

DRAFT

Modalities to foster use of renewable energy sources in the transport sector by the Energy Community Contracting Parties

9th Renewable Energy Coordination Group meeting
Energy Community

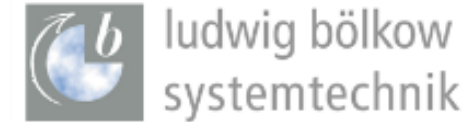
Matthias Altmann, Ludwig-Bölkow-Systemtechnik

Vienna | 23 April 2020



Project team

- **LBST** contributes techno-economic, strategic & regulatory expertise in renewable fuels, and experience in policy consulting for EU institutions and national governments
- **E4tech** offers technical understanding of alternative fuels, experience in developing decarbonisation strategies and implementation of EU Directives, and has already supported the Energy Community Secretariat in the past
- **SEEC** contributes its expertise in regional energy policies, legal expertise, techno-economic and strategy experience in renewable energy & environment and experience in supporting the Energy Community Secretariat



Agenda

- Project objective & scope
- Interaction with Contracting Parties
 1. Status quo of renewable energy consumption in transport (RES-T)
 2. Renewable fuels, potentials and existing production in Contracting Parties
 3. Policy options for increasing supply of RES in transport

Project objective & scope

■ Objective

- review the **current status of renewable energies in transport (RES-T)** in the Contracting Parties
- develop **modalities and roadmaps** for each of the Contracting Parties **for increasing the renewable share in transport** to a level compliant with the EU Renewable Energy Directive recast (RED II) **by 2030 (9%)**

■ Scope

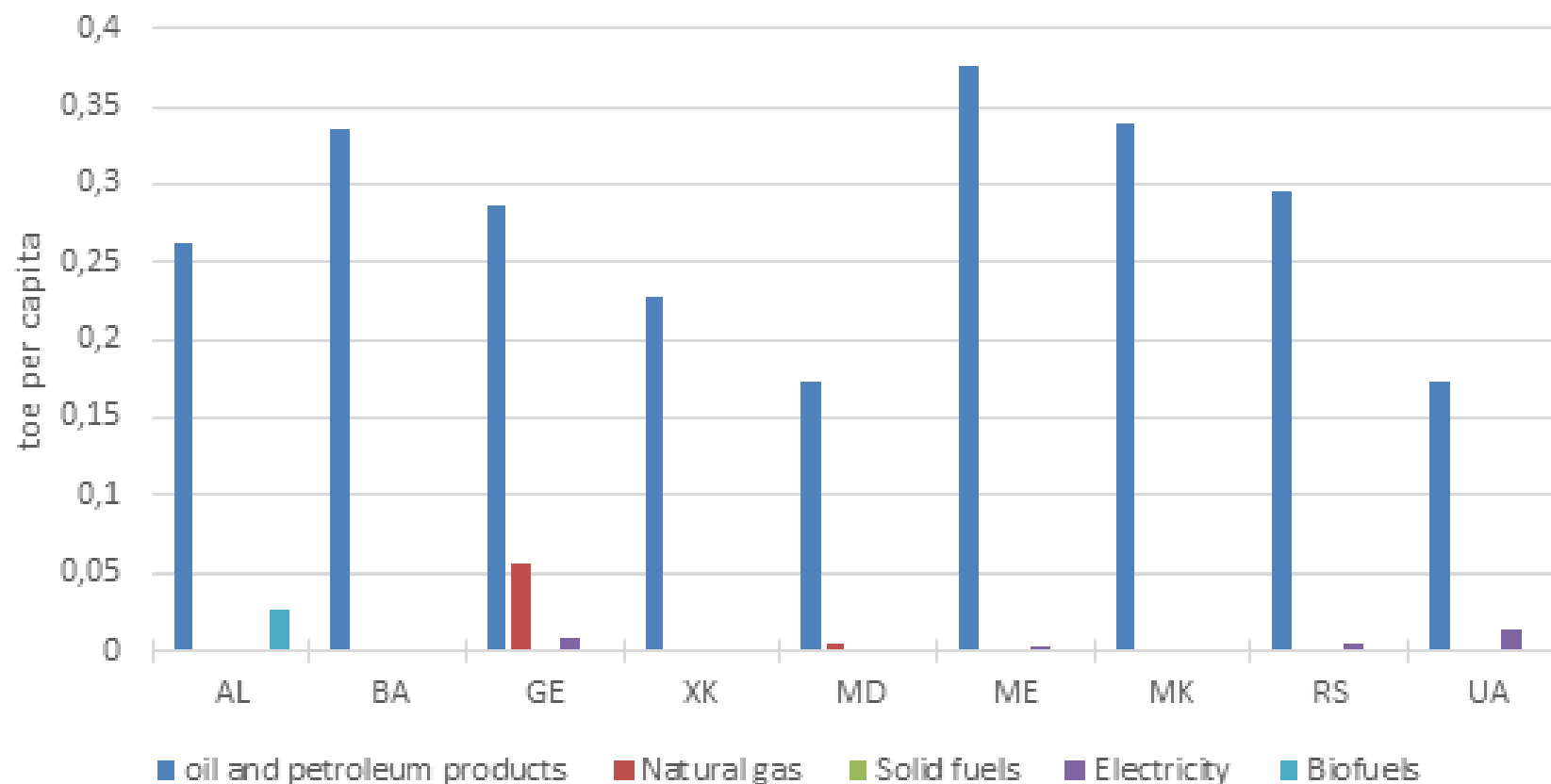
- Energy Community Contracting Parties
- 2030 time horizon
- Fuels:
 - biofuels produced from crops and wastes and residues
 - renewable fuels of non-biological origin (hydrogen, Power-to-Methane, Power-to-Liquids)
 - electricity used directly in the transport sector (road and rail)

