



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

25 November 2020

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Study factsheet



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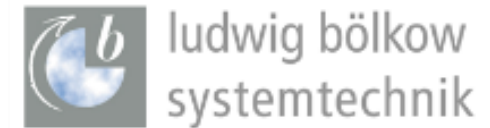
- Contracting Entity: Energy Community
- Duration: December 2019 – November 2020
- Study team: LBST, E4tech, SEEC, CENN
- Objective: Reviewing the current status of renewable energies in transport (RES-T) in the Contracting Parties (CPs) and developing roadmaps for each of the Contracting Parties for increasing the RES-T share to a level compliant with the Renewable Energy Directive recast of 2018 (RED II) by 2030

Study team



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- **LBST**
 - Project lead
 - Techno-economic, regulatory & policy expertise in renewable fuels
 - Focus on electricity and hydrogen
 - Regional focus on UA, MD
- **E4tech**
 - Techno-economic, regulatory & policy expertise in alternative fuels
 - Focus on biofuels
- **SEEC**
 - Regional focus on Balkan (AL, BA, XK, ME, MK, RS)
- **CENN** (subcontractor)
 - Regional focus on GE



Study scope



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- **Scope:**
 - Review the **current status** of use of renewable energies in transport by the Energy Community Contracting Parties
 - **2030 projections** for each Contracting Party in a business as usual scenario and in a target compliance scenario
 - Description of **main characteristics of different types of biofuels, and potential of renewable energy sources** for transport in each Contracting Party
 - Review of **good practices from EU MSs and beyond** that show a successful track record of increasing RES in the transport sector
 - **Roadmap to 2030** for each Contracting Party, outlining priority actions related to legal framework, incentives, strategy and policies to increase use of renewable energies in transport, assuming that the target will be set as for EU Member States
 - **Recommendations** to each Contracting Party on how to increase the renewable energy share in transport by 2030

- **Out of scope:**
 - Cost analyses
 - Benefit analyses
 - Detailed outlines of policies

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
- The Contracting Parties have **provided major input** to the study; other input was gathered by the study team through desktop research and stakeholder exchanges
- **Exchanges** have taken place **by phone/ webconference and by E-mail**
- **A consultation with the Contracting Parties** was carried out on the **draft results on the regulatory status quo and roadmaps for achieving the 2030 RES-T target**
- **Feedback** received has been taken into account for the final results
- Final results including recommendations were **presented to each CP in a stakeholder workshop**
- The **Final Report** has been submitted to the Energy Community
- In spite of **difficulties and challenges because of COVID-19**, the study findings are deemed **robust**

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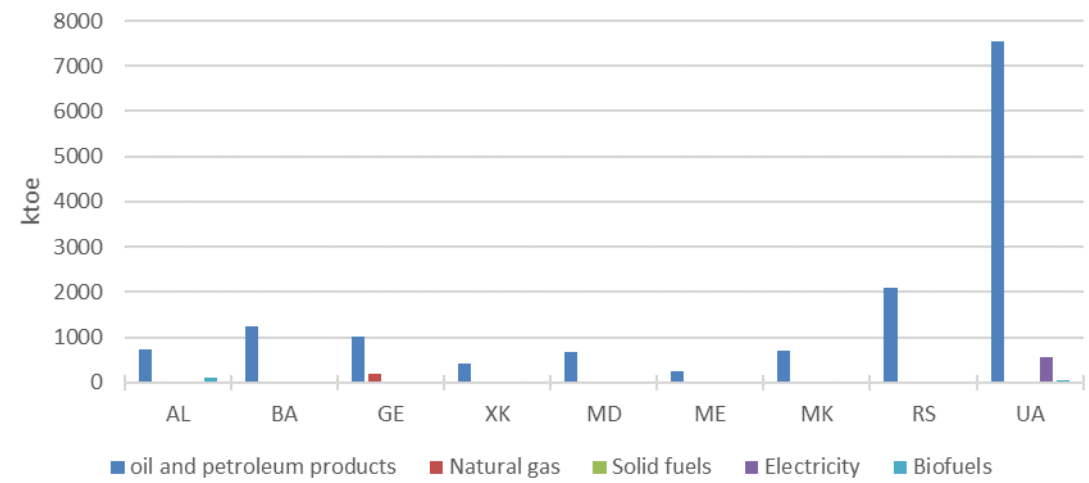
1. Status quo of RES-T and 2030 projections

In all Contracting Parties

Final energy consumption in transport by fuel in 2018

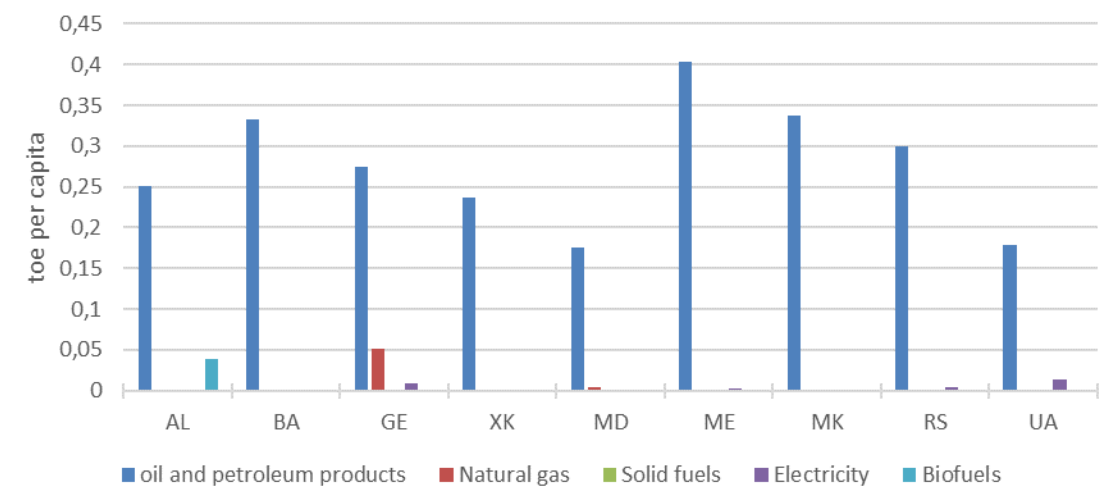
Absolute

- Oil and petroleum products are dominant fuels
- UA: electricity (rails, trolleybus, tram, etc.)
- GE: natural gas (road)
- UA, AL: non-compliant biofuels



Per capita

- Significant differences between CPs
- Alternative fuels are very low; highest per capita is natural gas in GE, then non-compliant biofuels in AL*, then electricity in UA

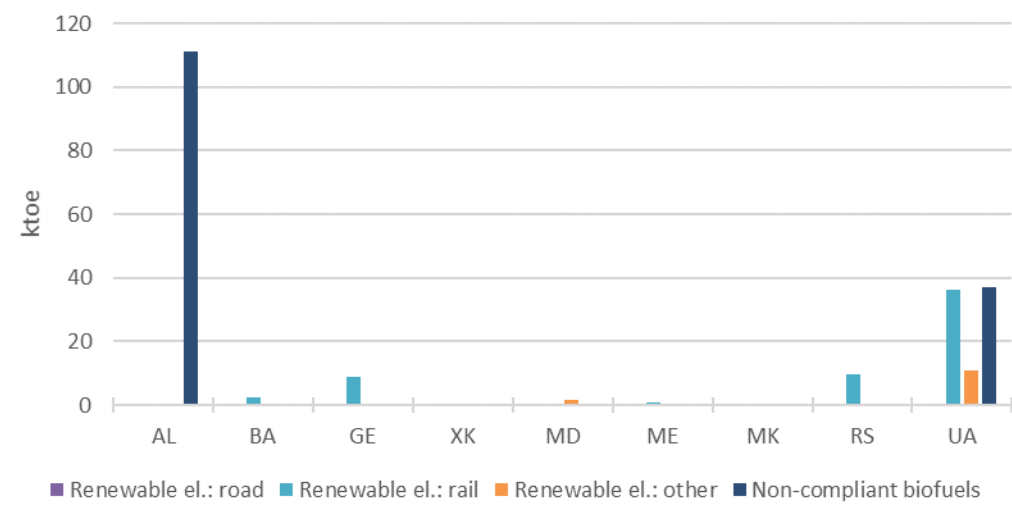


* Biofuels consumption data for Albania are taken from the Energy Balances of Eurostat (European Commission), which are based on official data submissions by Albania. However, other official sources of Albania provide lower data; e.g. the National Renewable Energy Action Plan (NREAP) of Albania includes significantly lower biofuels consumption data.

