

Discussion Forum

**3rd Advisory Group & User Forum,
National Workshop Croatia**

Zagreb, 18th January 2018



Points of discussion

- Introduction: Benefits from the ENERGY BARGE project
 - Short statements from external stakeholders (introduction round) – What is the Croatian point of view?
 - Open discussion guided by questions (markets & logistics)
- *Documentation of most important points on flipchart*

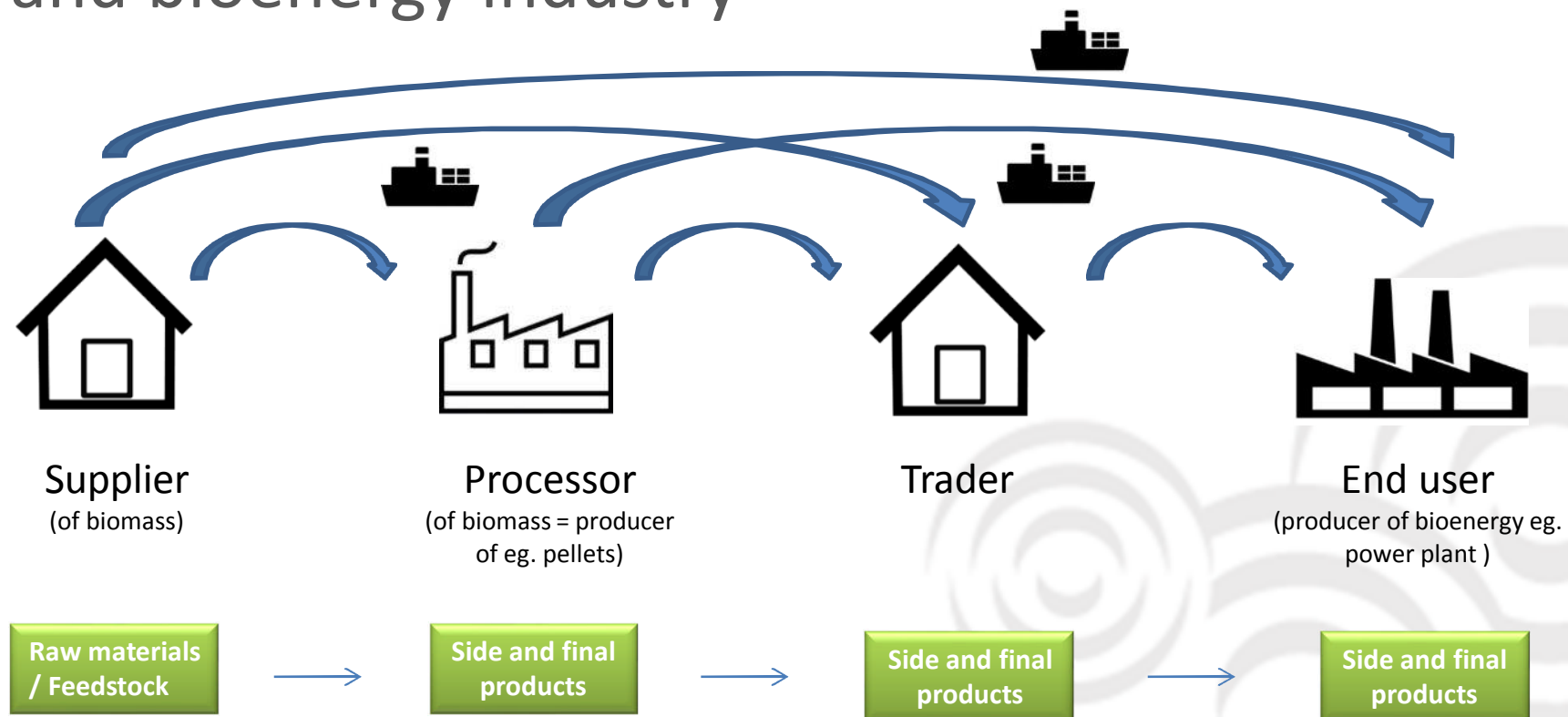
Benefits from the ENERGY BARGE project



Introduction: How can you benefit from ENERGY BARGE?

- Basis for **cross-sectoral and transnational knowledge exchange** on market opportunities and available logistics services
- **Business to Business opportunities** on regional and international level
- **Online information tools** for better exploitation of bioenergy potential along the value chain in the Danube Region
- **Practical Recommendations** for public and private actors in both the bioenergy and Danube logistics sectors
- **Implementation of investments** in the Danube logistics sector to serve your needs

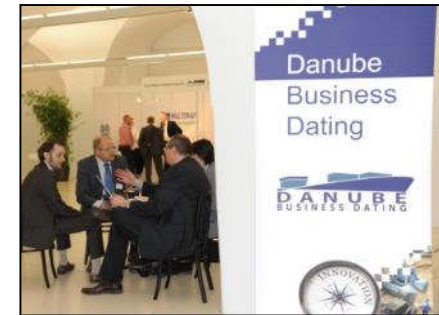
Target groups of ENERGY BARGE in the biomass and bioenergy industry



Regional Business-to-Business meetings

Scheduled date (Croatia): February 2019, Vukovar

- Meeting points for **all stakeholders interested in logistics solutions and business relations** in the field of Danube logistics
- Effective combination of information sessions and B2B contacts
- Perfect **opportunity to find a suitable logistics service provider** in the Danube region (transport, transshipment, storage of cargo relevant in the biomass and bioenergy sector)



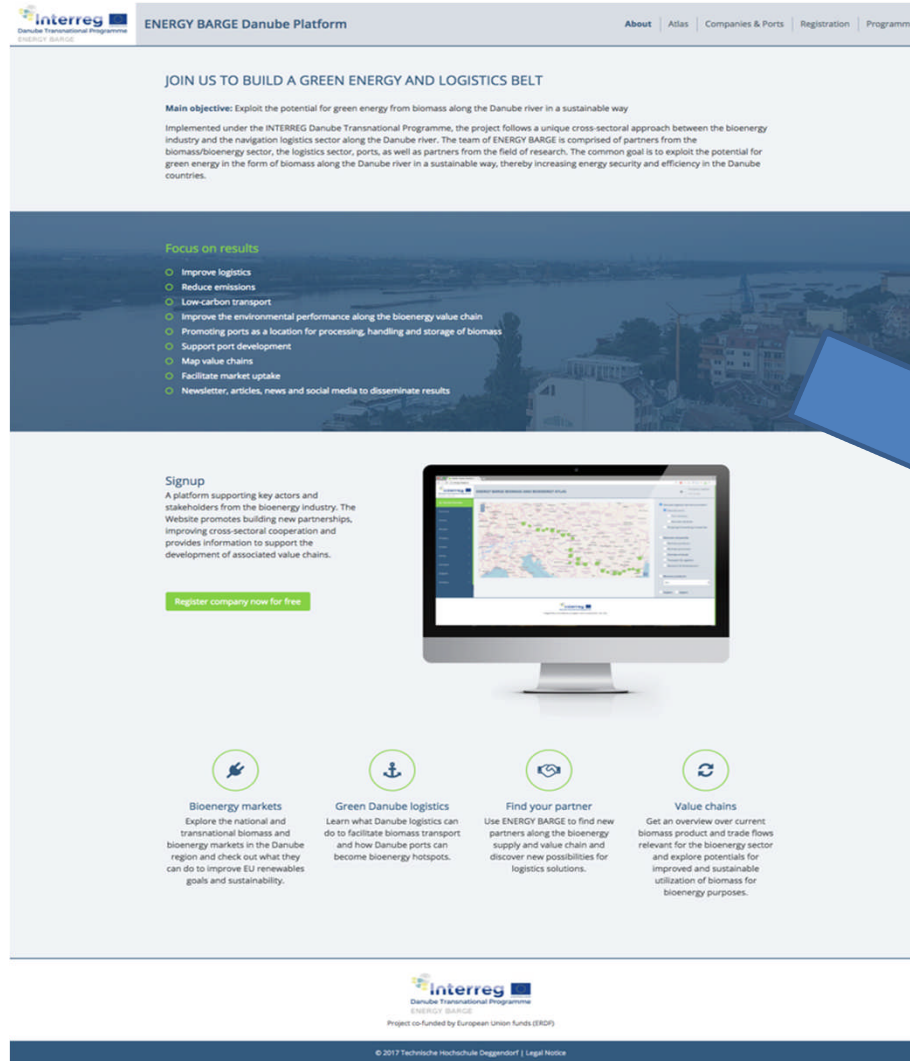
Regional Business-to-Business meetings

Methodology (basic approach: speed dating)

- Cargo owners and logistics suppliers register weeks ahead of the event
- After registration closing, meeting partners can be chosen & identified
- Meeting inquiry is sent
- Final meeting schedule is set shortly before the conference
- Execution of B2B meetings (20-30 minutes)



ENERGY BARGE – Online Platform



ENERGY BARGE Danube Platform

About | Atlas | Companies & Ports | Registration | Programme

JOIN US TO BUILD A GREEN ENERGY AND LOGISTICS BELT

Main objective: Exploit the potential for green energy from biomass along the Danube river in a sustainable way.


Implemented under the INTERREG Danube Transnational Programme, the project follows a unique cross-sectoral approach between the bioenergy industry and the navigation logistics sector along the Danube river. The team of ENERGY BARGE is comprised of partners from the biomass/bioenergy sector, the logistics sector, ports, as well as partners from the field of research. The common goal is to exploit the potential for green energy in the form of biomass along the Danube river in a sustainable way, thereby increasing energy security and efficiency in the Danube countries.

Focus on results

- Improve logistics
- Reduce emissions
- Low-carbon transport
- Improve the environmental performance along the bioenergy value chain
- Promoting ports as a location for processing, handling and storage of biomass
- Support port development
- Map value chains
- Facilitate market uptake
- Newspaper, articles, news and social media to disseminate results

Signup
A platform supporting key actors and stakeholders from the bioenergy industry. The Website promotes building new partnerships, improving cross-sectoral cooperation and provides information to support the development of associated value chains.

[Register company now for free](#)



Bioenergy markets
Explore the national and transnational biomass and bioenergy markets in the Danube region and check out what they can do to improve EU renewables goals and sustainability.

Green Danube logistics
Learn what Danube logistics can do to facilitate biomass transport and how Danube ports can become bioenergy hotspots.

Find your partner
Use ENERGY BARGE to find new partners along the bioenergy supply and value chain and discover new possibilities for logistics solutions.

Value chains
Get an overview over current biomass product and trade flows relevant for the bioenergy sector and explore potentials for improved and sustainable utilization of biomass for bioenergy purposes.

Interreg
Danube Transnational Programme
ENERGY BARGE
Project co-funded by European Union Funds (ERDF)

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Work in progress

Online modal shift platform

- **Publicly accessible information platform** for potential customers of Danube logistics services from the biomass/bioenergy sectors
- **Know-how exchange** on the transport, handling and storage of biomass products
- Information about Danube ports and other **logistics service providers** including contact data, maps, available equipment etc.



Short statements from external stakeholders (introduction round)

-

What is the Croatian point of view?