Interaction with Contracting Parties

- The consortium has exchanged with the Contracting Parties on the basis of a **questionnaire on data and information** related to all aspects of the project:
 - 1) Data on transport and energy for past statistics and future perspectives
 - 2) Potential of renewable energies; current status of pathways in each Contracting Party
 - 3) Relevant legislation, ongoing legislative procedures; background information
- Contracting Parties have **provided major input** to the study already
- **More input is crucial** to the success of the study:
 - **2030 projections and targets** for energy, notably in transport
 - **Regulatory status quo and initiatives**: Part 3) of the questionnaire
- **Draft results on modalities & roadmaps** to be presented to each Contracting Party in May/June (depending on reception of input from Contracting Parties)
- **Feedback** to be collected within 2 weeks

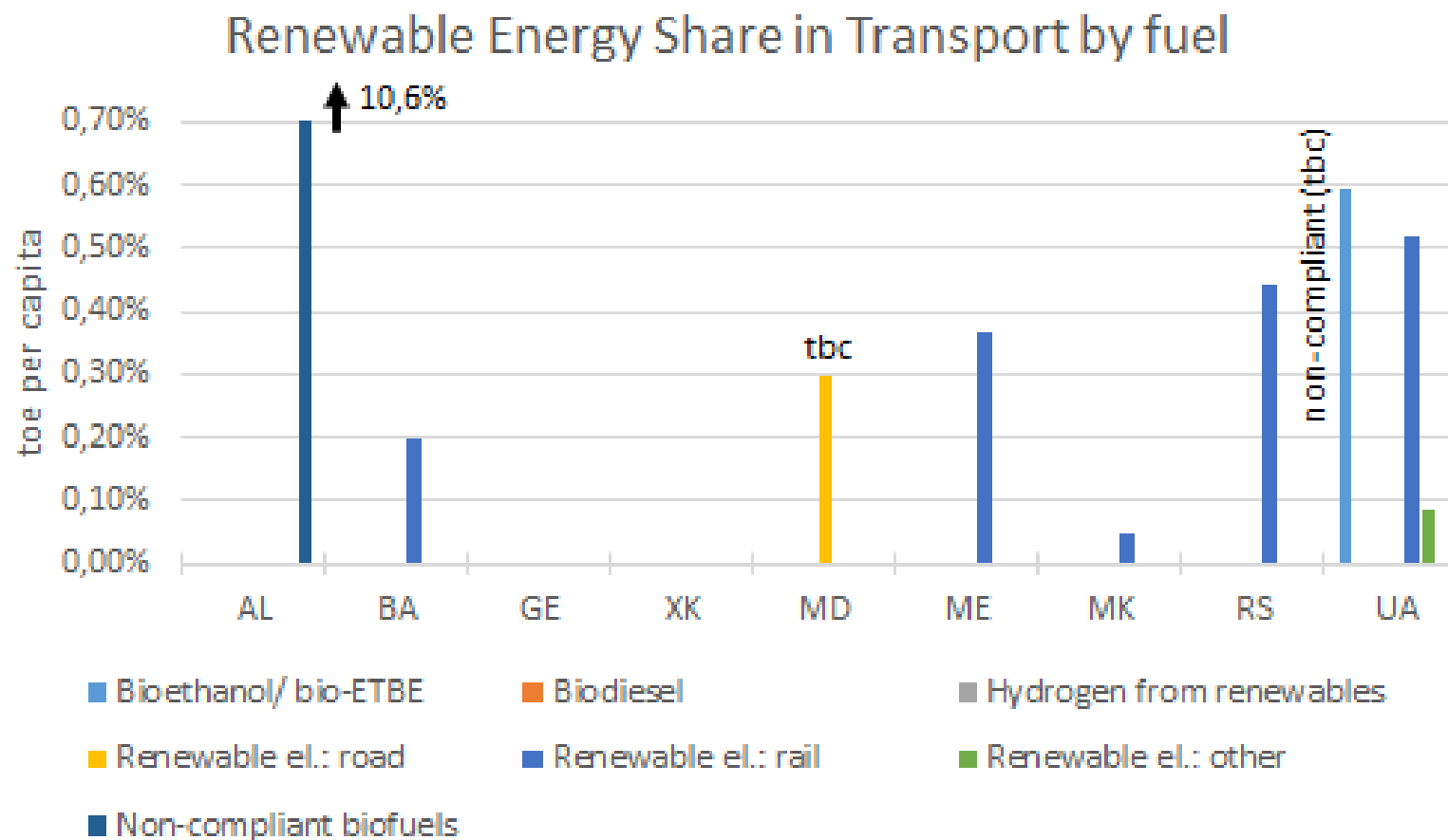
1. Status quo of energy consumption in transport (2017)

- Per-capita consumption of energy in transport is strongly dominated by petroleum products (diesel, gasoline, small shares of LPG)
- Georgia has a notable share of natural gas consumption in transport
- Per-capita electricity consumption in transport (mainly rail) is most notable in the Ukraine