Renewable energy consumption in transport by fuel in 2018

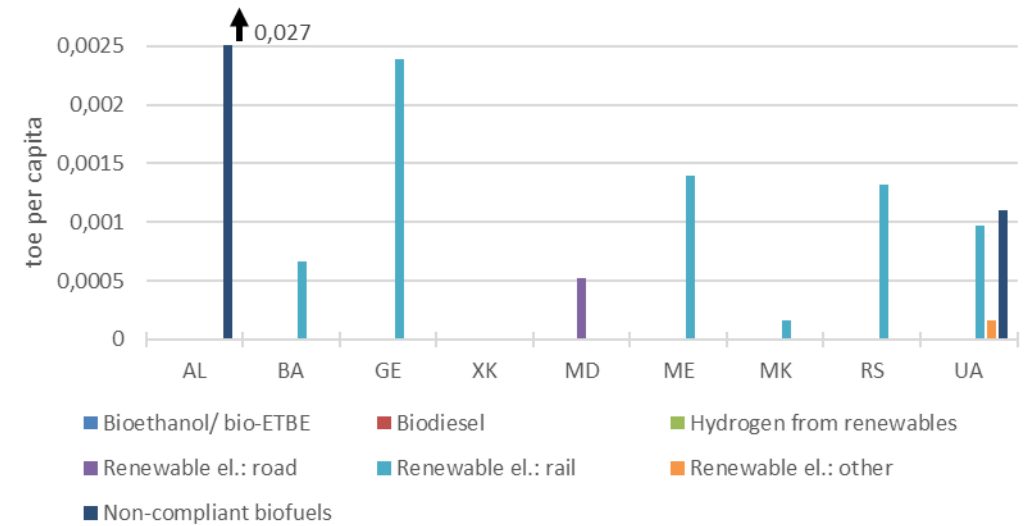
Absolute

- Biofuels are not compliant with RED
- Renewable electricity in rail in UA, RS, GE
- Renewable electricity in road in MD
- Renewable electricity in other in UA



Per capita

- Non-compliant biofuels in AL, UA
- Renewable electricity in rail, road, other in GE, ME, RS, UA, BA, MD



RED II: fuels, sub-targets / caps for biofuels

RED II rests on three pillars for RES-T:

- **Biofuels**
- **Electricity**
- **Hydrogen (more generally: RFNBOs)**

RFNBO: 'renewable liquid and gaseous transport fuels of non-biological origin' means liquid or gaseous fuels which are used in the transport sector other than biofuels or biogas, the energy content of which is derived from renewable sources other than biomass

Articles 25-27 of the RED II set several sub-targets and caps related to the transport target:

- **At least 3.5%** from **advanced biofuels** (after double counting; Annex IXA)
- **Maximum 3.4%** from **Annex IXB feedstocks** (after double counting)
- **Maximum 7%** from **food and feed crops**. If in 2020, the share of transport energy from these feedstocks is less than 1% in a Member State, the cap is 2%.
- Phase out of all fuels from high **indirect land-use change (iLUC)** feedstocks by 2030 (currently, only palm oil)

For all CPs except Albania, the

- *cap for crop-based biofuels is anticipated to be 2% (7% for Albania), and*
- *overall 2030 transport target is assumed to be 9% (14% for Albania)*

14% total target

The rest can be conventional biofuels, renewable electricity (RE), fuels produced from RE and from fossil wastes (7% cap on biofuels from food or feed crops)

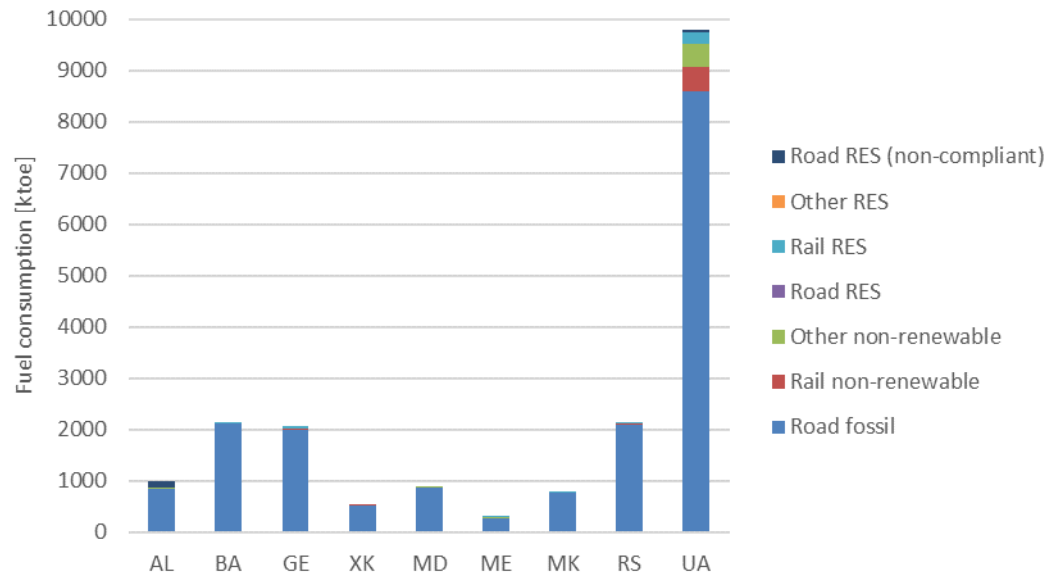
3.4% limit on waste oils and molasses

3.5% minimum must be advanced biofuels

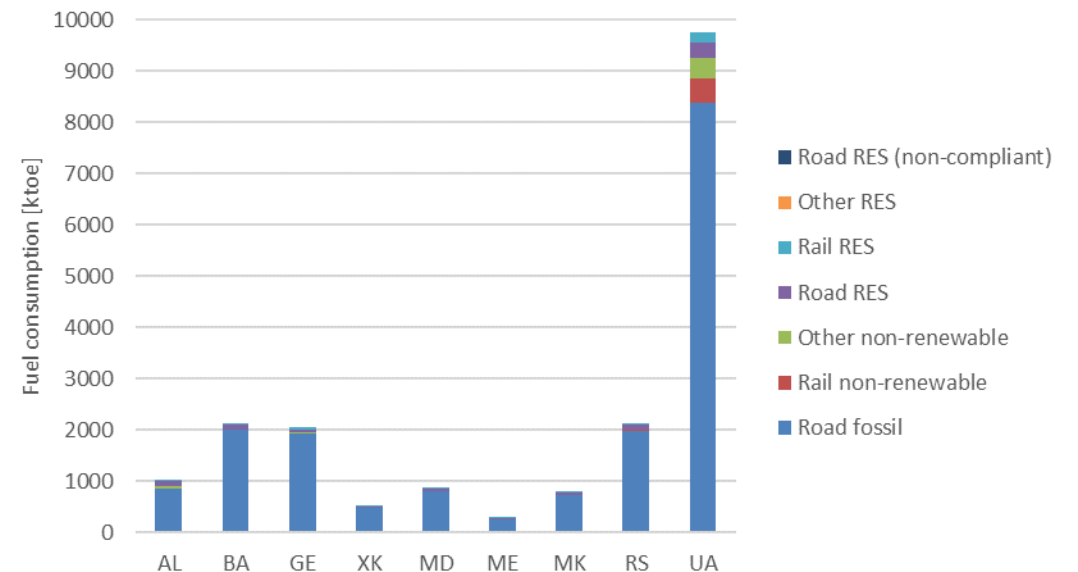
Annex IX Part A	Annex IX Part B
(a) Algae	(a) Used cooking oil
(b) Biomass fraction of MSW	(b) Animal fats
(c) Biowaste	
(d) Biomass fraction of industrial waste	
(e) Straw	
(f) Animal manure and sewage sludge	
(g) Palm oil mill effluent and empty palm fruit bunches	
(h) Tall pitch oil	
(i) Crude glycerine	
(j) Bagasse	
(k) Grape marcs and wine lees	
(l) Nut shells	
(m) Husks	
(n) Cobs cleaned of corn kernels	
(o) Forestry waste and residues	
(p) Other non-food cellulosic	
(q) Other ligno-cellulosic	

