#### 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



IEA Bioenergy

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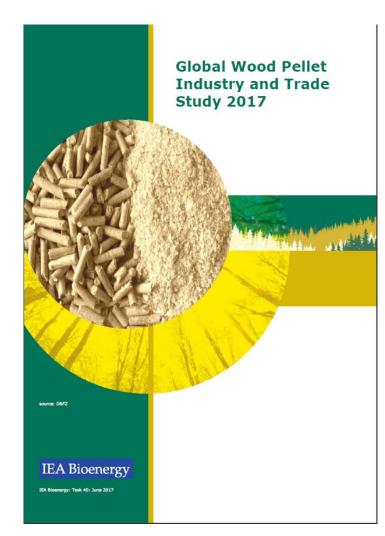
#### **Outline of today**

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
16:50	Summary	(moderation), all Daniela Thrän

#### 17:00 Closure



#### The study



Lead authors Daniela Thrän, David Peetz, Kay Schaubach

#### **Contributing authors**

Sofia Backéus Luca Benedetti Lena Bruce Suani Teixeira Coelho Laura Craggs Rocio Diaz-Chavez Javier Farago Escobar Jose Goldemberg Ruben Guisson Morten Tony Hansen Jussi Heinimö Bo Hektor J. Richard Hess Martin Junginger

Patrick Lamers Thuy Mai-Moulin Gordon Murray Olle Olsson Alessandro Pellini Svetlana Proskurina Fabian Schipfer Peter-Paul Schouwenberg Wolfgang Stelte Ute Thiermann Erik Trømborg Lotte Visser Michael Wild

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



#### The speakers



Daniela Thrän German Representative for the IEA Bioenergy Task 40 Head of Bioenergy Department, UFZ Head of Bioenergy Systems Department, DBFZ, Germany



Kay Schaubach Research Associate Bioenergy Systems Department; DBFZ Deutsches Biomasseforschungszentrum gGmbH, Germany



Fabian Schipfer Austrian Representative for the IEA Bioenergy Task 40 Research Associate, Energy Economics Group; Technische Universität Wien, Austria



Martin Junginger IEA Bioenergy Task 40 Leader Professor Bio-based Economy, Copernicus Institute of Sustainable Development, Utrecht University, Netherlands



Michael Wild Austrian Representative for the IEA Bioenergy Task 40 President, The International Biomass Torrefaction Council, Brussels, Belgium

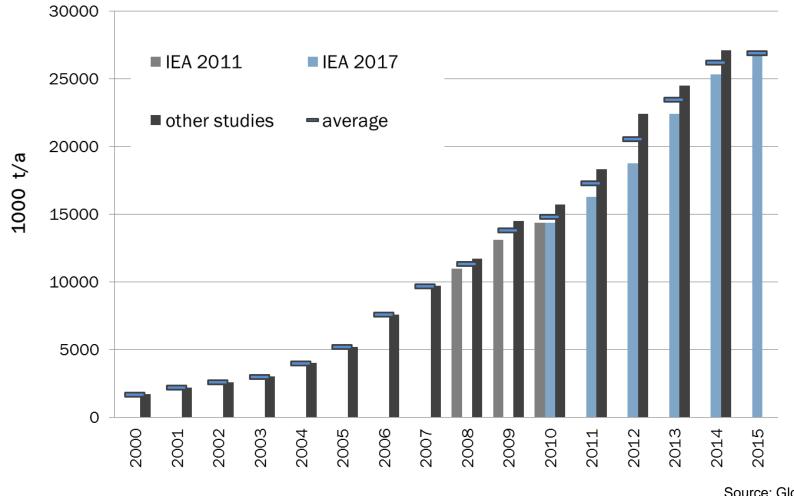


# The global view: hot spots, trade and major issues

Daniela Thrän, DBFZ



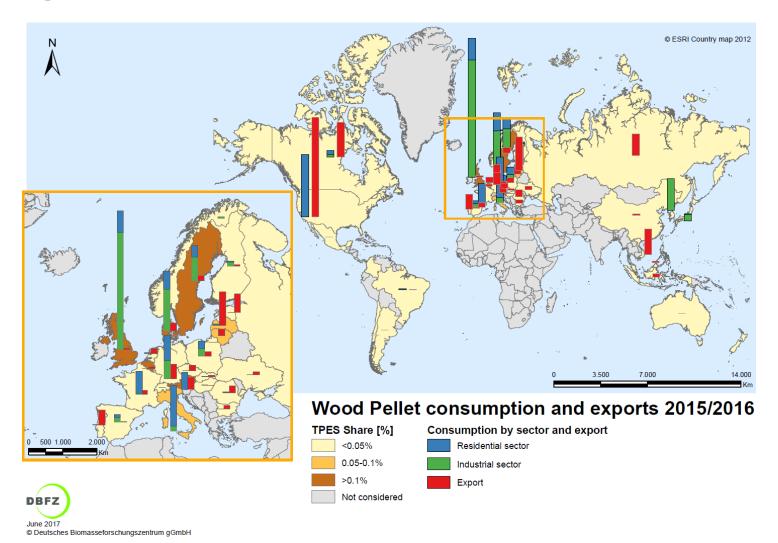
#### The wood pellet market is continously growing



