	15.000	Can	Wood	Q4/18
	Holmsund Biocarbon	120.000	Swe	Wood	Q1/19
	Project	Project Size	Country	Feedstock	Possible Commision date
In the pipeline	7 in Lousiana and Florids	200.000 each	US	Sugar cane harvest residue	2019-22
	5 Central/South Ameriva	200.000 each		Sugar cane harvest residue	2019-22
	CEG	500.000	North America/Asia	Wood	2020-22
	Heetway	350.000	US/Asia	Wood	2020-21
	AIREX	275.000	Canada	Wood	2019
	Bioendev	180000	Nordic Countries	Wood	2020-21

Thank you!



Questions and Answers

Martin Junginger



Summary

Daniela Thrän



Thank you very much for your attention!

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