2030 projections: absolute energy consumption (physical)

- Business as usual scenario
 - non-compliant biofuels (AL, UA)
 - RES electricity, notably in rail, increases following the anticipated increases of renewable electricity in the national power mix



- Target compliance scenario
 - Starting point: business as usual
 - Adopt selected RES-T options for 2030
 - Adjust energy consumption based on higher efficiency of battery-electric and hydrogen fuel cell-electric vehicles

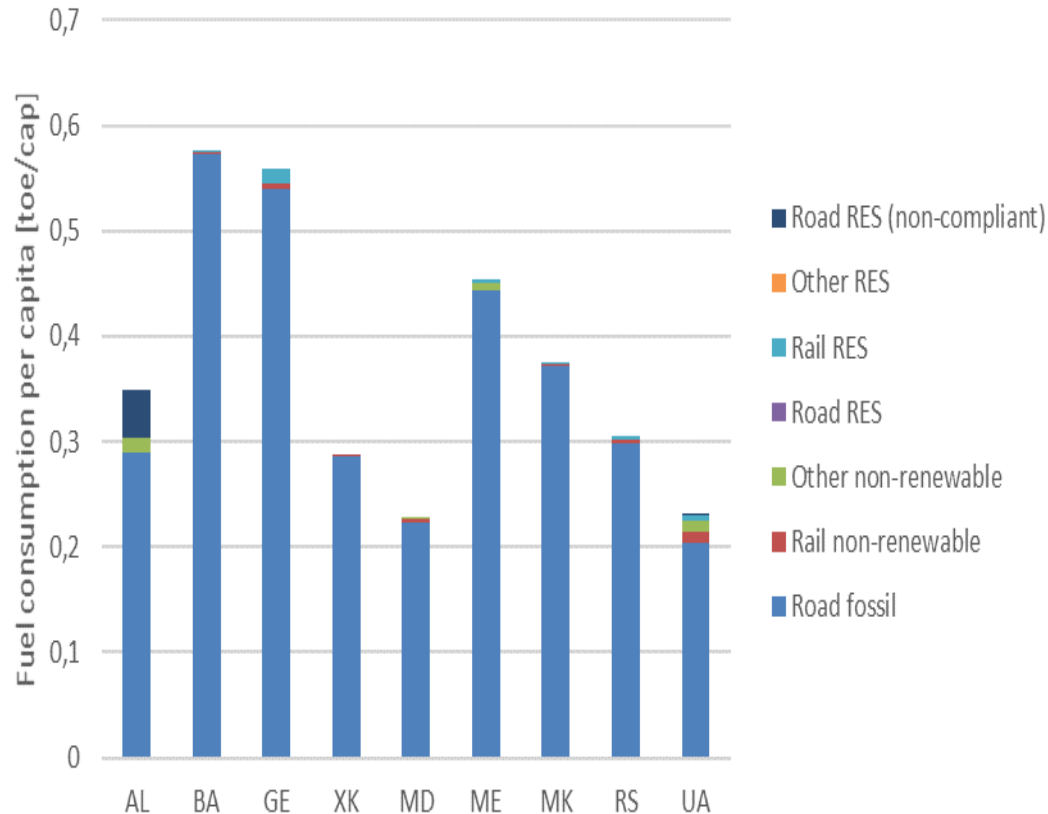


2030 projections: per-capita energy consumption (physical)

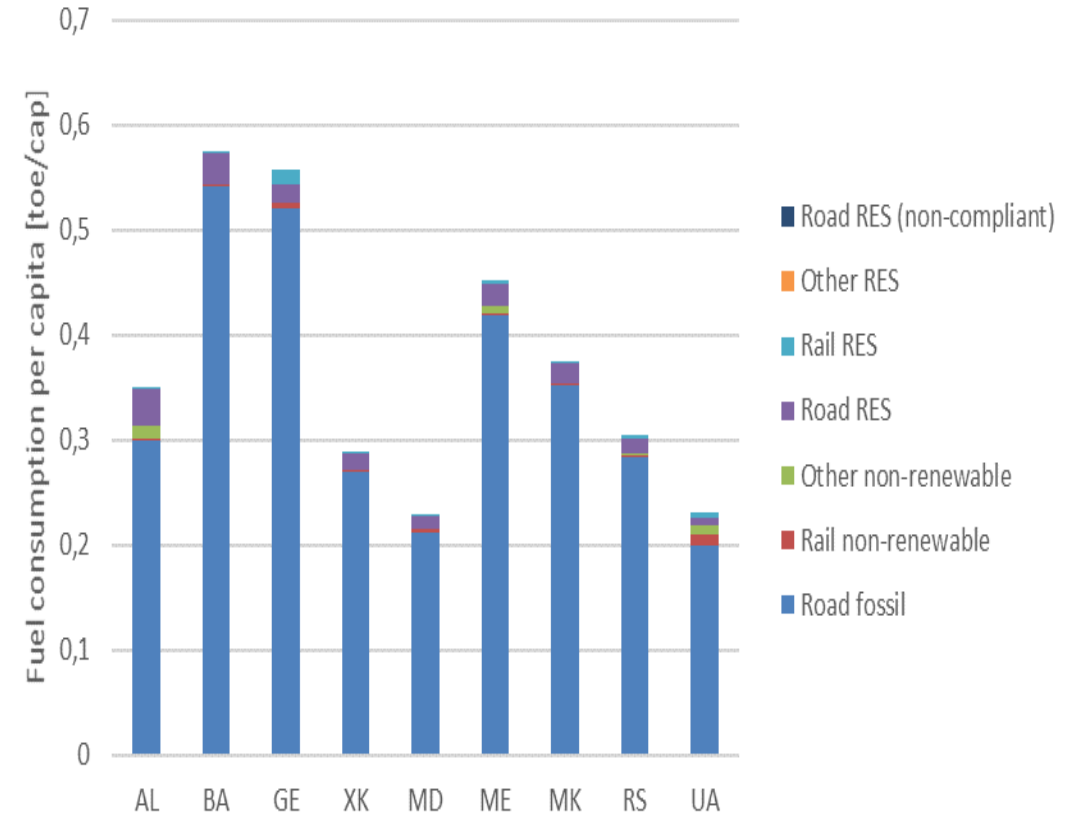


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■ Business as usual scenario