Source: Global Wood Pellet Industry and Trade Study 2017 6

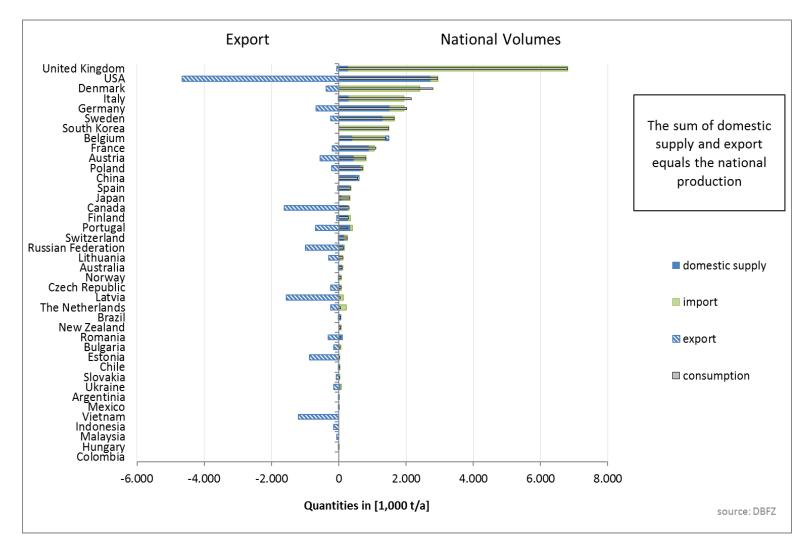


#### The global hotspots – consumption and exports





#### 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:

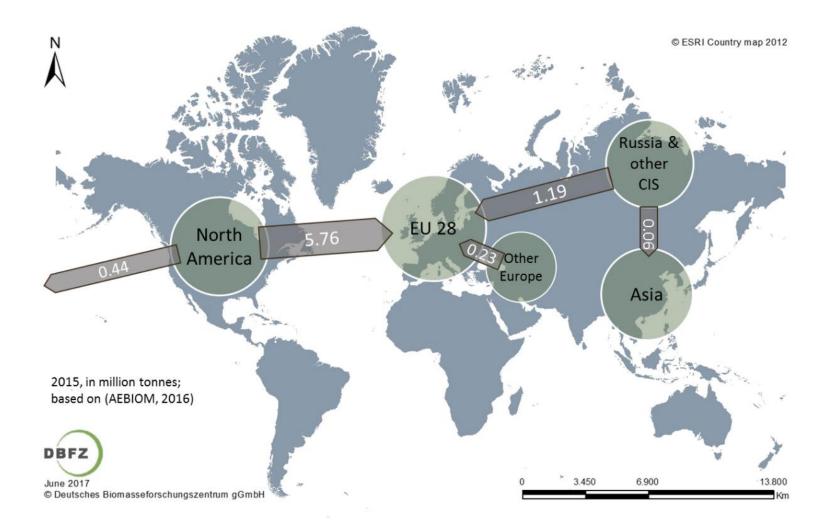
- Rising, with Japan, South Korea
- China is the great unknown

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)