Questions for discussion



Markets

Markets (geographical)



- Important **resource markets** in Danube Region, Western Europe, outside Europe for...
 - woodbased biomass
 - agricultural biomass
 - oilseeds
 - starchbased raw material
 - other

→ **potential for import?**

Markets (geographical)



- Important **target markets** in Danube Region, Western Europe, outside Europe for...
 - woodbased biomass
 - agricultural biomass
 - oilseeds
 - starchbased raw material
 - other

→ **potential for export?**

Markets (sector)

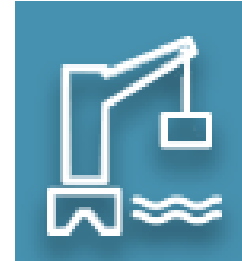
- Important **resource markets** in Danube Region, Western Europe, outside Europe
 - biomass producers (eg. agricultural companies, wood suppliers)
 - traders
 - other



Markets (sector)



- Important **target markets** in Danube Region, Western Europe, outside Europe
 - biomass processors (eg. biofuel producers)
 - bioenergy / biofuel users (eg. biomass power plant)
 - biobased materials & chemicals industry
 - traders
 - other



Logistics

Logistics (status quo)



- Relevance of Danube logistics services up to now
- Experiences with inland waterway transport so far
- Challenges for logistics services
- Annual patterns & peaks in cargo flows (eg. harvest season, increased energy demand in winter, etc.)
- Special logistics requirements of biomass products (e.g. certification, transport/transshipment/storage etc.)

Logistics (new services)



- Information needs with regards to available Danube logistics services
- Required business partners and contacts
- Possibilities for bundling cargo flows to reach the suitable volumes
- Feasibility of an increased use of Danube logistics services



Ann-Kathrin Kaufmann

BioCampus Straubing GmbH

Simon Hartl

viadonau – Austrian Waterway Company

www.interreg-danube.eu/energy-barge



HRVATSKI OPERATOR TRŽIŠTA ENERGIJE d.o.o.
Croatian Energy Market Operator Ltd.










HROTE HRVATSKI OPERATOR TRŽIŠTA ENERGIJE d.o.o.
CROATIAN ENERGY MARKET OPERATOR Ltd.



Activities

-  Organizing the electrical energy market
-  Organizing gas market
-  In charge of the incentives system; production of electrical energy from renewable sources and cogeneration
-  In charge of the Guarantees of Origin Registry
-  Leading the ECO Balance group

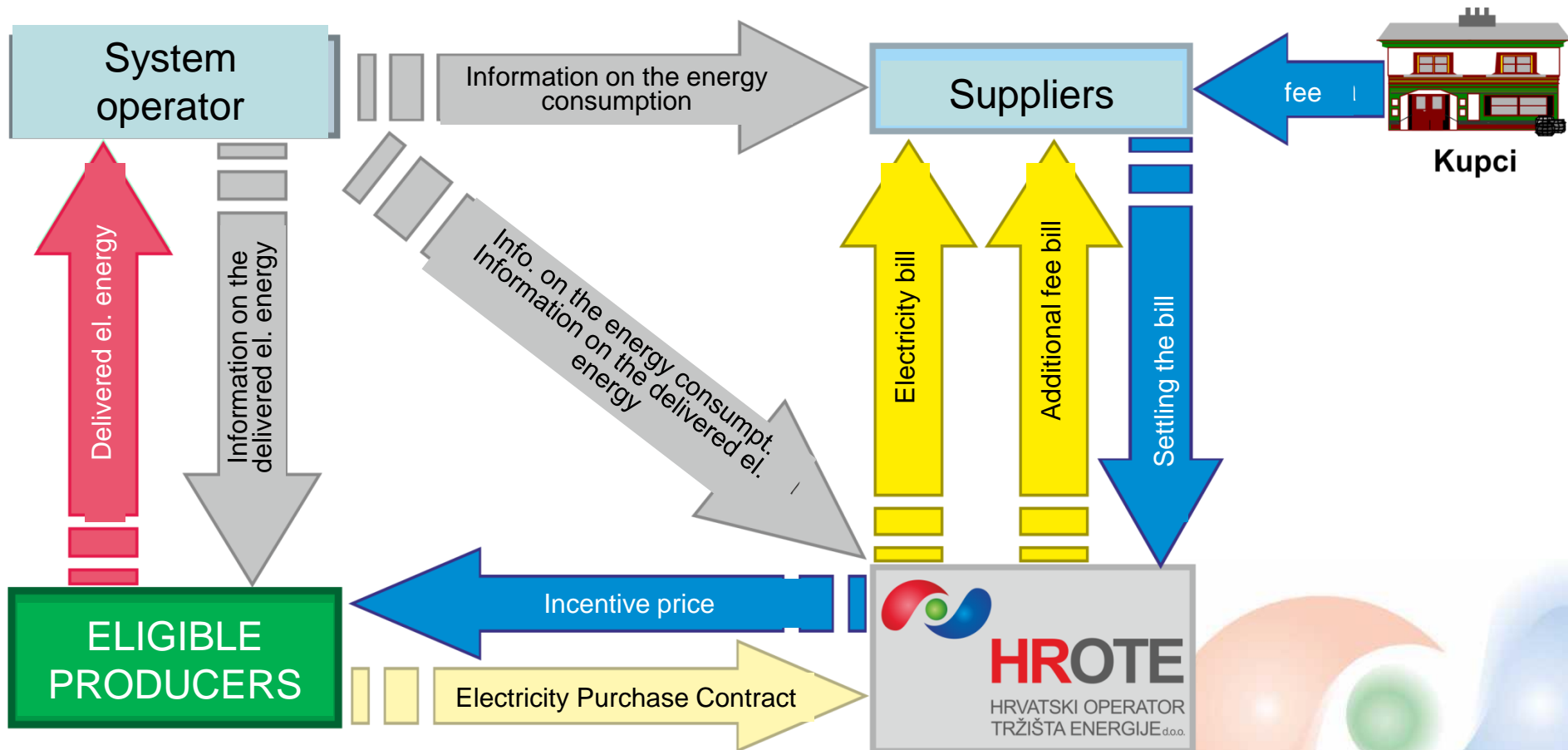




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CROATIAN ENERGY MARKET OPERATOR Ltd.



Incentive systems for RES and cogeneration

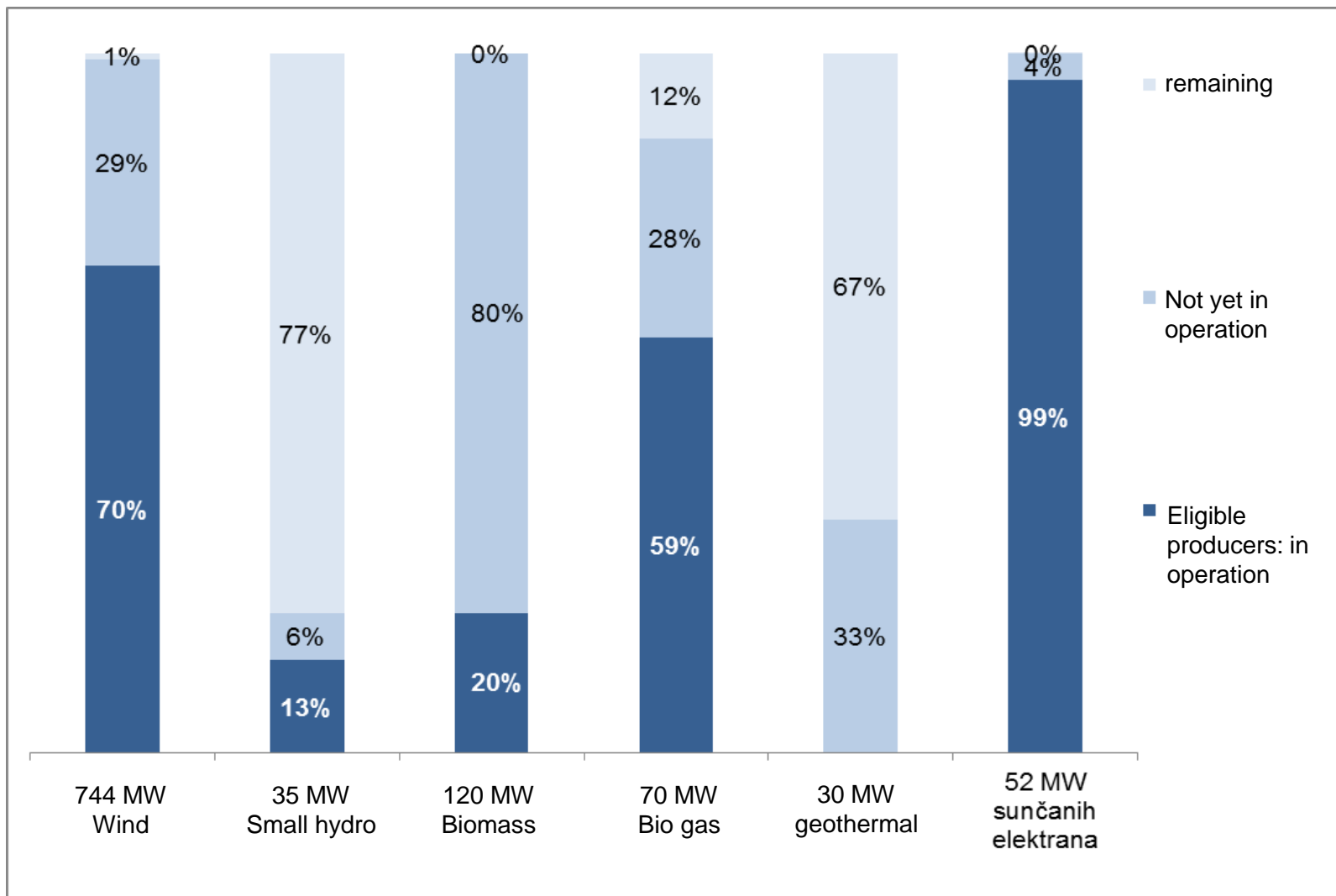




HROTE HRVATSKI OPERATOR TRŽIŠTA ENERGIJE d.o.o.
CROATIAN ENERGY MARKET OPERATOR Ltd.



RES – achieved on 5.1.2018.





HROTE HRVATSKI OPERATOR TRŽIŠTA ENERGIJE d.o.o.
CROATIAN ENERGY MARKET OPERATOR Ltd.



RES – Biomass on 5.1.2018.