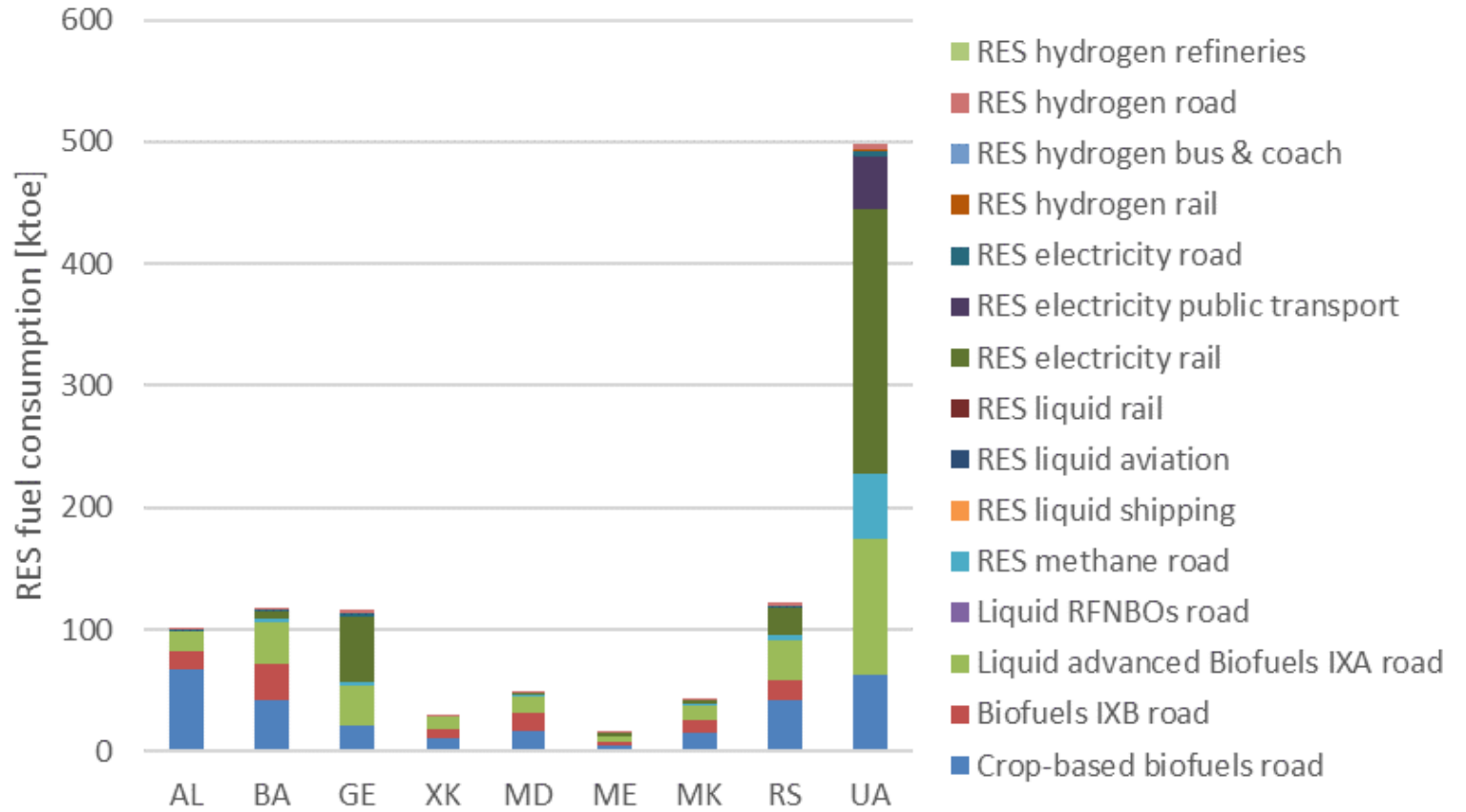


■ Target compliance scenario



2030 projections: target compliance by option (physical)

- Compliant biofuels make significant contributions in all CPs
 - Crop-based are capped
 - Advanced have minimum requirement
 - Annex IX B are capped
- RES methane in CPs where CNG vehicles and refuelling stations are established today (notably GE)
- Electricity in rail where electrified rail is available and developed until 2030, and where the national electricity mix has high RES share
- RES electricity in road is still limited in 2030
- RES hydrogen with minor contributions in 2030





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2. Regulatory Status Quo

For RES-T in the Contracting Parties

Regulatory Status Quo

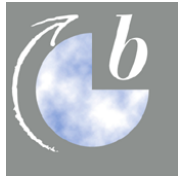
- The existing **regulatory status quo varies considerably** between CPs:
 - **RES-T obligations on fuel suppliers** have been adopted only recently in some CPs, are yet to come into force in some CPs, are not enforced in some CPs, or have not been adopted yet
 - **Sustainability requirements for biofuels** have been adopted only recently in some CPs, are yet to come into force in some CPs, or have not been adopted yet
- **Complementary policies** (e.g. financial incentives for the purchase of electric vehicles) are in place in some CPs; however, existing policies are often limited and fragmented, and overall strategies are often missing
- RES II provisions have not been implemented yet

Key policies: example Serbia

Policy	In force	Adopted	Draft	Not available	Adjustment to RED II	Comments
Obligation for renewable fuels in transport						
Road	1.1.2021	2019			Required	Regulation on the share of biofuels on the market (Official Gazette of RS no. 71/2019) Obligation is related to transport in general Rulebook on the calculation of the share of renewable energy sources (Official Gazette of RS no. 37/20)
Rail	1.1.2021	2019			Required	
(Domestic) navigation	1.1.2021	2019			Required	
(Domestic) aviation	1.1.2021	2019			Required	
Sustainability framework for renewable fuels in all transport sectors	1.1.2021	2019			Required	
Technical and other requirements as well as applicable standards for biofuels and bioliquids	1.1.2020	2019				Rulebook on technical and other requirements for biofuels and bioliquids (Official Gazette of RS no. 73/2019)
Policy for increasing RES share in electricity for transport and/or building up dedicated RES capacity for transport				X		
Transport fuels covered in National Energy and Climate Plan (NECP)						Draft in internal development

Complementary policies: example Serbia

Policy	In force	Adopted	Draft	Not available	Adjustment to RED II	Comments
Tax on the use of motor vehicles is not paid by the owners of electric vehicles and hybrid vehicles	yes	2011				The Law on Taxes on the Use, Holding and Carrying of Goods
Subsidized purchase of new vehicles that have exclusively electric drive, as well as vehicles with hybrid drive	yes	2020				The Regulation on the conditions and manner of implementation of subsidized purchase of new vehicles that have exclusively electric drive, as well as vehicles with hybrid drive
Subsidized purchase of new vehicles for the needs of renovation of the fleet of taxi transport as public transport	yes	2019				The Regulation on conditions and manner of conducting subsidized purchase of passenger vehicles for the needs of renovation of the fleet of taxi transport as public transport



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3. RES-T options

For 2030 target compliance

Overview of Options

- Biofuels and liquid RFNBOs
 1. Liquid crop-based biofuels in road transport
 2. Liquid Biofuels (based on Annex IX B feedstocks: UCO, animal fats) for road transport
 3. Liquid advanced Biofuels (based on Annex IX A feedstocks) for road transport
 4. Liquid RFNBOs in road transport
 5. Renewable methane in road transport
 6. Renewable liquid fuels in shipping
 7. Renewable liquid fuels in aviation
 8. Renewable liquid fuels in rail
- Electricity
 9. Rail electrification
 10. Electric public transport (bus, trolleybus, tram, metro)
 11. Electric road vehicles (passenger cars and trucks)
- Hydrogen
 12. Hydrogen in rail
 13. Hydrogen bus and coach (urban bus, long distance coaches)
 14. Hydrogen road vehicles (passenger cars and trucks)
 15. Hydrogen in refineries

1: Liquid crop-based biofuels in road transport

Drivers for growth	Crop-based biofuels are currently the most widely available and generally the cheapest alternative fuel in the EU and globally. Nevertheless they are still generally more expensive than fossil diesel and gasoline so policy is required to support their use. The majority of crop-based biofuels used globally today are ethanol and FAME biodiesel.
Policy framework	<p>Central key policies:</p> <ul style="list-style-type: none">• Blending mandate / GHG reduction obligation – Requires legislation defining all aspects of the mandate / obligation including who is obligated, penalty for non-compliance, where is the duty point, what is the target obligation / GHG reduction, buy-out price, caps or sub-targets for particular fuels or feedstocks etc.• Sustainability framework – this should be implemented alongside the blend mandate, to ensure that biofuels make high GHG savings and do not cause other environmental impacts such as on biodiversity. The sustainability requirements in the RED II should act as the framework for biofuel sustainability legislation, including provision to limit the supply of crop-based biofuels and phase out high-ILUC biofuels by 2030. Certification (national or voluntary schemes) must be established. <p>Complementary policies:</p> <ul style="list-style-type: none">• Grants / subsidies to fuel producers to build up domestic biofuel production in each CP• Information to retailers and consumers on switching and vehicle compatibility• A unit within the relevant government ministry must be designated responsible for: implementing, reviewing and updating policy; ensuring sustainability certification of fuels; administration of the scheme; data collection and reporting
Dedicated vehicles	Ethanol can be blended up to 5% _{vol} in gasoline (E5) and fatty acid methyl ester (FAME) can be blended up to 7% _{vol} in diesel (B7) with no modifications required to vehicles. Given the 2% cap, use of crop-based biofuels will not exceed these blend walls.
Dedicated infrastructure	E5 and B7 blends do not require dedicated infrastructure. Check materials for compatibility; follow protocols for first filling of storage tanks; additional blending facilities and tanks may be required.
Contribution 2030 (CP-specific)	Up to 2% for all CPs apart from Albania which can use up to 7%
Co-benefits	<ul style="list-style-type: none">▪ Domestic fuel production could support fuel producers and agricultural sector in each CP