## Thank you!



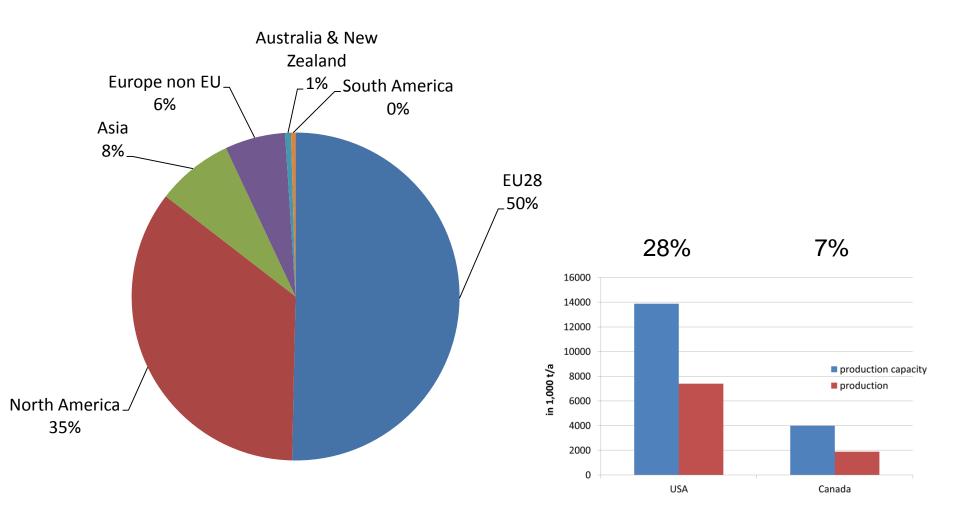


# North America – the large exporters

Kay Schaubach, DBFZ

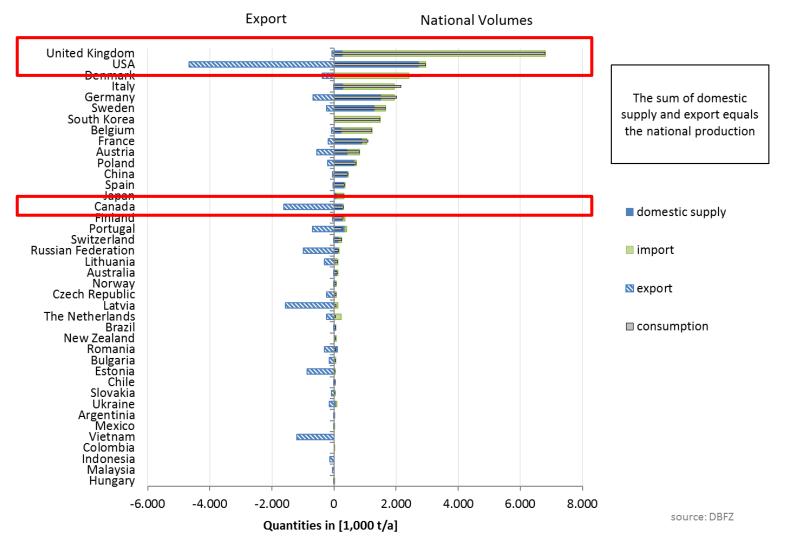


#### **Shares of global pellet production**





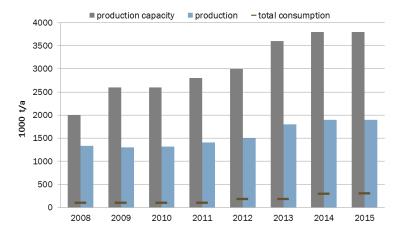
### North America in global perspective

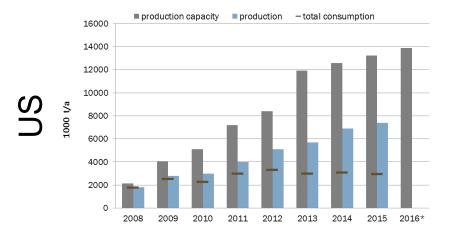




### **Canada and US in comparison**







#### **Exports**

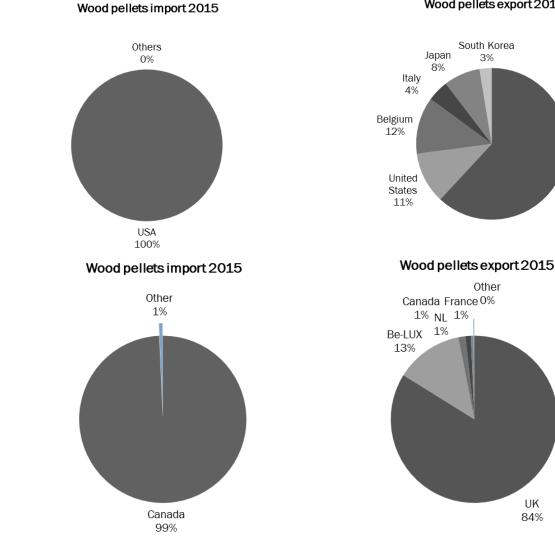
metric tonnes	2012	2013	2014	2015
United Kingdom	794,379	1,026,527	982,809	1,205,928
United States	86,665	152,271	218,889	205,743
Italy	85,238	219,551	204,528	85,513
Japan	105,640	76,018	61,807	80,203
South Korea	2,084	113,077	150,004	49,029
OTHER	295,171	52,787	19,355	1,366
TOTAL	1,369,177	1,640,231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

metric tonnes	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
of which to EU28	93%	98%	98%	99%