Eligible producers who have signed the Electricity Purchase Contract:

- 17 facilities
- 35.950 kW installed capacity



Project holders who have signed the Electricity Purchase Contract :

- 43 facilities
- 78.837 kW planned installed capacity



Total electric energy production from biomass sources in 2017.:186 GWh



Social, Economic and Technical Aspects of Biomass Power Plants

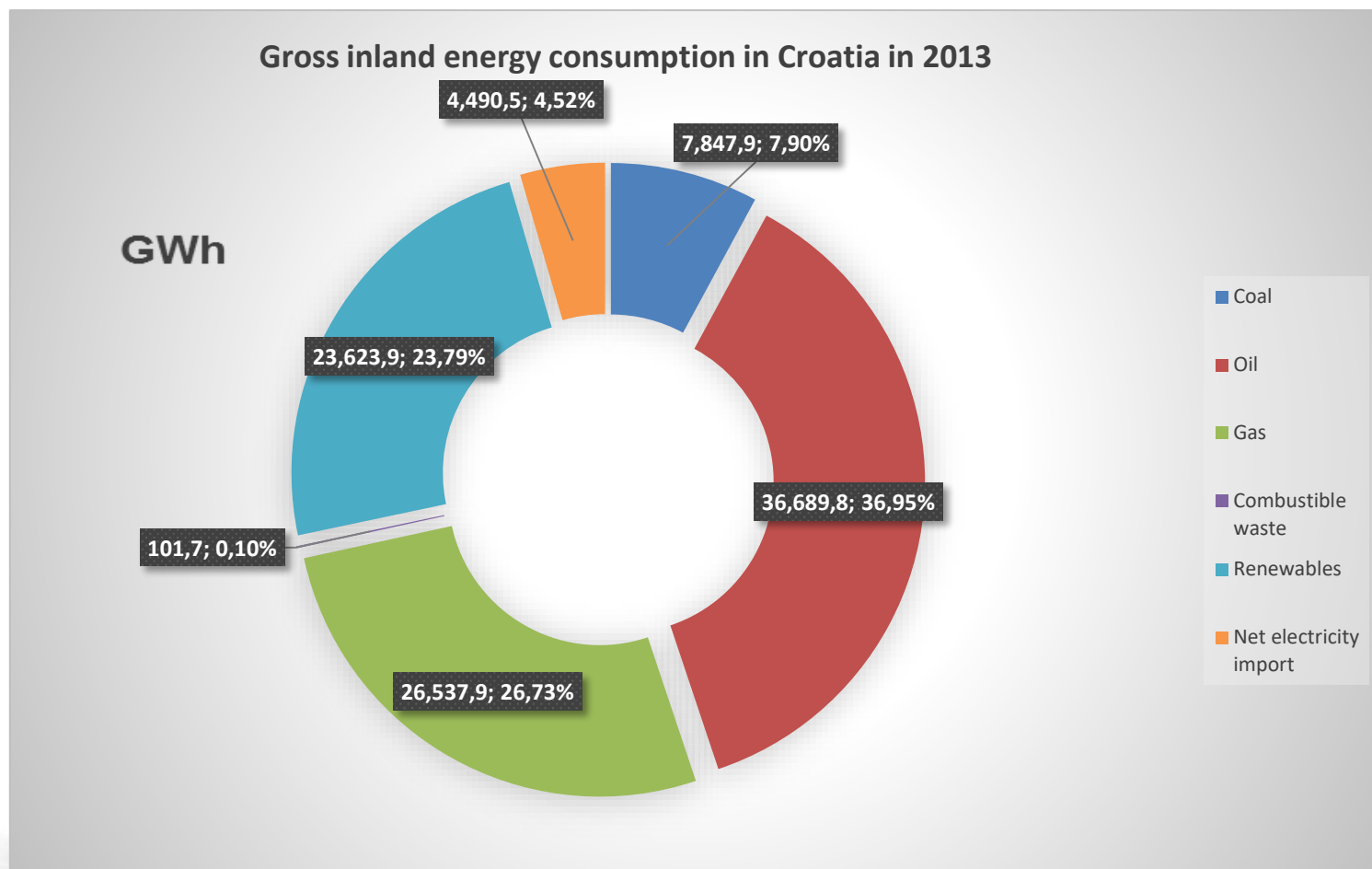
Dražen Balić

Energy Institute Hrvoje Požar

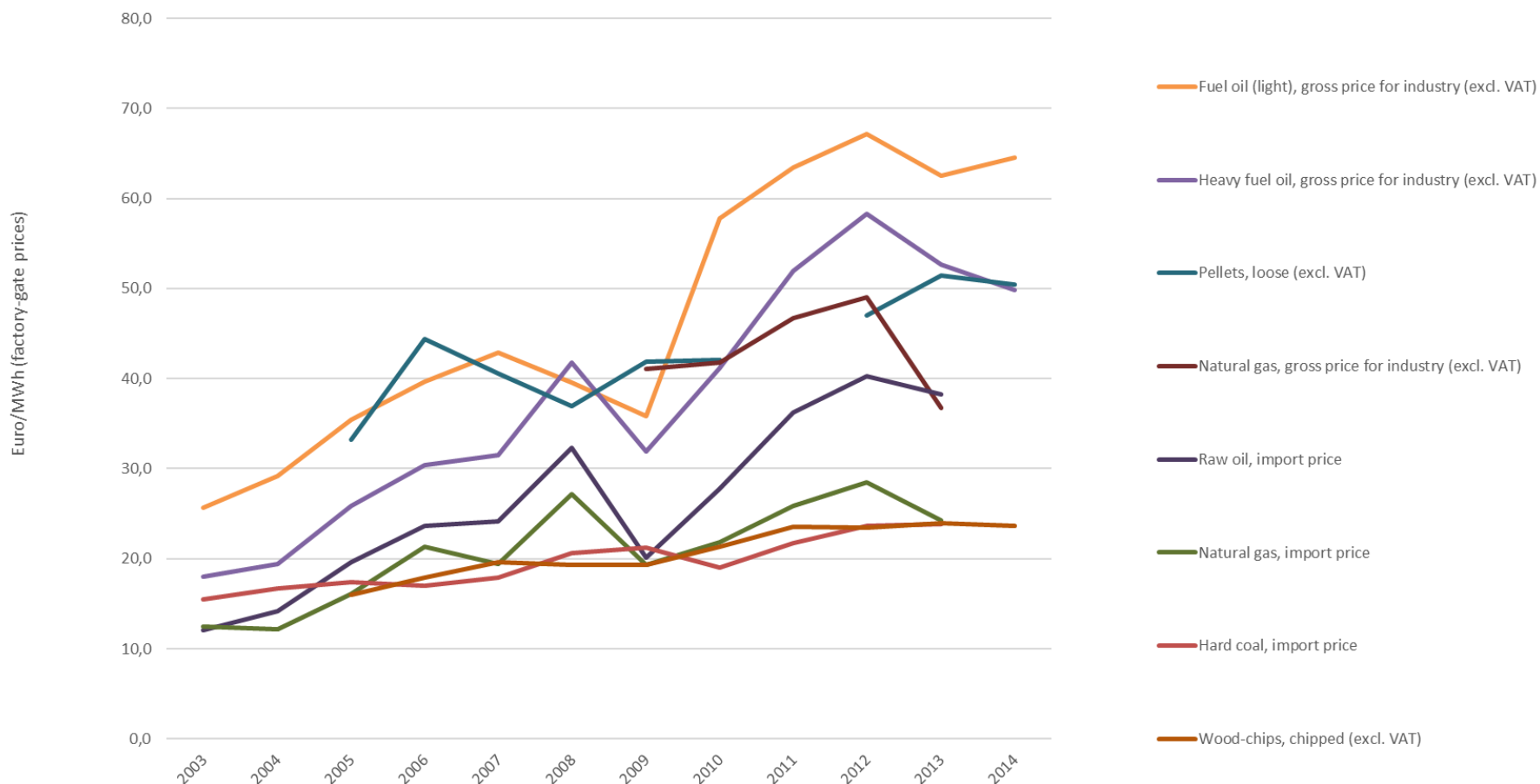
- **Energy – *conditio sine qua non***
- **46% of Total Final Energy for Heating and Cooling (IEA)**
- **CHP (+ DH) More Appropriate Way of Fuel Usage**
- **Social impact**
 - CO₂ Emissions
 - Impact on Local Community
 - By-products
- **Increased Share of RES**
- **Unfavourable Design of Electricity Market (Merit Order)**



Gross Inland Energy Consumption in Croatia



Prices and Import of Fossil Fuels



- **Forests**
 - 42% of Land Coverage
 - 0.56 Hectare of Forest Per Capita
 - 78% State Owned, 22% Private
- **Commercial Production in Croatia**

Type	Year 2013	Year 2014	Units
Total cut-down wood	5.436	5.926	'000 m ³
<i>Heating timber</i>	1.400	2.300	'000 m ³
<i>Industrial timber (coarse shared wood)</i>	4.037	3.626	'000 m ³
Chucks (saw-milled and veneer)	2.672	2.763	'000 m ³
Pulpwood	1.218	824	'000 m ³
Other industrial timber	147	39	'000 m ³

Source: DZS

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Ever more households forsake gas and implement wood heating

Winter is getting closer bringing worries and dilemmas about heating. In the last few years, the most obvious trend is the shift from gas heating to wood heating. We investigated the prices of heating timber and talked with a couple of chimney-sweepers about solid fuel switching for heating.

Branko Zebec and Goran Trubelj from two chimney-sweeper firms in Koprivnica asserted that ever more people forsake gas as a heating fuel. This is especially significant for households on the city outskirts. In some streets, up to 90 percent of households implemented wood heating...

Local News, Koprivnica, 03. October 2016

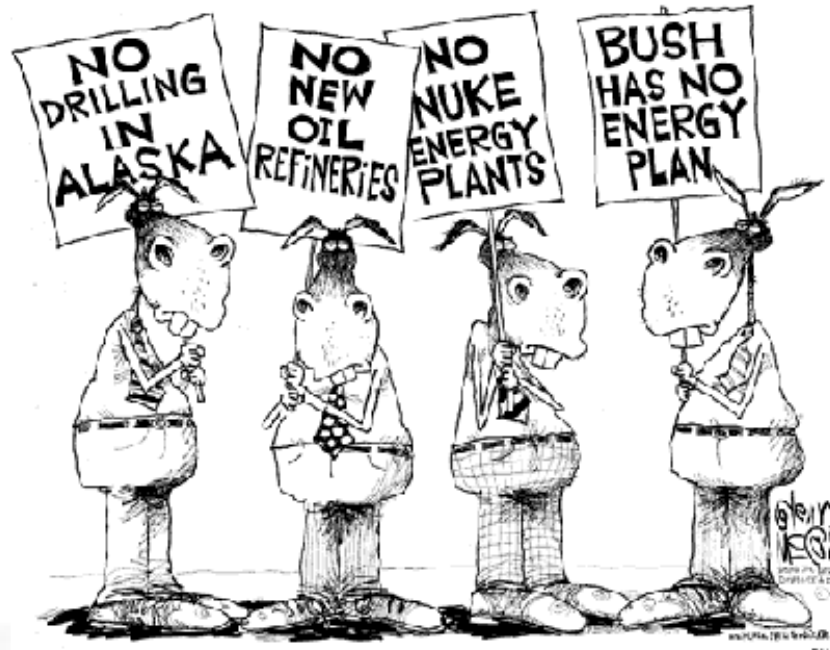
- **Sustainable Development** (Additive vs. Integral Protection)
- **Environmental Aspects** (Air, Water, Noise, Impact on Flora and Fauna, etc)
- **Benefits of Biomass Utilisation**
 - Environmental Friendly Fuel
 - Economic Sustainable
 - Development of Science and Industry
 - Fostering Employment in Local Community
- **Circumvented CO₂ Emission**
- **Primary Energy Factors**
- **Public Awareness About Biomass Utilisation**

Often Sayings Related to Energy Projects

NIMBY - Not In My Back Yard

BANANA - Build Absolutely Nothing Anywhere Near Anybody

TANSTAAFL - There Ain't No Such Thing As A Free Lunch



- **Security of Supply and Competitiveness (5 "As")**
 - **A**vailability
 - **A**ccesibility
 - **A**daptability
 - **A**ffordability
 - **A**ceptability



OPPORTUNITIES / CHALLENGES FOR BIOMASS POWER PLANTS

FLEXIBILITY

FLEXIBILITY

What is that?