11: Electric road vehicles (passenger cars and trucks)

Drivers for growth	Increased renewable electricity share in national electricity mix and dedicated renewable capacities for road transport contribute to the RES-T target. Electrifying road transport (vehicles, infrastructure) allows using (renewable) electricity and reducing conventional fuels. Establishing charging infrastructure (government and private sector) is crucial to vehicle fleet growth.
Policy framework	<p>Central key policies: Develop dedicated Electric Vehicle Strategy</p> <ul style="list-style-type: none"> • Increase RES share in electricity in general in existing policy instruments • Amend existing policies to incentivise development of dedicated RES electricity capacities for road transport • Increase number of electric road vehicles (set 2030 targets) by financial incentives (tax/ custom reductions/ exemptions, investment support) on vehicles, services, components for domestic production; counter financing by higher duties on conventional • Dedicated public and fleet (fast) charging infrastructure based on build-up strategy; financial incentives for infrastructure operators (e.g. reduction/exemption of VAT, custom, taxes etc. for construction/ operation); clear legal framework for infrastructure operators <p>Complementary policies:</p> <ul style="list-style-type: none"> • Communication: Increase public awareness for electric public transport • Municipal lighthouse projects, financial support programmes to fleet operators (taxi, delivery services etc.), public procurement • Training programmes for repair/maintenance of vehicles, infrastructure (academic, professional) • Zero/low emission zones in polluted city centres, limitation of old (unsafe, polluting) vehicles; free parking, use of bus lanes, etc.
Dedicated vehicles	Dedicated vehicles (BEV) required; passenger cars and light duty vehicles commercially available; no suitable electric vehicle solutions for long haul freight transport; electric medium/ heavy duty trucks suitable for distribution purposes.
Dedicated infrastructure	Dedicated public electricity (fast) charging infrastructure and dedicated charging infrastructure for vehicles fleets is required.
Contribution 2030 (CP-specific)	0.07% - 0.6%
Co-benefits	<ul style="list-style-type: none"> ▪ Decarbonisation and pollutant emission reduction from road transport (notably in cities, but also in rural areas) ▪ Reducing dependence on fossil energy imports ▪ Development of national manufacturing capacities for electric vehicles, charging infrastructure and components

Potential RES-T contributions from all options for all CPs

	Albania	Bosnia and Herzegovina	Georgia	Kosovo*	Moldova	Montenegro	North Macedonia	Serbia	Ukraine
share	15,3%	9,9%	13,7%	9,73%	9,2%	13,1%	10,5%	11,2%	13,8%
amount (ktoe)	111	129	180	32	49	25	52	148	787

- Potential RES-T contributions from all options range from 9.2% to 13.8% (15.3% for Albania)
- The absolute renewable energy consumption corresponding to these share varies strongly because of the different sizes of the CPs from 25 ktoe to 787 ktoe

Options: Results

- All CPs have a **number of options** to achieve the 2030 RES-T target of 9% (14% for Albania)
- In many CPs, **overachievement of the target** is possible, and could open opportunities for export
- Of the 9% (14% for Albania), crop-based biofuels are capped at 2% (7% for Albania), while 7% need to be achieved by other renewable fuels
 - **Biofuels** are anticipated to contribute most to the 2030 target
 - **Electricity use in rail** can make relevant contributions in some CPs, while it is lower (down to zero) in other CPs
 - **Electric road vehicles** have notable potential, which is anticipated to be used towards 2030 with a dynamic growth potential beyond 2030 to allow for a major RES-T share by 2050
 - **Hydrogen and battery-electric vehicles** are complementary as hydrogen fuel cell vehicles enable longer driving distances, and are suitable for cars and heavy-duty transport alike; dynamic growth beyond 2030 is anticipated

Potential RES-T contributions from all options: e.g. Ukraine

- A RES-T share of **13.8% in 2030** can be achieved as a combination of all options
- Further limited potentials exist in renewable liquid fuels in shipping, aviation and rail
- **Biofuels and electric rail** potentially contribute most in 2030
- **Electric and hydrogen vehicles** can already contribute by 2030, and have a strong growth potential thereafter

Option		Contribution to RES-T target (%) incl. multiple counting	Amount of renewable fuel used (ktoe)
Biofuels and liquid RFNBOs	1. Crop-based biofuels in road transport	2.0%	188.6
	2. Liquid fuels produced from Annex IX B feedstocks in road transport	3.4%	160.3
	3. Liquid advanced Biofuels (based on Annex IX A feedstocks) in road transport	2.3%	110.4
	4. Liquid RFNBOs in road transport	0.03%	2.90
	5. Renewable methane in road transport	1.2%	54.6
	6. Renewable liquid fuels in shipping	0.0%	0.00
	7. Renewable liquid fuels in aviation	0.0%	0.00
	8. Renewable liquid fuels in rail	0.0%	0.00
Electricity	9. Rail electrification	3.45%	217.0
	10. Electric public transport (bus, trolleybus, tram, metro)	1.12%	42.23
	11. Electric road vehicles (passenger cars and trucks)	0.19%	4.55
Hydrogen	12. Hydrogen in rail	0.01%	1.11
	13. Hydrogen bus and coach (urban bus, long distance coaches)	0.006%	0.60
	14. Hydrogen road vehicles (passenger cars and trucks)	0.05%	4.55
	15. Hydrogen in refineries	0.0%	0.00
Total		13.8%	787