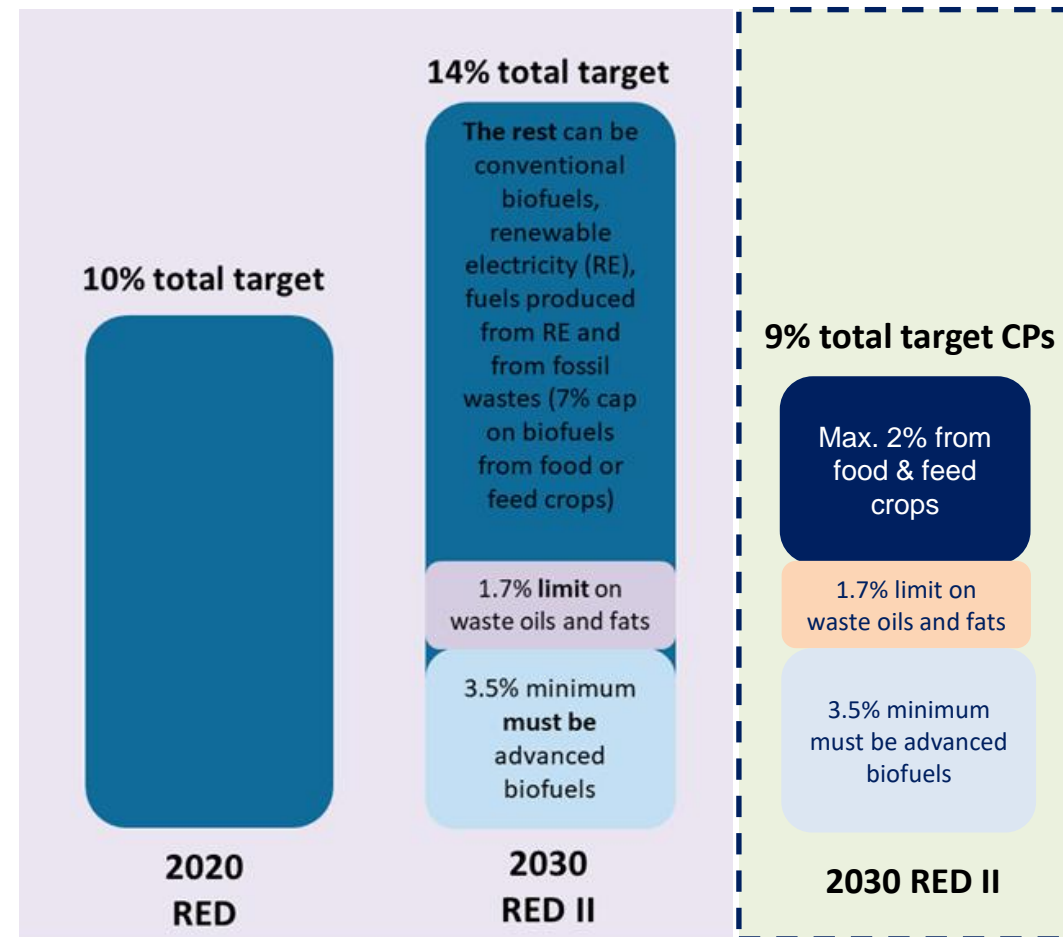
1. Status quo of *renewable* energy share in transport (2017)

- The renewable share in transport is below 1% in all CPs
- Biofuels consumed in Albania are not compliant with RED
- Bioethanol consumption in the Ukraine is not compliant with RED (tbc)
- The share of renewable electricity consumption in rail is most notable in the Ukraine, Serbia, Montenegro as well as Bosnia and Herzegovina
- Renewable electricity consumption in road transport in Moldova to be confirmed



2. RED II targets up to 14% renewable energy in transport CP target in this study is 9% due to cap on crop-based biofuels

- Renewable Energy Directive II from 2020 (REDII):**
 - 14% target for renewable energy in road and rail transport (RES-T)
 - Advanced biofuel target – 3.5% by 2030 (0.2% 2022, 1% 2025) after double-counting
 - 1% higher than a Member State’s 2020 contribution, up to maximum of 7%. If % fuel from food and feed crops in 2020 is less than 1% then the cap is 2%. In all CPs the cap is 2%
 - Capped ‘high ILUC’ biofuels at MS’s 2019 level, phased out to 2030
 - 1.2x multiplier for aviation and marine fuels (non-food based)
- Given that all CPs have a 2% cap on crop-based biofuels which is 5% below the maximum possible cap of 7%, the 14% RES-T target is reduced for each CP to **9% renewable energy in road and rail transport in 2030.****



Summary of RED and RED II targets

2. Characteristics of renewable fuels - overview

- Comprehensive overview of the different types of fuels which could be used to meet renewable energy targets
- Biofuels, renewable liquid and gaseous fuels of non-biological origin (RFNBOs), recycled carbon fuels and electricity used directly in the transport sector showing sufficient promise to contribute commercial volumes of fuel to the transport sector in 2030
- Presentation of:
 - An overview of the fuel chain and production methods
 - The current commercial status of the fuel, including TRL and production capacity, based upon international statistics
 - Estimated production costs from independent studies, or in the case of globally traded fuels, current and historic trading prices
 - A review of how each pathway is treated in RED II, and any nuances that affect policy treatment
- An example of the information is provided on the next slide