FLEXIBILITY

What is that?

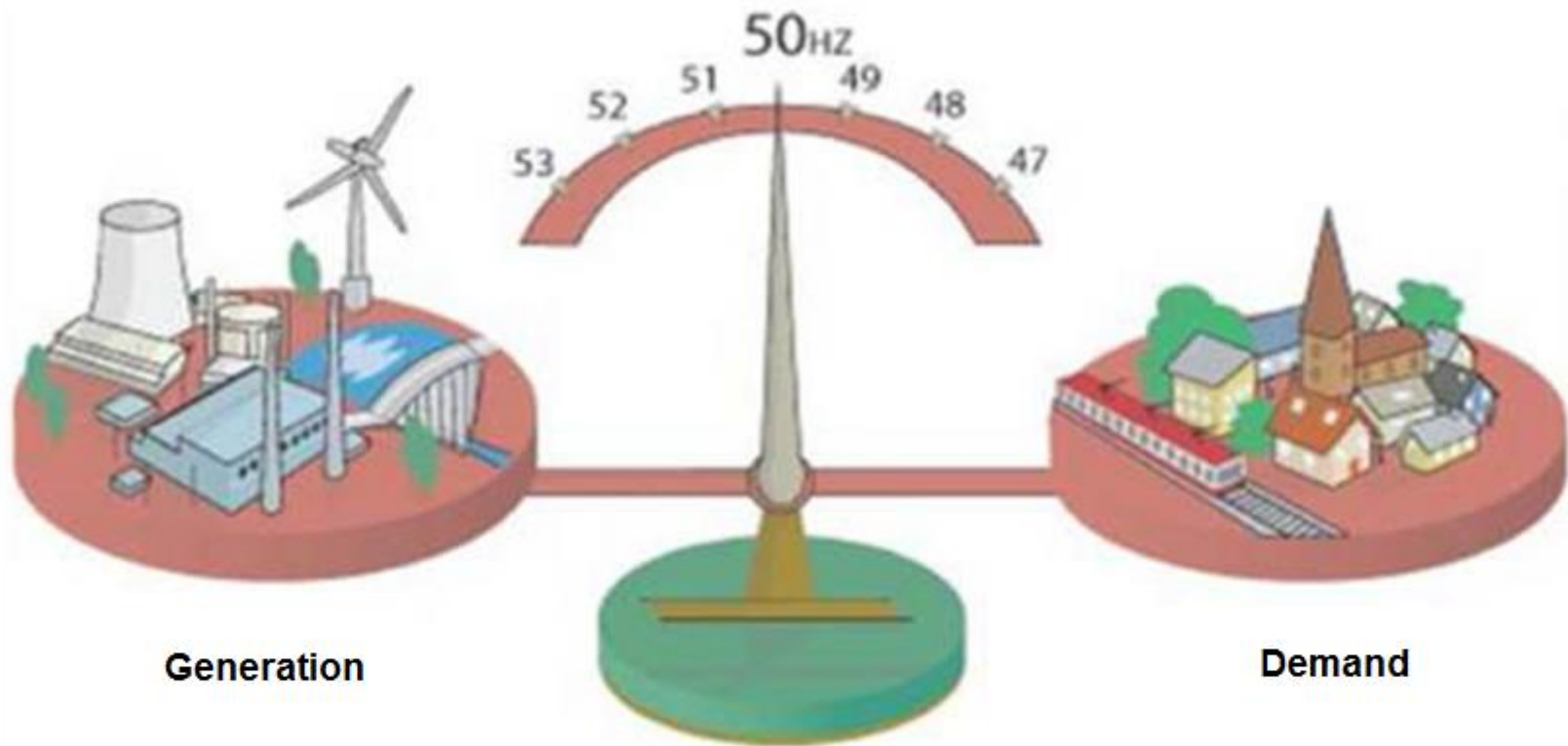
Do we need it?

FLEXIBILITY

What is that?

Do we need it?

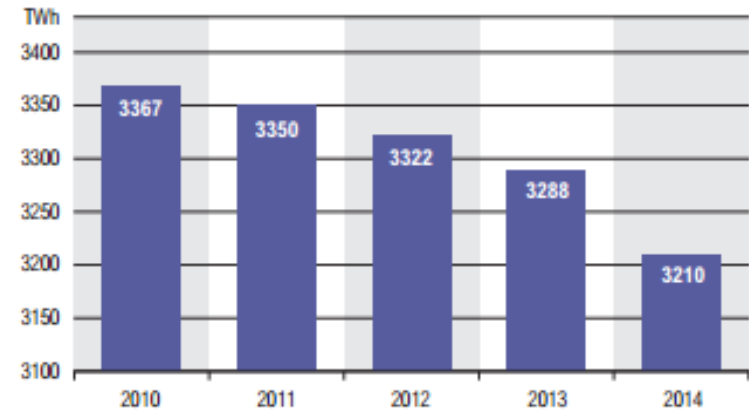
And in what amount do we need it?



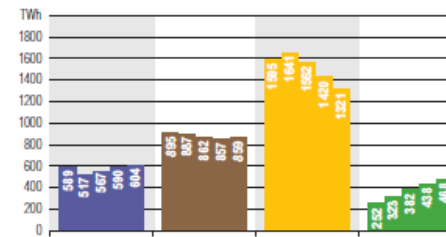
Electricity **Cannot** be Stored in Real Time!

- **Power System - Overcapacity**
 - Increased Share of Intermittent RES
 - Decrease of Electricity Consumption
 - Adoption of Energy Efficiency Measures

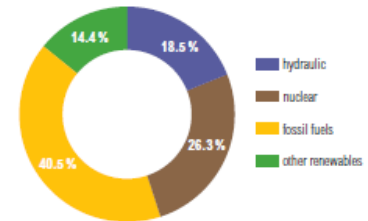
- **Electricity Market Merit Order**



Yearly energy consumption in TWh



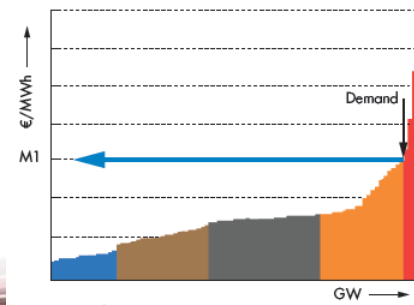
Energy net generation from 2010 to 2014 in TWh



Energy net generation in 2014

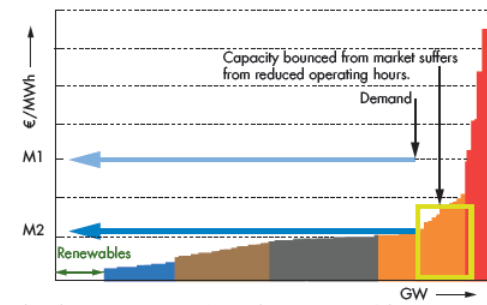
Source: entso-e

Market without feed-in of renewables



M1: Market price without renewables.

Market with feed-in of renewables at fixed prices for renewables.



M2: Market price with renewables at fixed prices for renewable feed-in.
Source: graphic EnBW, VGB, www.vgb.org

- **Provision of Ancillary Services**

- Balancing Power System (Secondary and Tertiary Reserve)

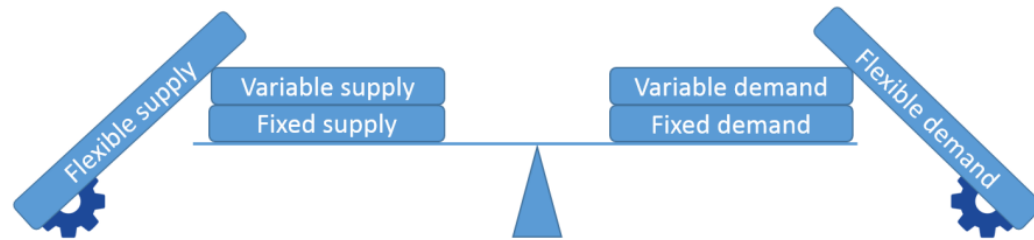
- **Additional Revenues**

- **Visibility** of Small-scale Producers

- **Production at the Place of Consumption**

 Prosumers

- **Efficient Usage** of Infrastructure



- **Provision of Ancillary Services**

- Balancing Power System (Secondary and Tertiary Reserve)

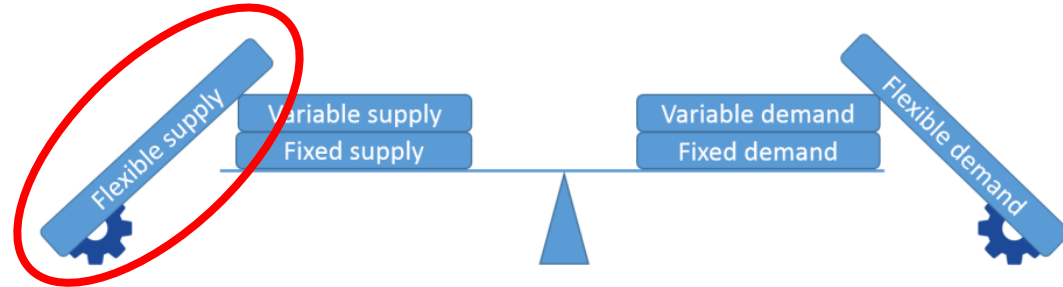
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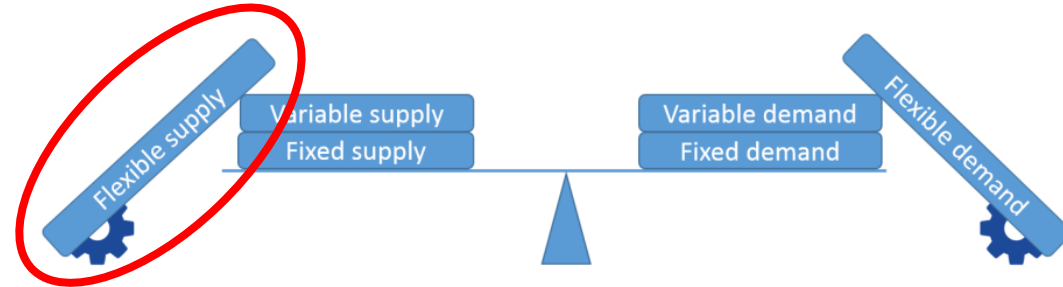


- **Efficient Usage** of Infrastructure



- **Provision of Ancillary Services**

- Balancing Power System (Secondary and Tertiary Reserve)



- **Additional Revenues**

- **Visibility** of Small-scale Producers

- **Production at the Place of Consumption**



- **Efficient Usage** of Infrastructure

The biggest traffic jam:
260 km, China



Conclusions

- **Contemporary Energy System** ➔ Technologies Acceptable from Societal Point of View
- **Integral Approach** and **Meaningful** Utilisation of (Thermal) Energy
- Necessary **Number** of **Operating Hours**
- **Holistic Approach** in Project Development
- Achievement of **Synergy Effects**
- **Legal** and **Regulatory** Framework
- **Clean Energy for All Europeans**





Thank you for your attention!

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Sustainable and economically viable utilisation of biomass for energy purposes: Current status and future trends

University of Zagreb
90 Years of Faculty of Mechanical
Engineering and Naval Architecture



Boris Ćosić dipl.ing.