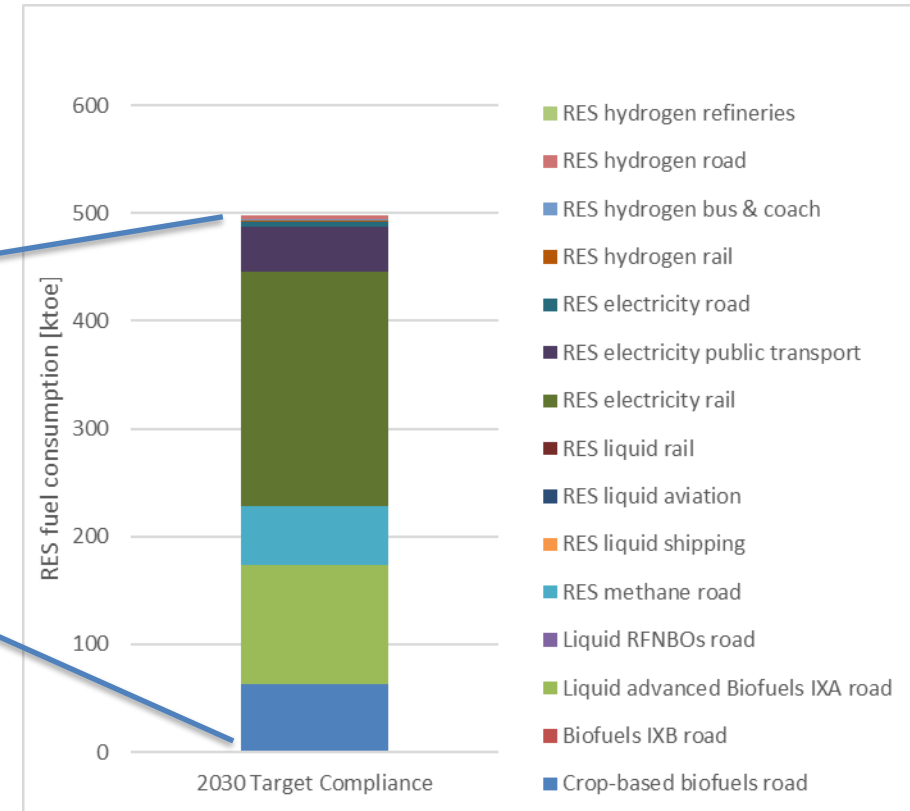
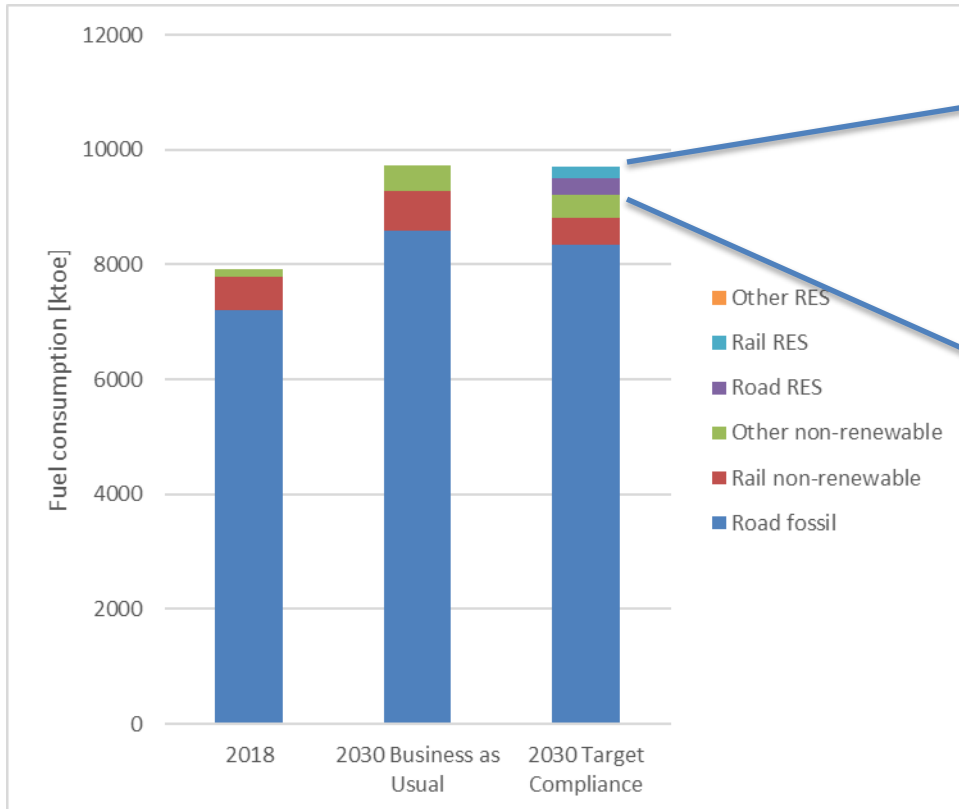
2030 scenarios: Business as Usual vs. Target Compliance

example: Ukraine



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Fossil and renewable fuels excluding multipliers



2030 projections based on:

Institute for Economics and Forecasting of the National Academy of Sciences of Ukraine, Technical University of Denmark: Long-term Energy Modelling and Forecasting in Ukraine: Scenarios for the Action Plan of Energy Strategy of Ukraine until 2035 - Final Report.