#### **Exports – UK as center of gravity**

Canada



Wood pellets export 2015

United

Kingdom

62%

UK

84%

Source: Global Wood Pellet Industry and Trade Study 2017

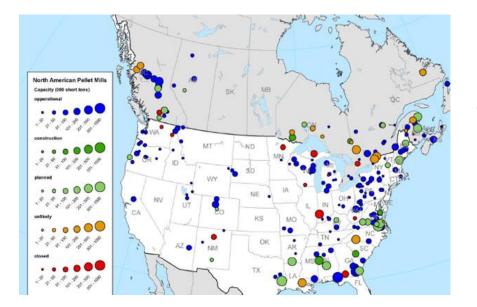
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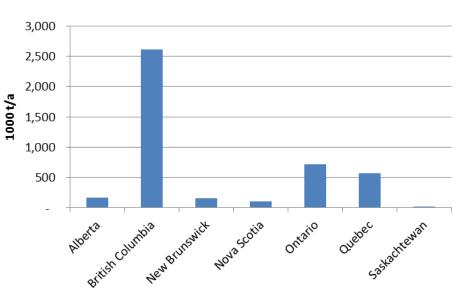
01/12/2017



#### **Location of pellet mills**

#### US





Canada

Capacity distribution across Canadian provinces.



### **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!



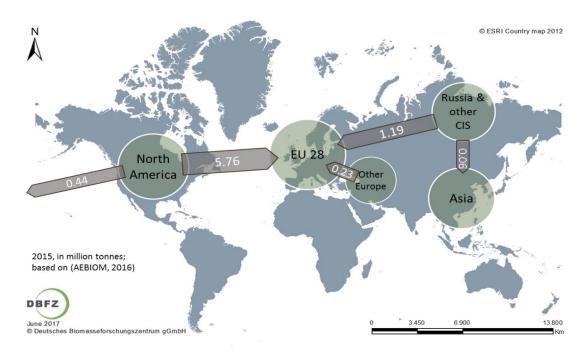


## Europe – the center of consumption

Fabian Schipfer, TU Vienna



#### **Europe – the context**



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

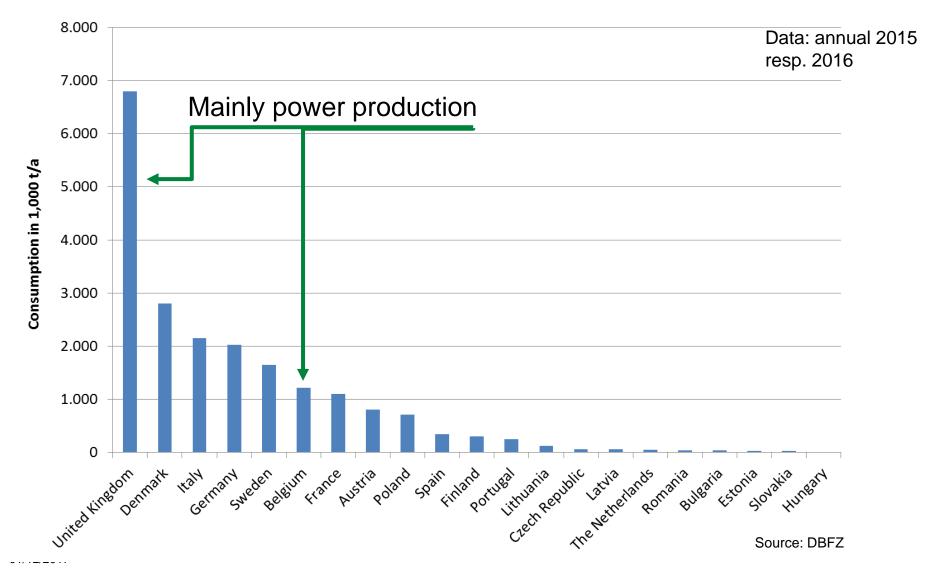


### **Consumer portfolio**

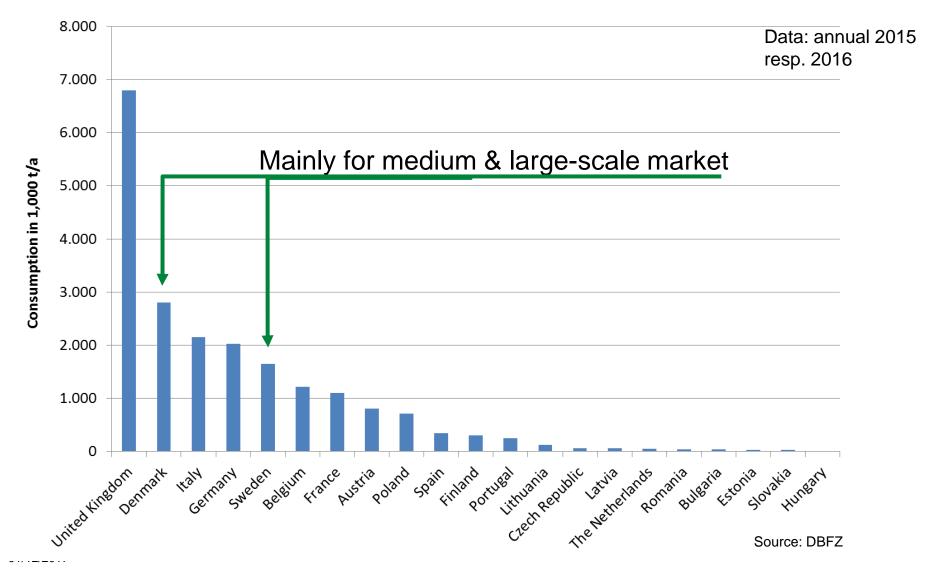
#### Types of consumers

- 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 Stirlingengine)
- 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)