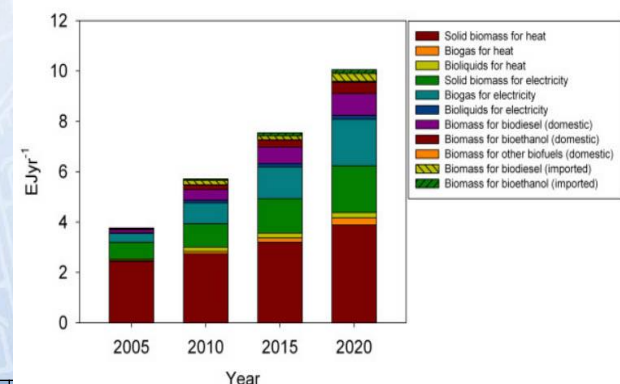
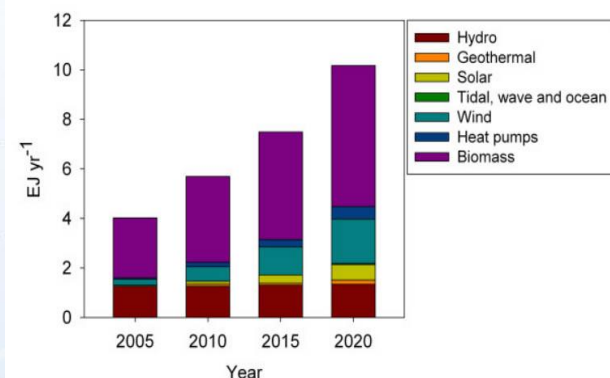
University of Zagreb, Faculty of Mechanical
Engineering and naval Architecture

Energy Barge – Project Workshop
January 18, 2018, Hotel Palace, Zagreb, Croatia

Biomass in Croatia and EU

2.

- Directive 2009/28/EC – Member States need to provide National Renewable Energy Action Plan (NREAP)
- Croatia - Directive 2009/28/EC transposed into national legislation
 - NREAP has been prepared with high emphasises on wind and biomass
- Croatia - New Low Carbon Development Strategy



Technology	Energy strategy 2009 - 2020 goals	NREAP - 2020 goals	Modified NREAP 2020 Goals	RES with FIT in operation 5.1.2018	RES with FIT - only contract 5.1.2018	LCDS - 2020 Goals	LCDS - 2030 Goals	LCDS - 2050 Goals
	[MW]	[MW]	[MW]	[MW]	[MW]	[MW]	[MW]	[MW]
Photo Voltaic	45	52	56	51.479	1.982	56	120-250-350	64-674-2204
Wind Energy	1200	400	744	519	219	744	1200-1600-2000	3168-3158-3618
Small hydro	100	100	35	4.48	2.239	66	100-140-140	100-140-140
Biomass and waste	140	85	120	35.95+5.5	78.837	120	135-140-170	135-140-200
Biogas		40	70	35.734	19.786	70	80-90-100	80-90-120
Geothermal	20	50	30		10	30	30-30-40	30-30-50

The „competition trap” everyone wants them !

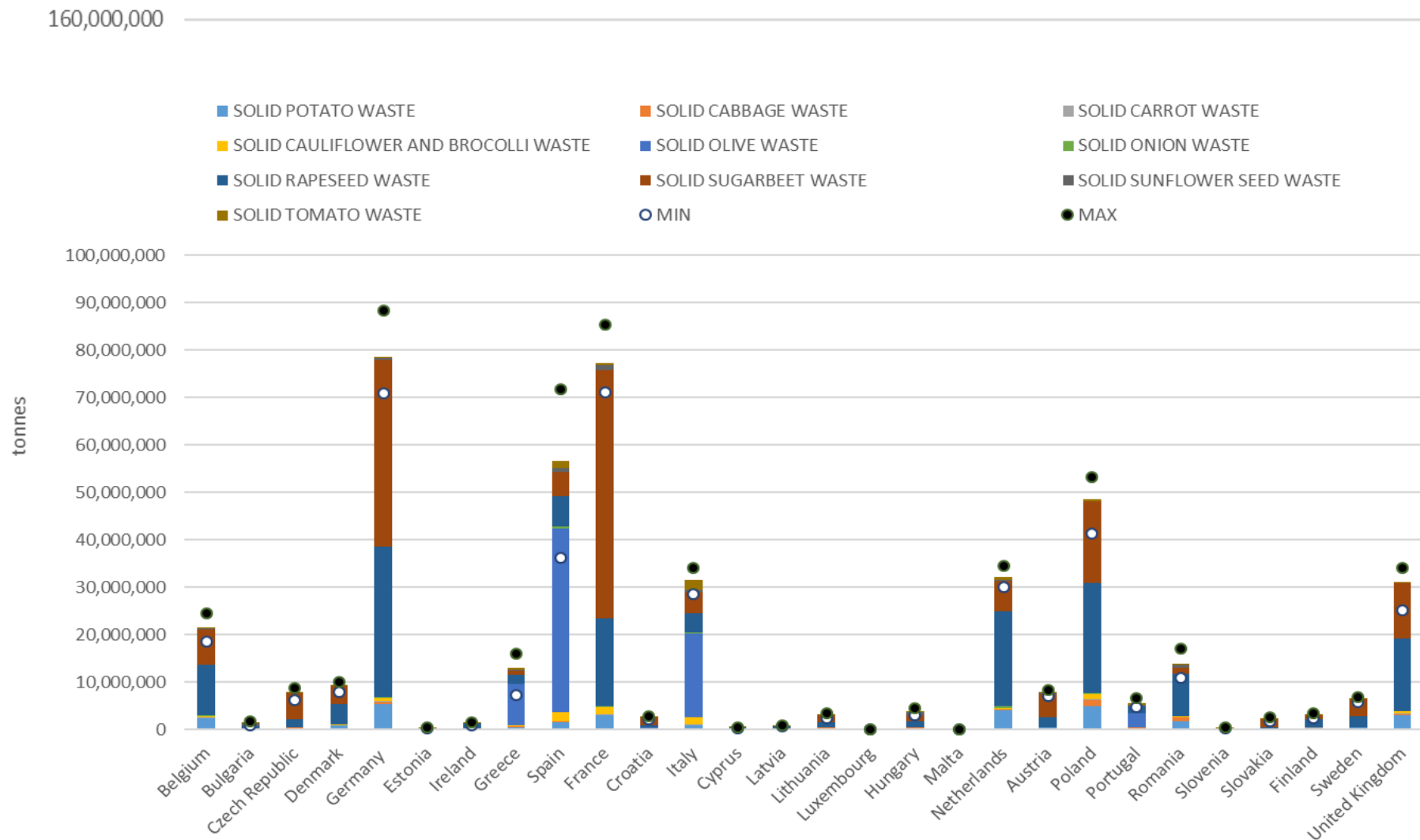
Bio-resource	Origin	Yield [tFM/(ha.y)]*	Main content	Yield for main comp. [t /(ha/y)]	Current competition: f= food; b =bio-fuel; c= chemicals; e= energy; p= pulp&paper
corn	fields	10-15	starch	6-9.5	f/b /c/e
wheat	fields	8	starch	4.5	f/b /c
potatoes	fields	30-50	starch	5-8.5	f/b /c
rape	fields	2-4	oil/protein	0.9-1.8/0.5-1	f/b /c
sun flower	fields	2.6-3.6	oil/protein	1.3-1.8/0.5-0.7	f/b /c
jatropha**	fields	4	oil	1.2	b/c
palm fruits**	plantation	15-22	oil	4-6	f/b /c
sugar beet	fields	70-95	sugar	10-16	f/b /c/e
sugar cane**	plantation	40-100	sugar/cell.	6-15/6-15	f/b /c/e
grass	grass land	6-12	cellulose	2.5-5	f/b/e
miscanthus	fields	12-28	cellulose	5-13	e/(c/p)
wood	forest	3.5-6	cellulose	1.3-2	b/c/e/p
short rotation wood	fields/grass land	10-18	cellulose	3-6	b/e/(c/p)

Trying to avoid the „competition trap“:

Raw material category	Origin	Material (examples)
Secondary	Agricultural wastes	Manure
	Residues from industries	Slaughterhouse residues
		Tallow
		Oil seed cake
		Glycerol from bio-diesel prod.
		Dried distillers grain
		Black liquor from pulping
		Sugar beet chips
		Pomace
		Tanning residues
	Residues from energy provision	CO ₂
		Ashes
	Harvest residues from agriculture/forestry	Low quality forest residues
		Straw from corn, cereals, oil seeds, ...
		Leafs from beets, potatoes, ...
		Cuttings from wine yards, orchards, ...
Tertiary	Residues from society	Waste paper
		Waste plastic
		Organic municipal waste
		Garden cuttings
		Used vegetable oil
		Waste water
Additional	Underutilised bio-resources	Grass
	currently uncultivated land	Micro algae, energy crops, energy wood

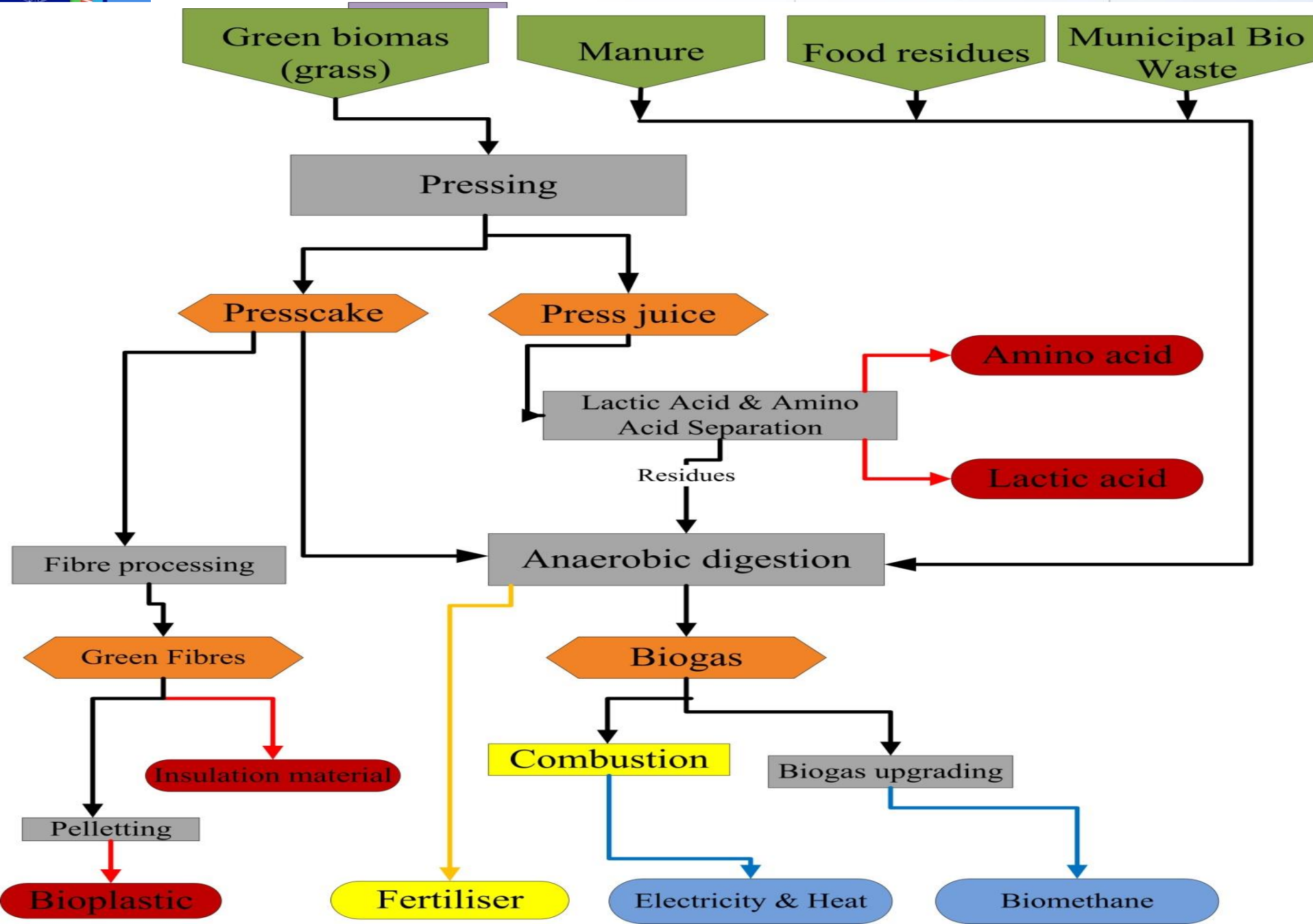
Trying to avoid the „competition trap“:

5.