<https://timesukraine.tokni.com/>

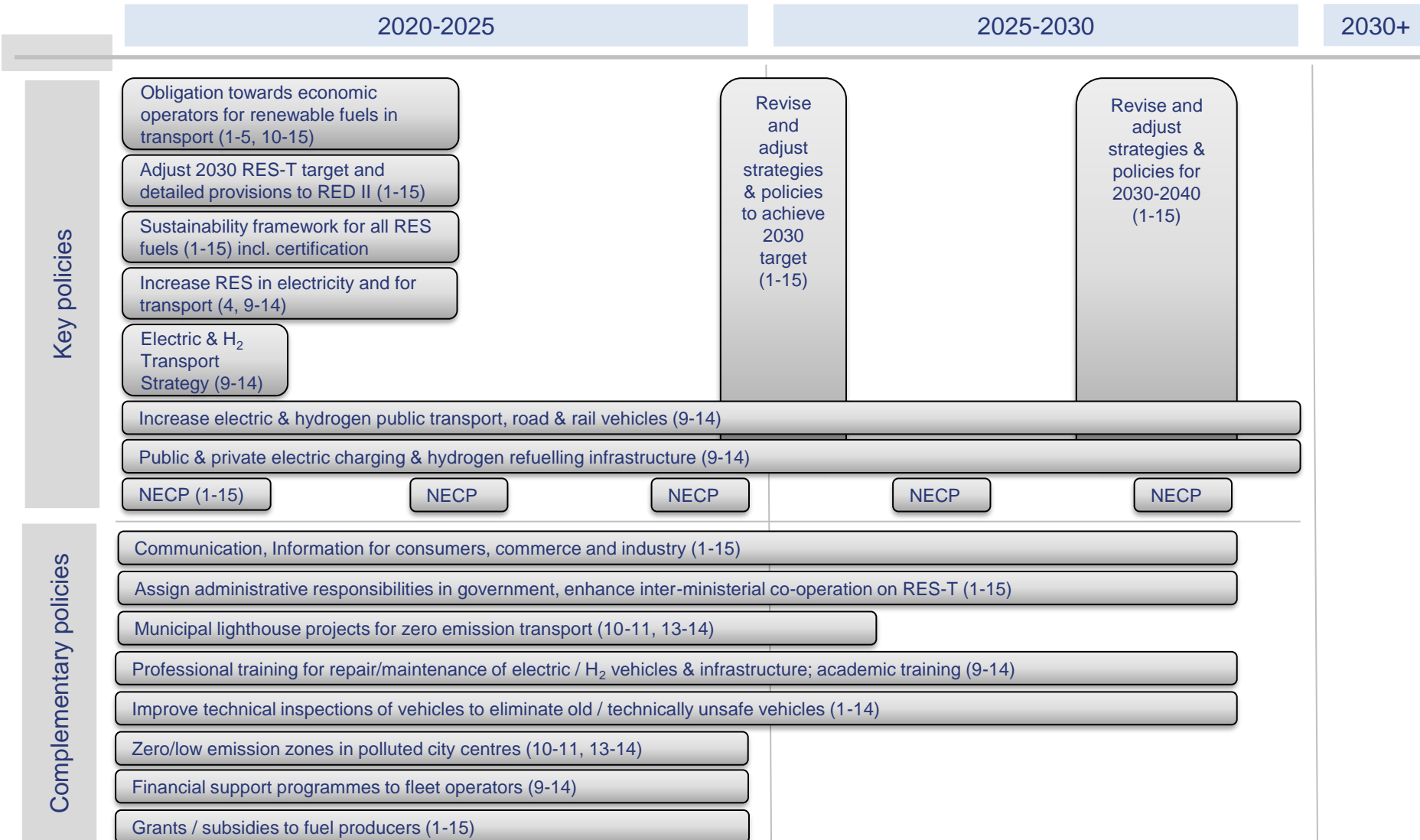


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4. Roadmaps for CPs

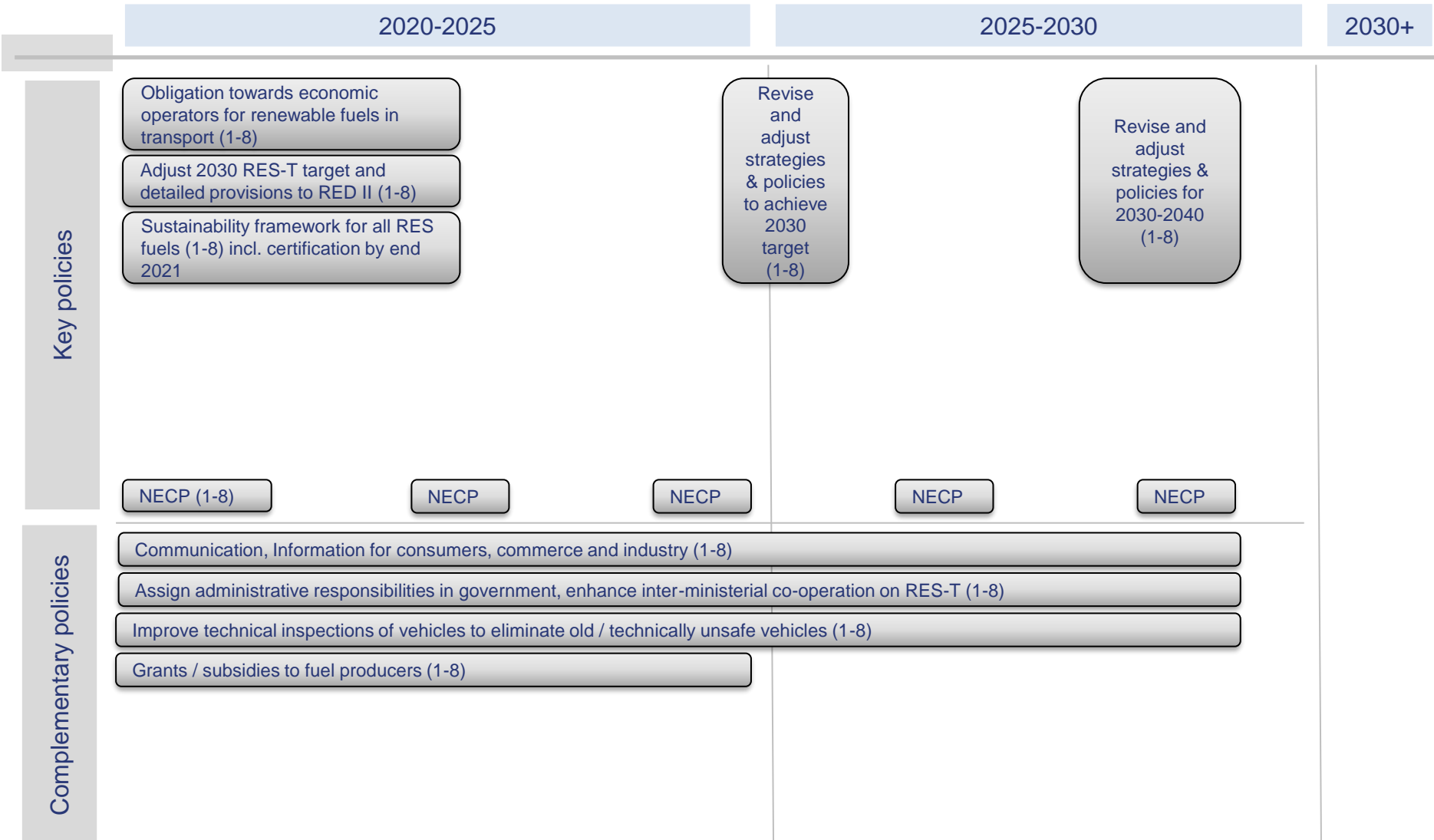
For 2030 target compliance

Typical Roadmap – Overview



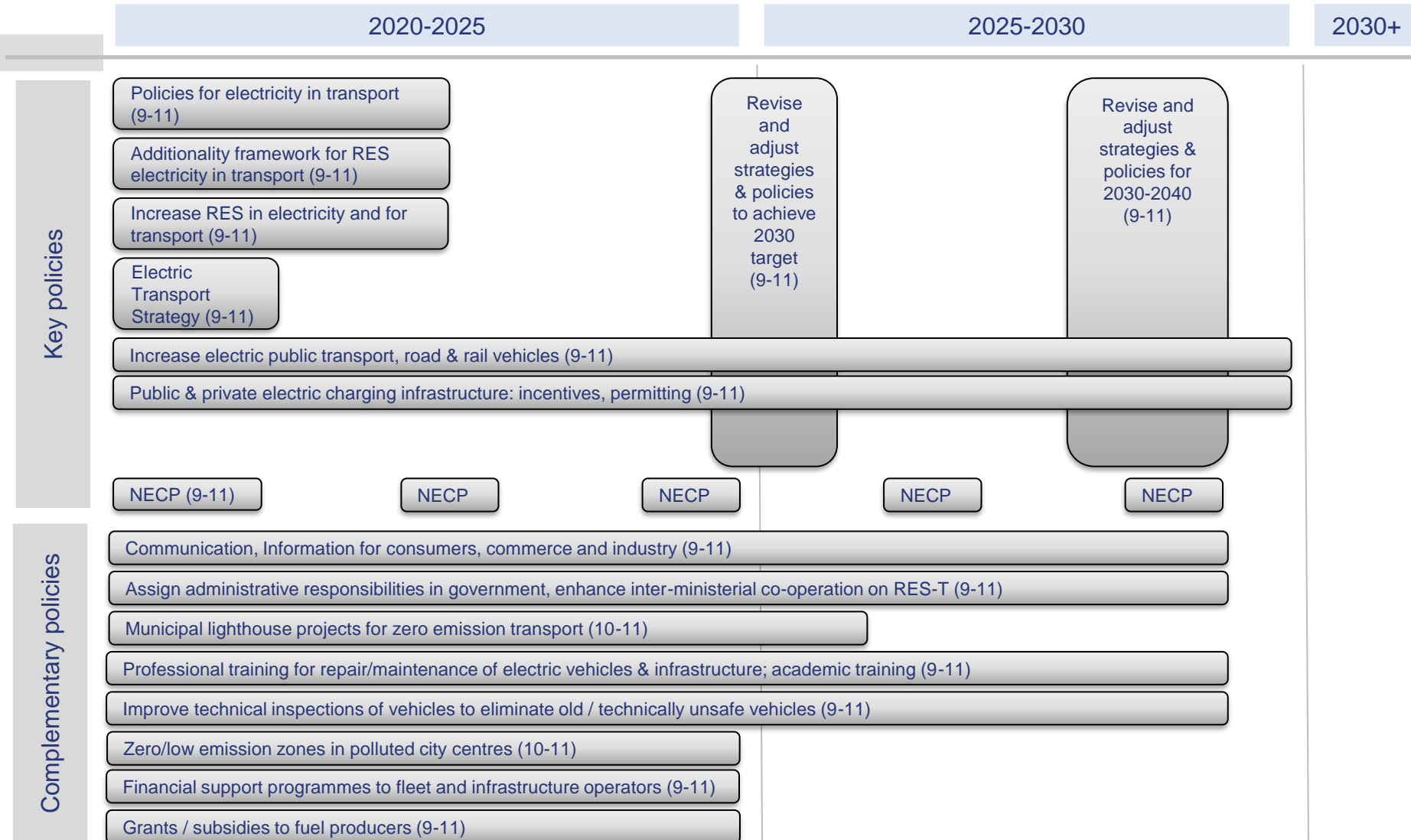
Summary of options	
Biofuels and liquid RFNBOs	1. Crop-based biofuels in road transport
	2. Annex IXB-based biofuels in road
	3. Advanced biofuels (IX A) in road
	4. Liquid RFNBOs in road transport
	5. Renewable methane in road transport
	6. Renewable liquid fuels in shipping
	7. Renewable liquid fuels in aviation
	8. Renewable liquid fuels in rail
Electricity	9. Rail electrification
	10. Electric public transport (bus, tram etc)
	11. Electric road vehicles (cars, trucks)
Hydrogen	12. Hydrogen in rail
	13. Hydrogen bus and coach
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	15. Hydrogen in refineries

Typical Roadmap – Biofuels and liquid RFNBOs



Summary of options	
Biofuels and liquid RFNBOs	1. Crop-based biofuels in road transport
	2. Annex IXB-based biofuels in road
	3. Advanced biofuels (IX A) in road
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	5. Renewable methane in road transport
	6. Renewable liquid fuels in shipping
	7. Renewable liquid fuels in aviation
	8. Renewable liquid fuels in rail
Electricity	9. Rail electrification
	10. Electric public transport (bus, tram etc)
	11. Electric road vehicles (cars, trucks)
Hydrogen	12. Hydrogen in rail
	13. Hydrogen bus and coach
	14. Hydrogen road vehicles (cars, trucks)
	15. Hydrogen in refineries