Feedstock	Conversion technology	Fuel(s) produced
Sugar/starch crops	Fermentation	Alcohols
Oils (crops and waste)	Esterification	FAME ("biodiesel")
Oils (crops and waste)	Hydro-treatment	HVO/HEFA
Lignocellulosic material/non-biogenic wastes (incl. MSW)	Gasification + FT	Diesel/kerosene/gasoline
	Gasification + synthesis	Methanol
	Pyrolysis	Diesel/kerosene/gasoline
Wet wastes and agricultural residues	Hydrolysis fermentation	Alcohols
	Anaerobic digestion	Methane
Alcohols	Alcohol catalysis	Kerosene/diesel
Renewable electricity		Electricity
	Electrolysis	Hydrogen
	Electrolysis + methanation	Methane
	Electrolysis + synthesis	Power-to-liquid alcohol/ gasoline/ kerosene/ diesel

Summary of fuel pathways to be assessed

DRAFT

2. FAME – biodiesel via transesterification of oils and fats

Oils

Feedstocks include rapeseed, sunflower, soybean, palm oils, used cooking oil (UCO) and tallow

Chemical route: Transesterification

Highly mature, commercial route – TRL 9
Uses methanol as a feedstock

Biodiesel (FAME)

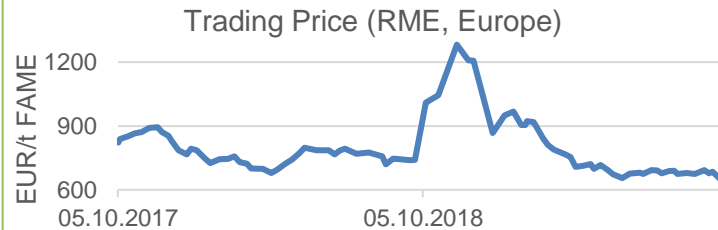
Can be blended at 5-10%* in road diesel and can be used in rail and shipping



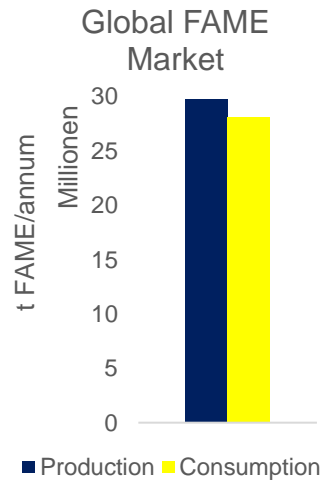
*Higher blends are limited by compatibility with exhaust treatment in cars, cold weather properties, lower energy content than diesel (8%) and poor storage stability.

Economics

- Mature technology: limited scope for production cost reductions
- Production costs dominated by feedstock price
- Globally traded commodity



Markets



- EU is the largest producer and consumer
- Produced in almost all EU countries
- Blend walls limit total market size
- EU biodiesel plant sizes between 2.3 and 680 million litres per annum

Sustainability

- The use of fuels from food/feed crops is capped in RED II
- UCO and tallow-based fuels are capped at 1.7% by 2030
- High iLUC feedstock fuels phased out by 2030

2. Potential RE sources in each CP

- Potential for the production of renewable fuel within each CP, based on domestically available resources
- Estimation of the total resource that could realistically be available to be used for fuel production, without taking account of competing uses of that resource. The figures therefore indicate maximum **potential** to produce renewable fuel in each CP, and **not** anticipated future production of renewable fuel
- There can be a wide range of results between different sources assessing renewable resource potential, for example due to different methodologies or assumptions used
- The sources used were, where possible, robust independent studies or international statistics, which provided data across multiple CPs or feedstocks (see graph on the right)
- Based on typical conversion efficiencies for the production of renewable fuels, the potential for renewable fuel production in each CP was estimated (draft results show on next slide)