Rules for bio-resource utilisation: Learn



Transport sector!!!

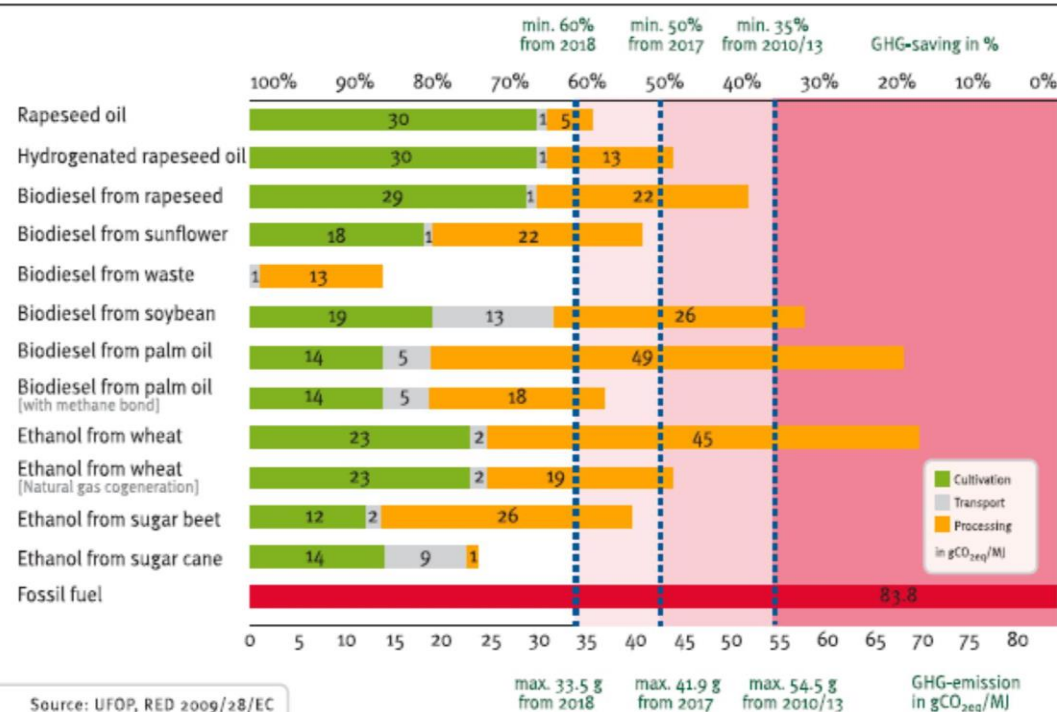
7.

- Directive 2009/28/EC – obligation of ensuring that the share of energy from renewable sources in all forms of transport in 2020 is at least 10 % of the final consumption of energy in transport
- Directive 98/70/EC - require suppliers of fuel or energy to reduce by at least 6 % by 31 December 2020 the life cycle greenhouse gas emissions per unit of energy of fuels used in the Member State
- Indirect land use change emissions?

How to achieve goals?

- RES-T 1.14% in Croatia from electricity in railroad and public transport
- GHG emission fee
 - Fee: 0,47 €/kgCO_{2eq}
- Obligatory share of biofuel
 - Fee: 0,052 €/MJ

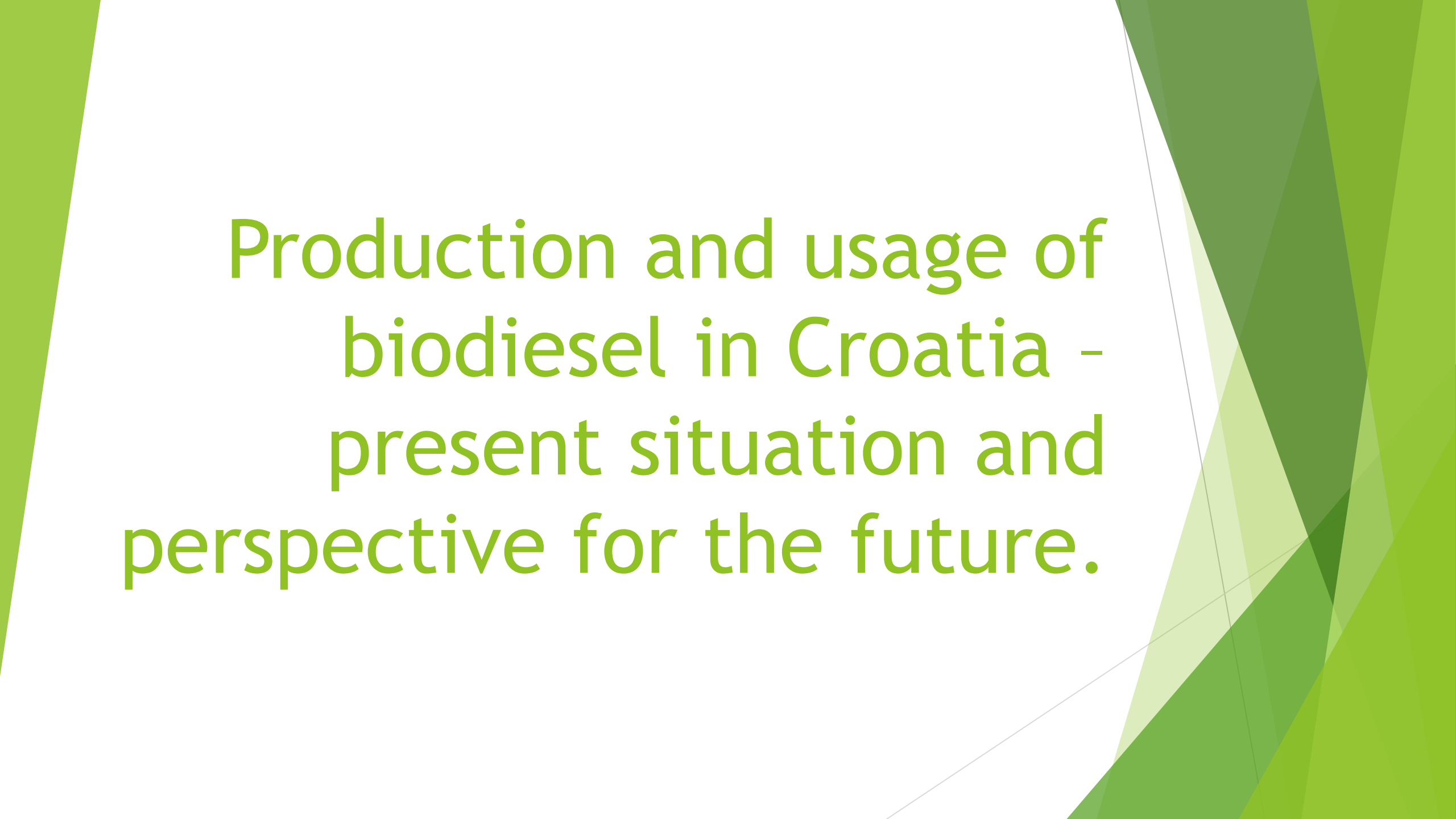
Standard - GHG - emissions for biofuels



Thank You for Your Attention!!!!

Questions?

Email: boris.cosic@fsb.hr

The background features abstract, overlapping green geometric shapes, primarily triangles and polygons, in various shades of green, creating a modern and dynamic visual effect.

Production and usage of biodiesel in Croatia - present situation and perspective for the future.

Production of biodiesel in Croatia

- First factory for biodiesel production was open 2006 (in Ožalj)
- Biodizel Vukovar started with production in 2008
- There is one more factory which was open and started with production in 2015 (Mebu Netreć)

All three installed technologies are made to produce biodiesel from rapeseed oil

Production of rapeseed oil in Croatia very varies (in 2016 was produced 113 kt and in 2015 60 kt of rapeseed)

Installed capacity for producing rapeseed oil in Croatia is 50 kt (Čepin)

Overall production capacity for biodiesel in Croatia is 80 kMt

Technology for biodiesel production

- All three factories have very similar technology based on gravitational separation
- They can mostly produce first generation biodiesel - from different vegetable oil but because of legal regulation it is limited to rapeseed oil
- Because of insufficient and unstable production of oil (rapeseed) most of it was imported
- The same thing is valid for chemical needed for production
- In Croatia there is also several collectors of used cooking oil, but because of current situation all what they collect, they export

Legislative framework for usage biodiesel in Croatia

- First law which defined usage of biodiesel in Croatia came into force in 2009, but by-law acts which made it functional, were adopted in 2011
- In 2011 production of biodiesel started to be subsidized, and in the third quarter of 2014 the subsidies were stopped
- In 2013 came into force national action plan for renewable energy sources which defined the amount of biodiesel that should be used in Croatia
- But what was planned with that plan was never reached
- In the meantime, EU legislation changed (2015) where is incorporate obligators GHG saving which biodiesel must reach - we are still waiting that that change to be implemented in Croatians law

Problem of non-compliance of Croatian law with situation on field

- When first law was fully implemented, usage of biodiesel was covered with subsidies
- When the subsidies stopped, no measures were taken to force distributors to use biodiesel again
- In all surrounding countries some support or penalty is implemented if full distributors don't use biodiesel (or other biofuels in mineral fuels)
 - Hungary - if fuel distributors do not put on market prescribed amount of biofuels they should pay penalty
 - Slovakia - it is the same situation plus biofuel which is placed over there also should reach certain saving of GHG emission
 - Slovenia - combination of penalty for non blending and support in way of tax relief for usage of biofuels

Solution for problem of non usage of biodiesel in Croatia

- Changing the law in a way that it becomes more clear and transparent without confusing elements
- Law enforcement with effective, proportional and dissuasive penalty for non using biodiesel (and also all other biofuel)
- Or on some other way encourage fuel distributors to use biodiesel (tax relief on use amount)
- Involving obligation for GHG saving, which must be made with using biodiesel
- Establish system for control of biodiesel usage, and that also should be incorporated in law

The background features abstract, overlapping green geometric shapes, primarily triangles and polygons, in various shades of green, creating a modern and dynamic visual effect.