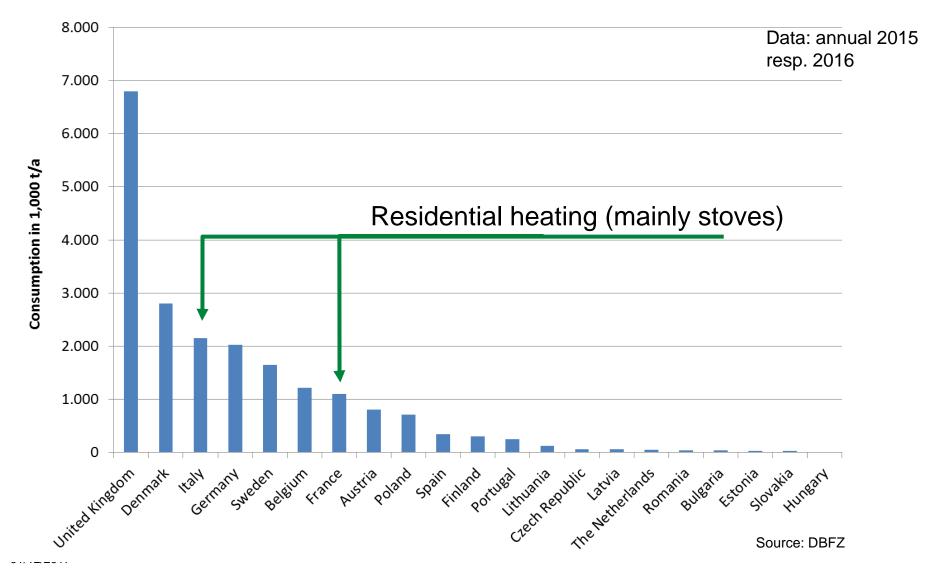




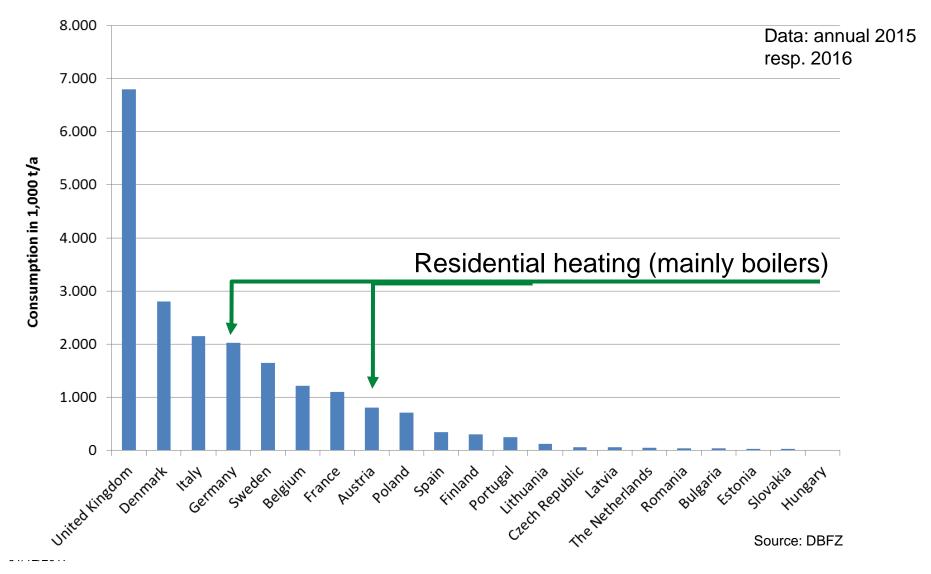






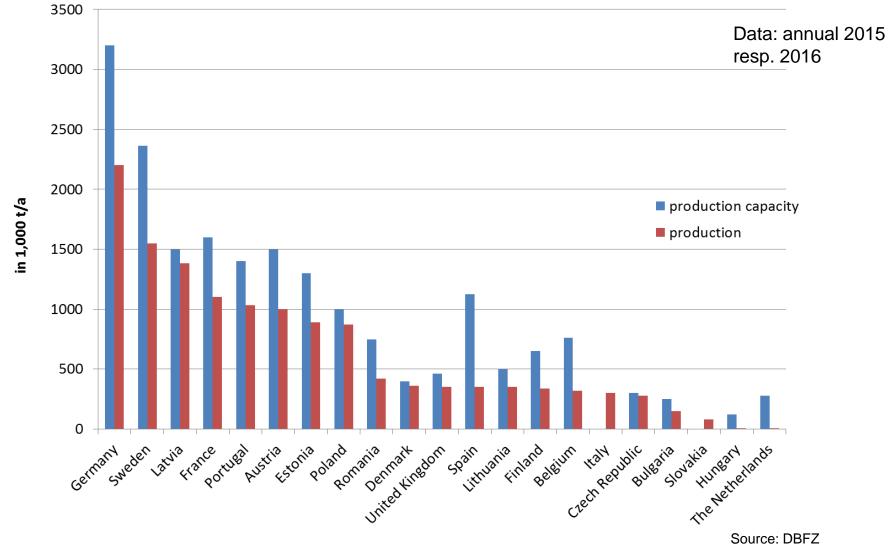








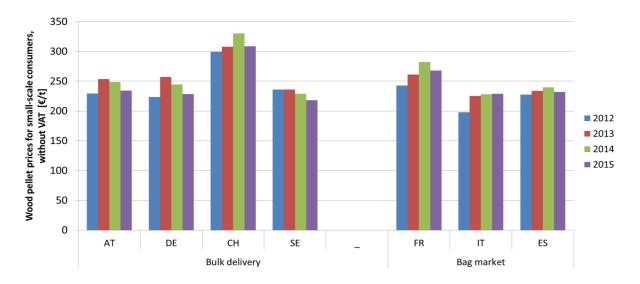
#### **Producers in EU28**





#### **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 (!?)

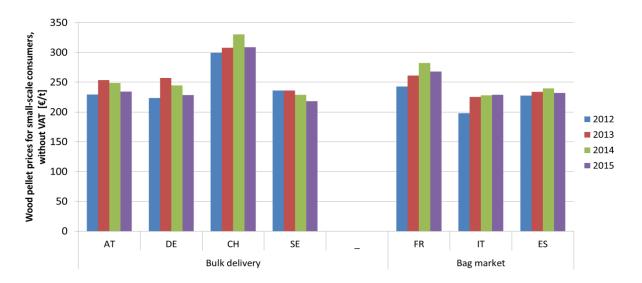


01/12/2017 Comparison of wood pellet prices for small-scale consumers, either delivered in bulk or prices for pellets in bags. Sources; (AVEBIOM, 2017; BFS, 2017; CARMEN, 2017; GSE, 2017; MEEM, 2017; Pelletsförbundet, 2017; ProPellets, 2017)



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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

01/12/2017 Comparison of wood pellet prices for small-scale consumers, either delivered in bulk or prices for pellets in bags. Sources; (AVEBIOM, 2017; BFS, 2017; CARMEN, 2017; GSE, 2017; MEEM, 2017; Pelletsförbundet, 2017; ProPellets, 2017)



### 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, Hofor



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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 <sup>nd</sup> -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 / nonindustrial 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

	RO, RHI, CfDs RTFO - UK		GCs Flanders – BE	IA - DK	SDE+ - NL	Current Harmonization Level	Harmonization Possibilities	Note