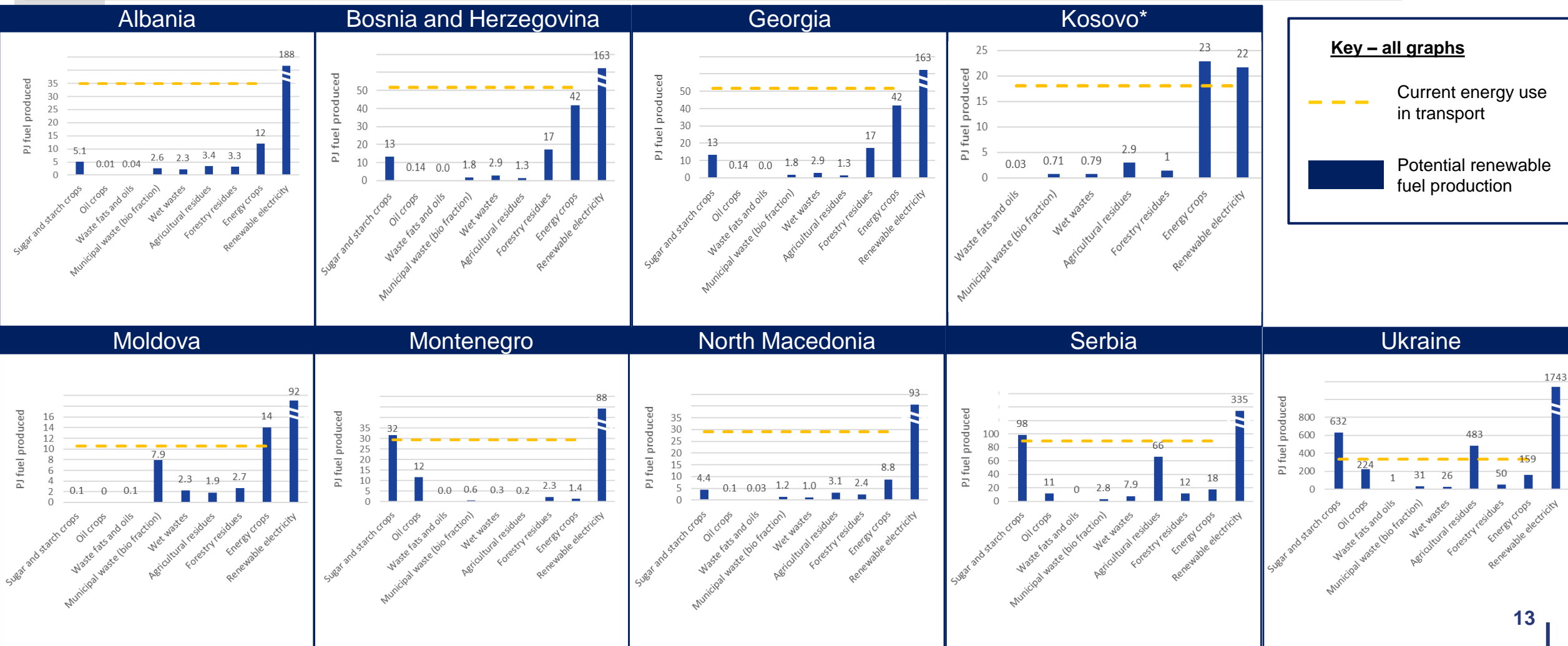
Renewable Resource	AL	BA	GE	XK	MK	MD	ME	RS	UZ
Sugar and starch crops	FAO-stat			N/A	FAO-stat				
Oil crops	FAO-stat			N/A	FAO-stat				
Waste fats and oils	World Bank								
Municipal waste (bio fraction)	World Bank								
Wet wastes	Scarlat et al (2018)		N/A	Scarlat et al (2018)					
Agricultural residues	S2Biom (2017)		WEG (2014)	S2Biom (2017)					
Forestry residues	S2Biom (2017)		WEG (2014)	S2Biom (2017)					
Energy crops	S2Biom (2017)		N/A	S2Biom (2017)					
Renewable electricity	Shell GER database			IRENA	Shell GER database				