Thank you for your
attention



Increase in wood
pellet production
with the
implementation of a
new 350 kW ORC
module



Wood pellet plant and CHP plant
Udbina

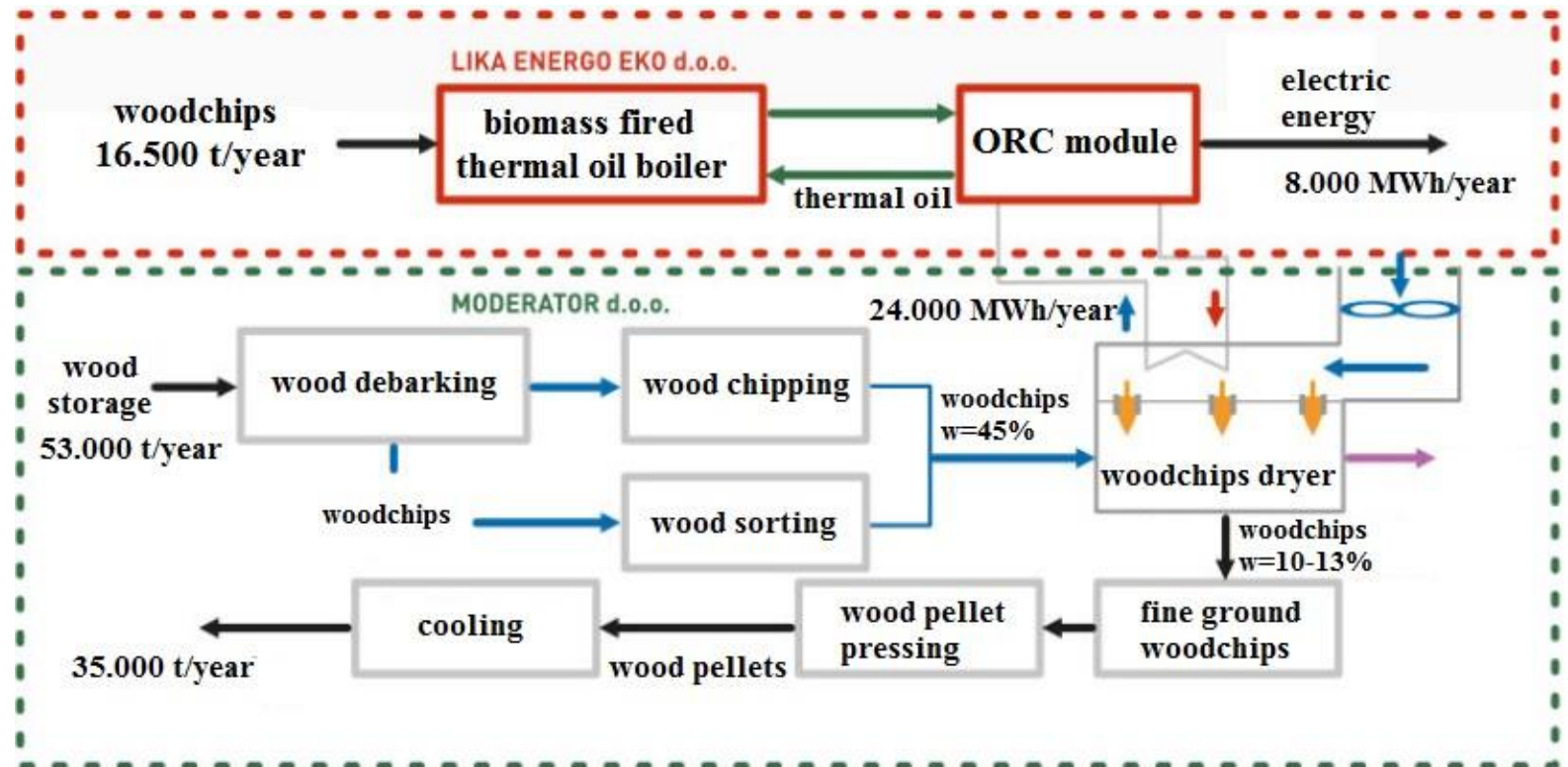


3

Wood logs that are being delivered to the location

From the idea to the project realization

- ▶ 2009 company LIKA ENERGO EKO d.o.o. was set up and all official approval procedures were carried out
- ▶ CHP plant and wood pellet plant were constructed by the end of 2011
- ▶ At the beginning of the 2012 plants became operational



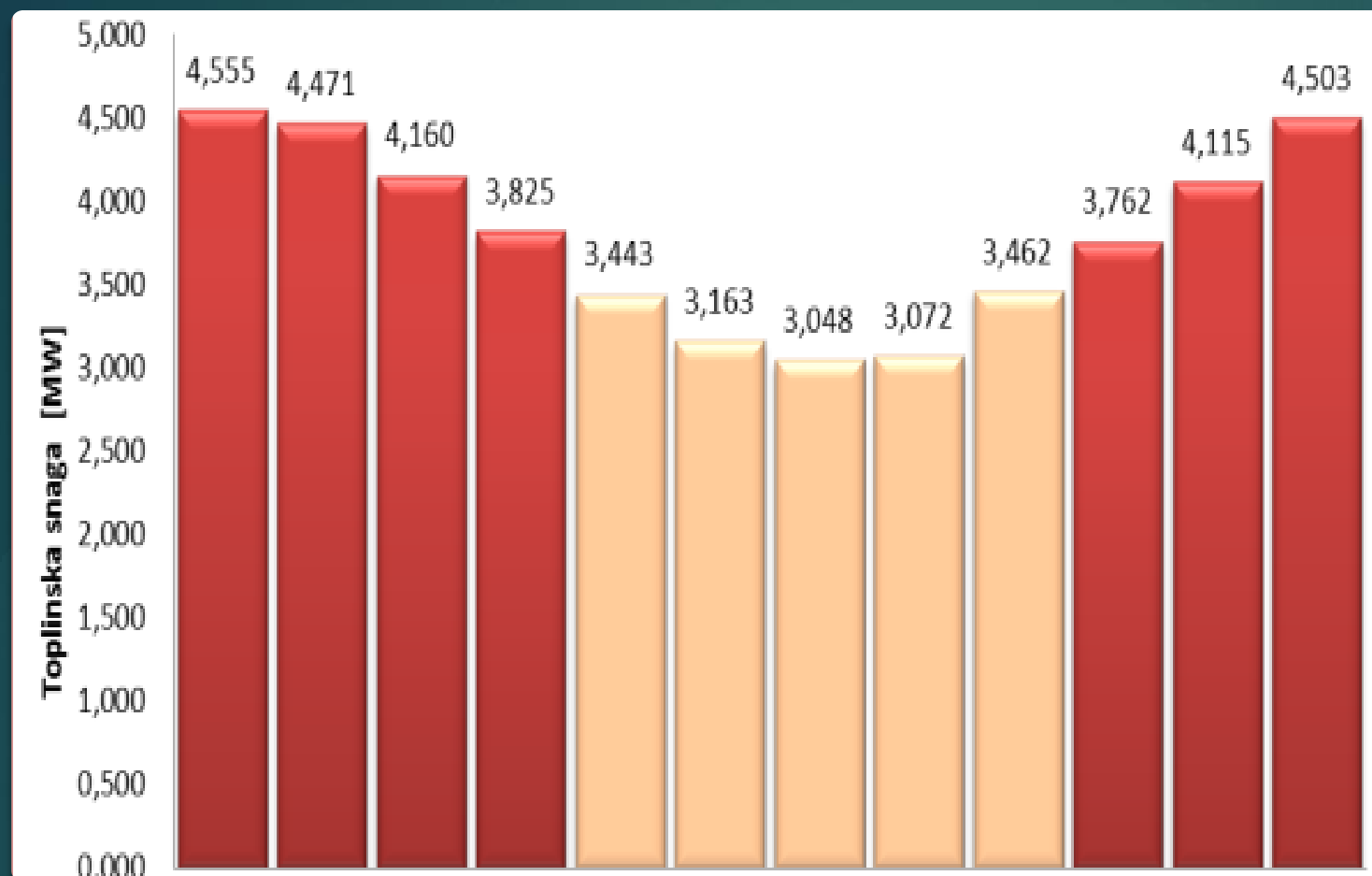
Positive effects that the project had:

- ▶ 7 workers employed in CHP plant
- ▶ 30 workers employed in the wood pellet plant
- ▶ 12 workers employed in firewood production
- ▶ Increase in income of the forest administration Gosipć
- ▶ Creation of new job opportunities in the department of wood biomass collection and manipulation
- ▶ Secure production and distribution of wood pellets as the precondition for the transfer from fossil fuels towards biomass



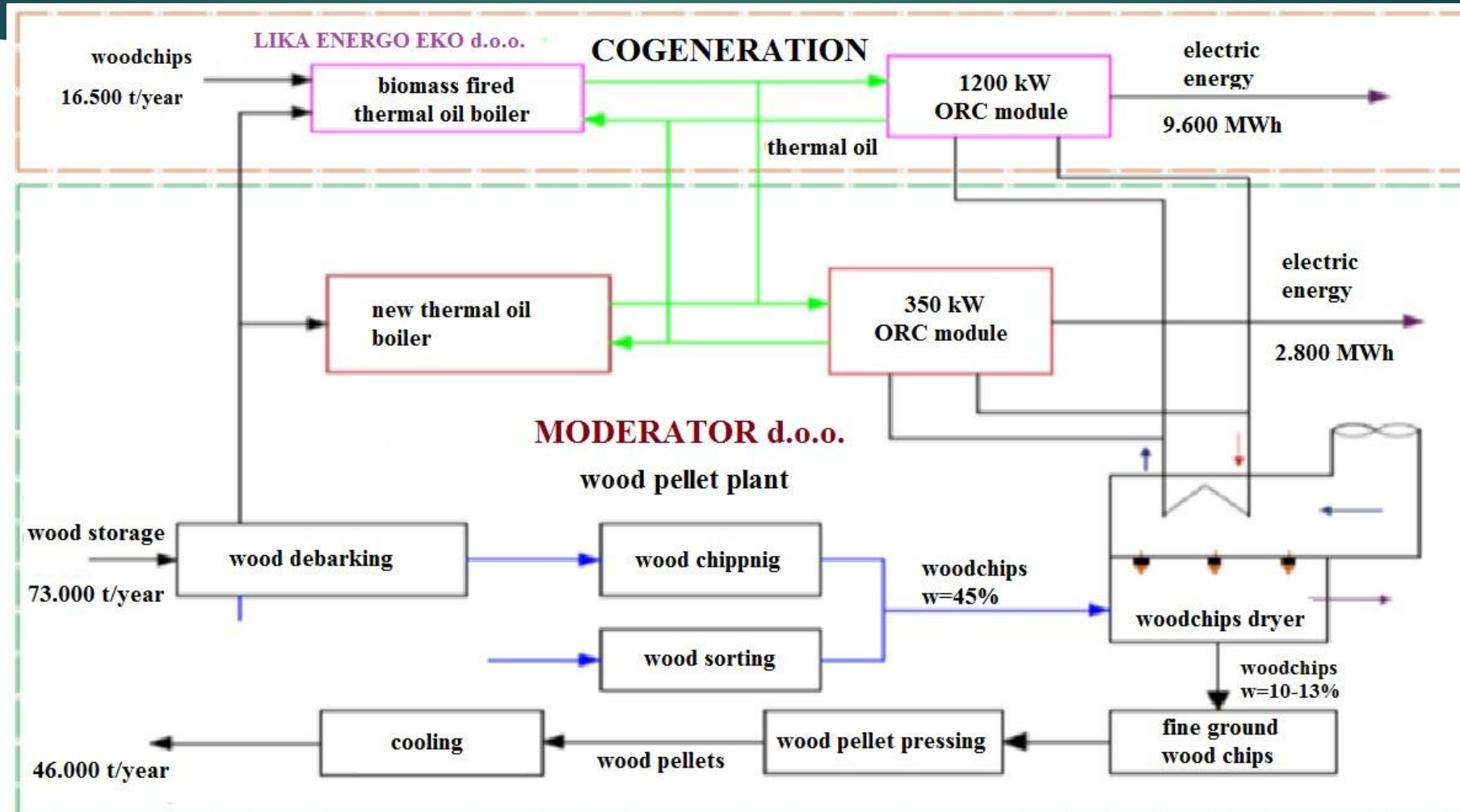
Current wood
pellet
production:
5t/h

Targeted
production of
wood pellets:
6-7 t/h



Wood pellet production could not be larger than 5 t/h because of the too large heat demand during 7 months