Typical Roadmap – Electricity in transport

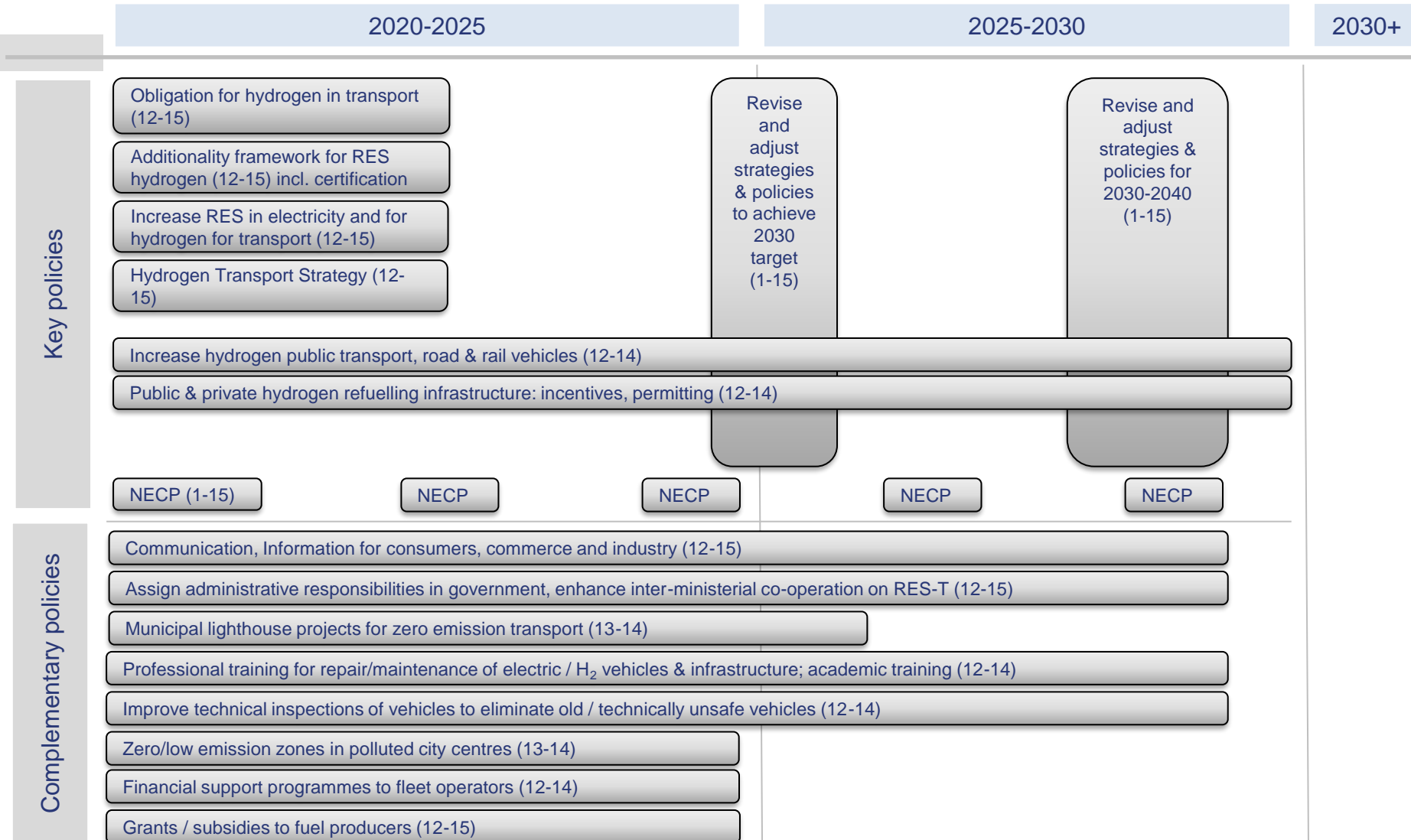


Summary of options	
Biofuels and liquid RFNBOs	1. Crop-based biofuels in road transport
	2. Annex IXB-based biofuels in road
	3. Advanced biofuels (IX A) in road
	4. Liquid RFNBOs in road transport
	5. Renewable methane in road transport
	6. Renewable liquid fuels in shipping
	7. Renewable liquid fuels in aviation
	8. Renewable liquid fuels in rail
Electricity	9. Rail electrification
	10. Electric public transport (bus, tram etc)
	11. Electric road vehicles (cars, trucks)
Hydrogen	12. Hydrogen in rail
	13. Hydrogen bus and coach
	14. Hydrogen road vehicles (cars, trucks)
	15. Hydrogen in refineries

Typical Roadmap – Hydrogen



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Summary of options	
Biofuels and liquid RFNBOs	1. Crop-based biofuels in road transport
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5. Conclusions & Recommendations

For 2030 RES-T target compliance

Conclusions



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- None of the CPs achieves the 10% RES-T target for 2020
- All CPs have **a number of options** to achieve the 2030 RES-T target of 9% (14% for Albania)
- In many CPs, **overachievement of the target** is possible, and could open opportunities for export
- The existing **regulatory status quo varies considerably** between CPs; RES II provisions have not been implemented yet
- Of the 9%, crop-based biofuels are capped at 2% (7% for Albania), while 7% need to be achieved by other renewable fuels
 - **Biofuels** are anticipated to contribute most to the 2030 target
 - **Electricity use in rail** can make relevant contributions in some CPs, while it is lower (down to zero) in other CPs
 - **Electric road vehicles** have notable potential, which is anticipated to be used towards 2030 with a dynamic growth potential beyond 2030 to allow for a major RES-T share by 2050
 - **Hydrogen and battery-electric vehicles** are complementary as hydrogen fuel cell vehicles enable longer driving distances, and are suitable for cars and heavy-duty transport alike; dynamic growth beyond 2030 is anticipated
- **Additional benefits** of achieving the 2030 RES-T target include the reduction of fossil energy import dependence, additional national value creation, new or enhanced national value chains with related economic benefits and possible job creation, additional contributions to the national climate targets
- Even with target achievement, the anticipated consumption growth in most CPs will result in increased fossil fuel imports relative to 2018. Therefore **even higher ambitions** could be beneficial in economic and environmental terms

Recommendations

- As a proven policy tool, all CPs should adopt a **2030 target** for renewable energies in transport based on **RED II**
- All elements of the regulatory framework should be **based on RED II**, and should be in place by the **end of 2022**
- Where legislation is already in place setting obligations for certain quantities of biofuels on the market, defining sustainability criteria and establishing certification, **enforcement is needed**
- **Additional key policy elements** needed to achieve 2030 RES-T targets include:
 - Checking and adjusting taxation systems to provide incentives for renewable fuels as well as electric and hydrogen vehicles, and disincentives for fossil fuels
 - strategy and support mechanisms for electricity in transport
 - strategy and support mechanisms for hydrogen in transport
- **Complementary policies** are recommended to be established in order to ensure target achievement and maximum benefits to the economies in the CPs
- **Co-benefits with other policy areas** should be actively developed. This includes renewable electricity, air quality improvements in urban areas and other environmental and health issues as well as economic benefits
- Furthermore, **co-operation with other Contracting Parties**, and more generally with other countries, allows leveraging synergies
- Policies should be revised and possibly adjusted **around 2025** based on a policy and results evaluation
- The biannual progress reports and the regular revisions of the **National Energy and Climate Plans** are the appropriate instrument for monitoring successful implementation and development towards the 2030 target

Contact



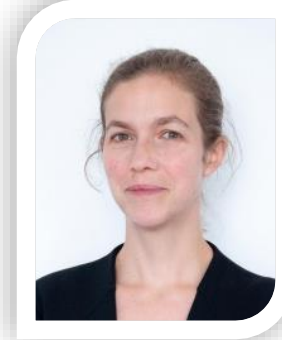
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