Level of requirements	Legally bind- ing to receive support	Legally bind- ing to receive support	Legally bind- ing to receive support	Voluntary	Legally binding to receive support	Low	±	Harmonization pos- sible between the Netherlands and the UK
. Timeline of nplementation	March 2016	Already implemented	Already implemented	January 2016	To be determined	Medium	±	Harmonization possible between four countries
l. Sustainability equirements Coverage								
Greenhouse Gas Emission:								
- Calculation method	*	4	*	1	4	Medium	±	Harmonization possible between four countries
- Limit compared with 1990 level	*	~	*	1	✓	Medium	<b>→</b>	Harmonization possible between four countries
- Time of implementation	*	~	1	1	✓	High	<b>→</b>	Harmonization possible between four countries
Land Use:								
Sustainable forest management:								
Legal, sustainable sourcing & certification	*	±	±	1	✓	Low	-	Harmonization pos- sible between the four countries
Forest productivity and well-functioning	*	±	±	*	4	High	4	Harmonization possible between four countries
Biodiversity protection	*	±	±	1	4	Medium	4	Harmonization possible between four countries
Ecosystems conservation	*	±	±	1	4	High	4	Harmonization possible between four countries
Feedstock categories	1	±	±	1	×	Low	-	Harmonization rarely possible between four countries
iLUC	×	×	×	×	4		×	