Plant scheme after the integration of a new 4.2 MW biomass boiler and 350 kW ORC module



New generation biomass boiler

- Fire bed 4.2 MW
- Thermal oil heat exchanger 2.5 MW
- Hot water economizer 900 kW



Project results:



Production of the wood pellets at the rate of 6 t/h starting from this year



Production of 400 m³/month of dry firewood

THANK YOU FOR YOUR ATTENTION

Borna Šojat





CROATIAN BIOMASS PROJECT

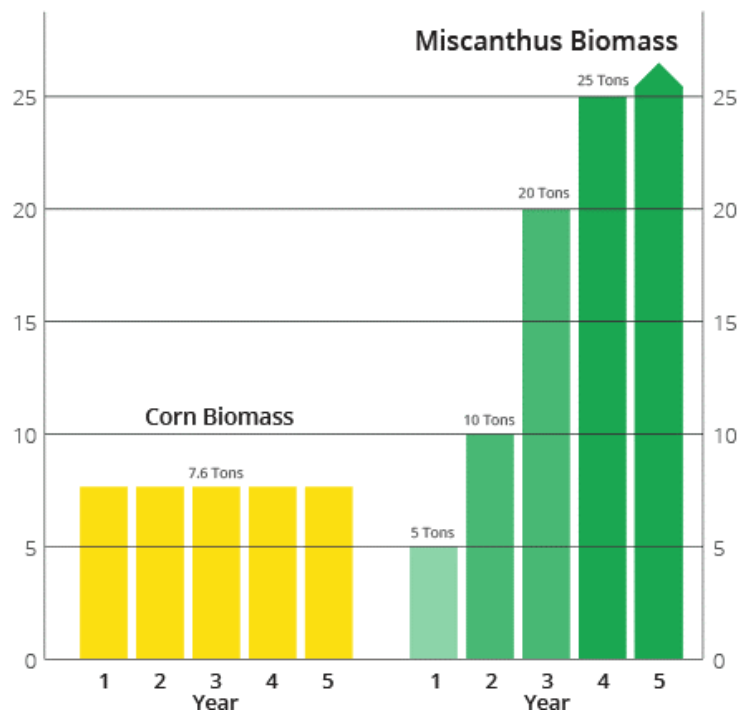
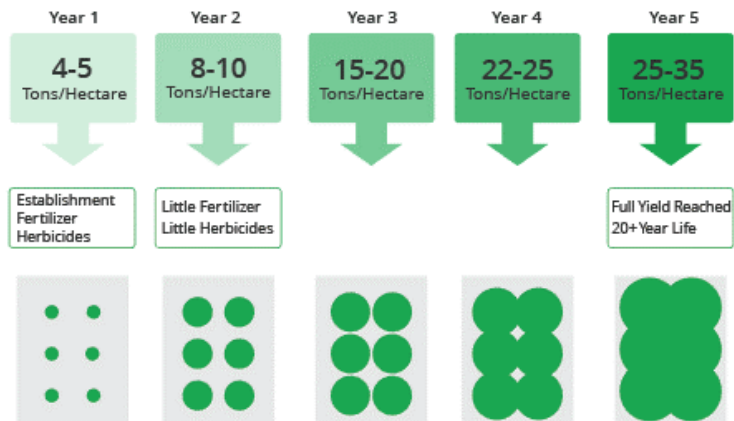
Vedran Šarić, project manager

Energy Barge, Zagreb, Hotel Palace; Jan 18, 2018.

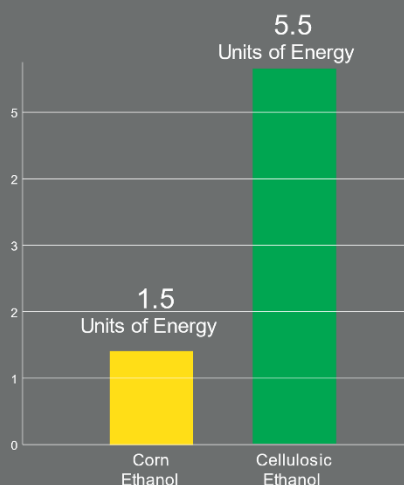
The background of the slide is a photograph of a lush green field of Miscanthus x giganteus grass. The grass is tall and dense, with long, thin leaves. In the foreground, there is a lower, more scrubby green area. The sky above is blue with scattered white clouds. A semi-transparent dark grey box with rounded corners is positioned on the left side of the image, containing text and a bulleted list.

Miscanthus x giganteus

- Energy plant
- Non-food crop
- Sterile hybrid (non invasive)



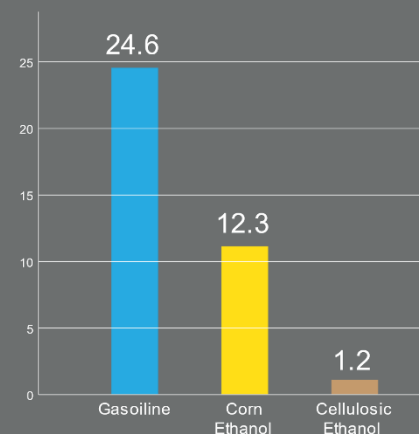
POSITIVE ENERGY BALANCE



Source: National Resources Defense Council, citing: Hammerschland, Roel. 'Ethanol's Energy Return On Investment: A Survey of the Literature 1990-Present' Environ. Sci. Technol., 40 (6), 1744-1750, Feb. 2006.

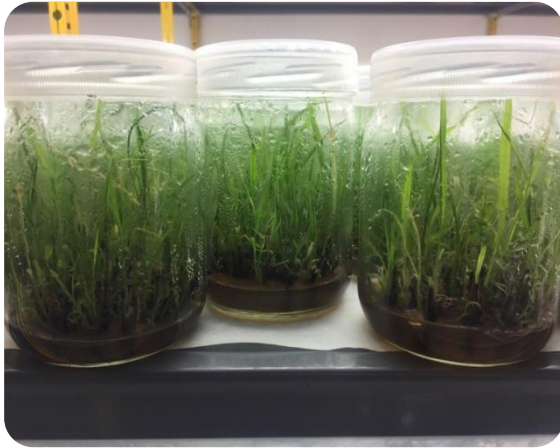
95% LESS GHG EMISSIONS

Pounds of CO2 Equivalent



Source: Farrell, Alexander E. (UC Berkeley) and Daniel Sperling (UC Davis). 'A Low Carbon Fuel Standard for California: Part 1: Technical Analysis.' May 7, 2007.

BEECO NURSERY PLANTATION IN CROATIA



In-vitro plantlets



Planting of in-vitro (BEECO Nursery plantation)



Miscanthus after 4 months – aerial and close-up (BEECO Nursery plantation)



A diagram showing the components of a biomass supply chain. At the center is a green rounded rectangle labeled 'BIOMASS FEEDSTOCK'. Four white rounded rectangles are arranged around it: 'BIOENERGY' at the top-left, 'CELLULOSE, PULP AND PAPER' at the top-right, 'BIOFUELS' at the bottom-left, and 'BIOCHEMICALS' at the bottom-right. The entire diagram is overlaid on a background image of a lush green field of tall grasses or reeds.

BIOMASS FEEDSTOCK

BIOENERGY

CELLULOSE,
PULP AND PAPER

BIOMASS
FEEDSTOCK

BIOFUELS

BIOCHEMICALS

The **biomass supply chain** incorporates several components of biomass added value utilization, which in turn consist of several activities for which different alternative methods are available. Different components of the biomass supply chain include the production of biomass feedstock, logistics of biomass, its conversion to bioenergy, biofuels or added value bioproducts, and further distribution for end user. The single largest limiting factor for the production of bioenergy or bioproducts is the unavailability of biomass. Dedicated, fast-growing and high-biomass-producing plantations of lignocellulosic crops can overcome this problem.



UK - 17.000 HA
GERMANY - 15.000 HA
FRANCE - 3.500 HA
IRELAND - 2.200 HA
AUSTRIA - 1.014 HA
HUNGARY - 1000 HA
SWITZERLAND - 500 HA



KEY ENERGY
CROP FOR 1 BILLION
TONNES OF BIOMASS

IN 2017 TOTAL
AREA REACHED
100.000 HECTARES

MORE THAN
540.000 HECTARES
OF UNUSED
AREA

1.620.000
TONS OF BIOMASS
AT 15% OF
UNUSED
AREA

585.000
TONS OF
BIOETHANOL
ANNUALLY



BEECO PRODUCTION PHASES



We implement sustainable technologies and provide turnkey biomass commercial supply solutions for bio-projects as far, as a range of comprehensive services: from energy crops plantations set-up and the establishment of energy farming to vertically integrated clean-tech biomass utilization systems for added value bioproducts.





Thank you for your attention!

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**Peleti
Rengel**

Peleti Rengel

Straw pellets from Croatia





**Peleti
Rengel**

- Full name: PELETI RENGEL d.o.o.
- Owner: Adriane Rengel
- Location: Pitomača (Croatia)
- Founded: beginning of 2017
- 4 employees





**Peleti
Rengel**

- **PRODUCTS:**

- Straw pellets

- diameter: 6 mm
 - moisture: < 10%
 - ash: < 10%
 - Net calorific value: 15 MJ/kg
 - packages available: 15kg + big bags up to 1000kg



- Mainly to be used for furnaces but also for animal farms
 - Furnaces



**Peleti
Rengel**

- **TECHNOLOGY:**
 - Production facilities installed by the company Pelet Metalac from Srbija
 - Plant capacity: 500 kg/hour





**Peleti
Rengel**

- FEESTOCK:
 - Wheat straw
 - Own production
 - Additional feedstock bought from nearby small farms
- LOGISTICS
 - Own transport for smaller orders
 - Commercial tow trucks used for larger quantities