Summary of sources used for assessing renewable potential in each CP

- Few sources or data-points were obtained directly from the CPs on this topic

DRAFT

2. Potential RE sources in each CP in 2030



2. Existing production of renewable fuel in each CP

- **Aims of this task:** Review existing production of renewable fuel in each CP
- Little feedback was received on existing renewable fuel production in each CP, therefore information was based on that publicly available to the consulting team – we would be glad to update with any additional information from CPs.
- There are two types of renewable fuel production plants operating today in the CPs:
 - Ethanol production via fermentation of sugar / starch crops
 - FAME production from oil crops or waste oils
- In some CPs there are anaerobic digestors processing agricultural waste to produce biogas for heat and power production, But none are known to be upgrading the biogas to produce biomethane, which would be required in order for it to be used as transport fuel.

Contracting Party	Fuel produced	Number of plants	Total capacity	Unit	Comment
Albania	FAME biodiesel	1	100	kt/yr	
Bosnia and Herzegovina	Ethanol (from ligno-cellulosic material)				One planned facility producing lignocellulosic ethanol
	FAME biodiesel	1	155	kt/yr	Currently under investigation
Georgia	FAME biodiesel	1	1	kt/yr	
Moldova	Ethanol (from sugar/starch crops)	1	12	kt/yr	A FAME plant has closed (capacity 50t/day)
North Macedonia	FAME biodiesel	4	31	kt/yr	Two additional FAME plants planned with combined 13kt/yr capacity
Ukraine	Ethanol (from sugar/starch crops)	8	110	kt/yr	Four additional planned ethanol plants, with total planned capacity 280 kt/yr. Eight closed plants (total capacity: 154kt/yr) could start up again if economical.
	FAME biodiesel	4	25	kt/yr	One closed plant with 180 kt/yr capacity.

Summary of known renewable fuel production in each CP

3. Policy options for increasing supply of RES in transport

- Good-practice policy options for increasing RES in transport
- Policies are required across the renewable fuels value chain, particularly to stimulate the use of fuels which require other vehicles (e.g. hydrogen, electricity, high biofuel blends, etc.)
- Policy options across the value chain are structured around the key impacted stakeholders (see graph on the right) providing:
 - Policy description and key options for implementation
 - Advantages and disadvantages
 - Examples
- Case studies for next phase of work:
 - Ukraine measures to increase battery-electric vehicles
 - Renewable fuel blending obligation in Netherlands
 - Railway electrification in India
 - H₂ bus fleet in Aberdeen, Scotland
 - Electric bus fleet in London

Stakeholder	Obligation / incentive	Policy mechanism
Fuel suppliers	Obligation	Blending obligation
		Low carbon fuel standard
	Incentive	Grants, loans and financing guarantees for low carbon fuel production plants
		Payment for fuel supplied
Fuel retailers	Obligation	Mandatory availability of certain fuels
	Incentive	Grants, loans and financing guarantees for construction of refueling stations
Vehicle manufacturers	Obligation	Vehicle CO ₂ standards or production mandates
	Incentive	Grants, loans and financing guarantees for construction of manufacturing facilities
Transport end user	Obligation	Sales bans or zero-emission vehicle (ZEV) targets
		Public procurement obligations
	Incentive	Grants, loans or other financial incentives for the purchase of vehicles
		Financial incentives to reduce relative cost of owning a vehicle using renewable energy
		Non-financial incentives to increase attractiveness of owning a vehicle using renewable energy

Thank you for your attention

Team leader



Matthias Altmann
Senior Consultant
T: +49 89 60811038
E: matthias.altmann@LBST.de