Source: Mai Moulin et al. (2017) Toward a harmonisation of national sustainability requirements and criteria for solid biomass. BioFPR, DOI: 10.1002/bbb.1822 OPEN ACCESS



#### **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

				SO/TS 172	25-8:	2016								
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			No	porty class, i mative	Lnalys	is method		Unit	nets produ	aced by th	iermal proce	ssing o	fnon	
			150	gm and source 17225-1 Table	#, 1				2.1 Harb	TAI			- non-we	oody biomass
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				r, D+ and Leng	th Lo		mm	1	nidues Aquatic blom	Hest In state	1			
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			Ash, A, ISO Mechanica	1,150 18134-1			w-%	$\square$	-3,13 < L (from D12 ± M10 ≤ 1	0 D25)	3,15 < L ≤ (from D12 to M10 ≤ 10	50	(from D04 3,15 < 1	15, D ± 1; L ≤ 40 to D10) L ≤ 50
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Chlorine, Cl. ISO 16968	mg/kg	dry	5	≤ 1 ; 0,5			<u>≤1</u> ≤15			≤2 ≤15	_			
Cadmium, Cd, ISO 16968 Chromium, Cr, ISO 16968	mg/kg mg/kg	dry		≤10 ≤10	-		< 20			≤20 ≤10	-			
	mg/kg mg/kg	dry		≤10	_		≤10 < 0.1	_		< 0.1	_			
Lead, Pb, ISO 16968 Mercury, Hg, ISO 16968	mg/k	g dry		≤ 0,1 ≤ 10	-		< 10			≤10 ≤100	-			
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For D06 to D10 the amount	st of penets i	aget	mm are screet	ned by hand	accord	ding star	adard ISO	1884	46. or any other	additives 1	like			
At the point of delivery. Fi	ines less that roduction, de	livery	or combustio	n (e.g. pressi	ing aid	1s, slagg	ing trimbe	mer	noisture con	tent (M) 8	96 is			
For D06 to D10 the amount At the point of delivery. Fi Type of additives to aid start, com flour, potato Net calorific value as reco 19.13 MJ/kg (5.3 kWh/kg All characteristic temper	flour, vegeta rived (Q) res	ple oil, uiting	from net calor	(fic value on	dry b MJ/k	asis 21,0 g (5,2 k3	ni MJ/kg: Nh/kg]-	and th	TVT) herrier	obere				
<ul> <li>Net calorific value as receiption of the second seco</li></ul>	and by 10 atures (shris	% mol	starting temps	rature (SST)	defo	id be sta	temperat ted.	mre (	or ), meansy					
<ul> <li>All characteristic temper temperature (HT) and fir</li> </ul>	ow temperat	ure (F	T]] in oxidizin	Committons										



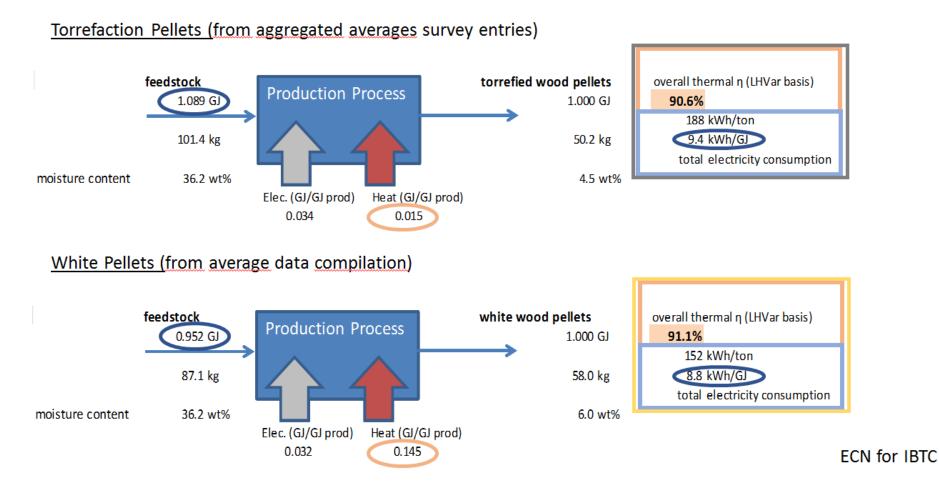
#### **Torrefied Biomass in its field**

		White Wood Pellets	Steam Exploded Pellets	Torrefied Pellets	Steam Coal
feedstock Wood		х	x	x	
feedstock Agro				x	
Bulk density	kg/m3	650	750	700-800	700-750
Moisture ar	%	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



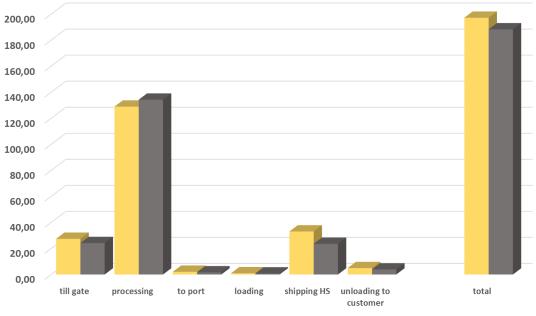
## Comparison torrefaction vs. white wood pellet production (same feedstock, 1 GJ)





#### 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

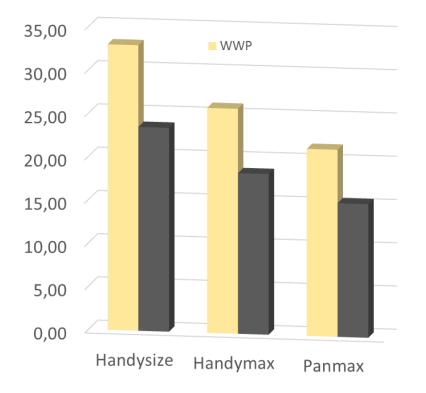


			Energy	
	Normalised	Normalised	consumed	Advantage
Transported	WWP	TP	TP/WWP	ТР
	MJ/GJ	MJ/GJ		%
	full chain of	pellets		
Handysize	197,162	188,211	95,46%	4,54%
	downstream	logistics only		
Handysize	68,305	53,971	79,01%	20,99%
	full chain on	WWP and to		ettes
Handysize	197,162	179,971	91,28%	8,72%

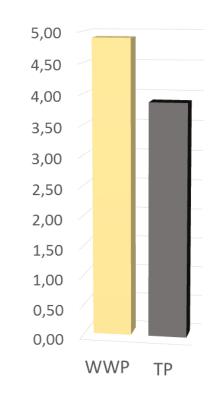


#### **Advantages along chain from FOB**

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

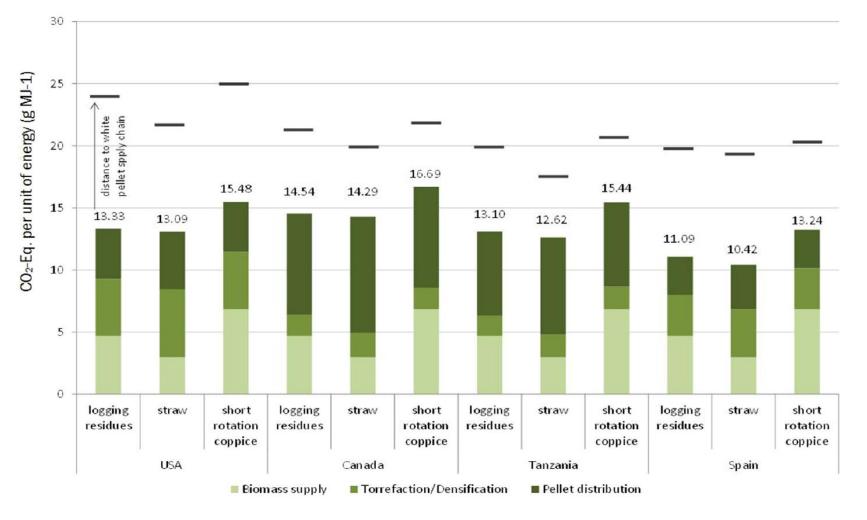


Energy Consumption from vessel to plant stockyard in MJ/GJ





#### **GHG Comparison**





#### **Torrefaction Implementation Indicator**

The second state of the second state is a	d a se a	
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**

	Desise	Project Size mt/a	Country	Feedstock	
	Project	15.000	110	Curren Como Hamandon sidua	
	White Castle, LA	15.000	US	Sugar Cane Harvest residue	
	Dilsen Stokkem	28.000	В	Wood	
	Derby	30.000	UK	Wood	
Existing	Umea	16.000	Swe	Wood	
	Quitman	30.000	US	Wood	
	Beauncur	15.000	Can	Wood	
	Project	Project Size	Country	Feedstock	Commision date
	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
Commited to	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
	7 in Lousiana and Florids	200.000 each	US	Sugar cane harvest residue	2019-22
In the nineline	5 Central/South Ameriva	200.000 each		Sugar cane harvest residue	2019-22
In the pipeline	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



**Contact:** 

Daniela Thrän: daniela.thraen@dbfz.de

Kay Schaubach: kay.schaubach@dbfz.de