



ADVANCEFUEL

Analysing the role of RESfuels in decarbonising the transport sector until 2030 and beyond

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ECN part of TNO

**4th ADVANCEFUEL Stakeholder
Workshop**

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ECN BECOMES TNO



- Up to 31 March 2018: Energy research Centre of the Netherlands (ECN)
 - From April 1st 2018 to December 31st 2019: ECN part of TNO
 - From 1 January 2020 onwards: TNO Energy transition
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- ❑ TNO: Netherlands Organisation for applied scientific research





Objectives



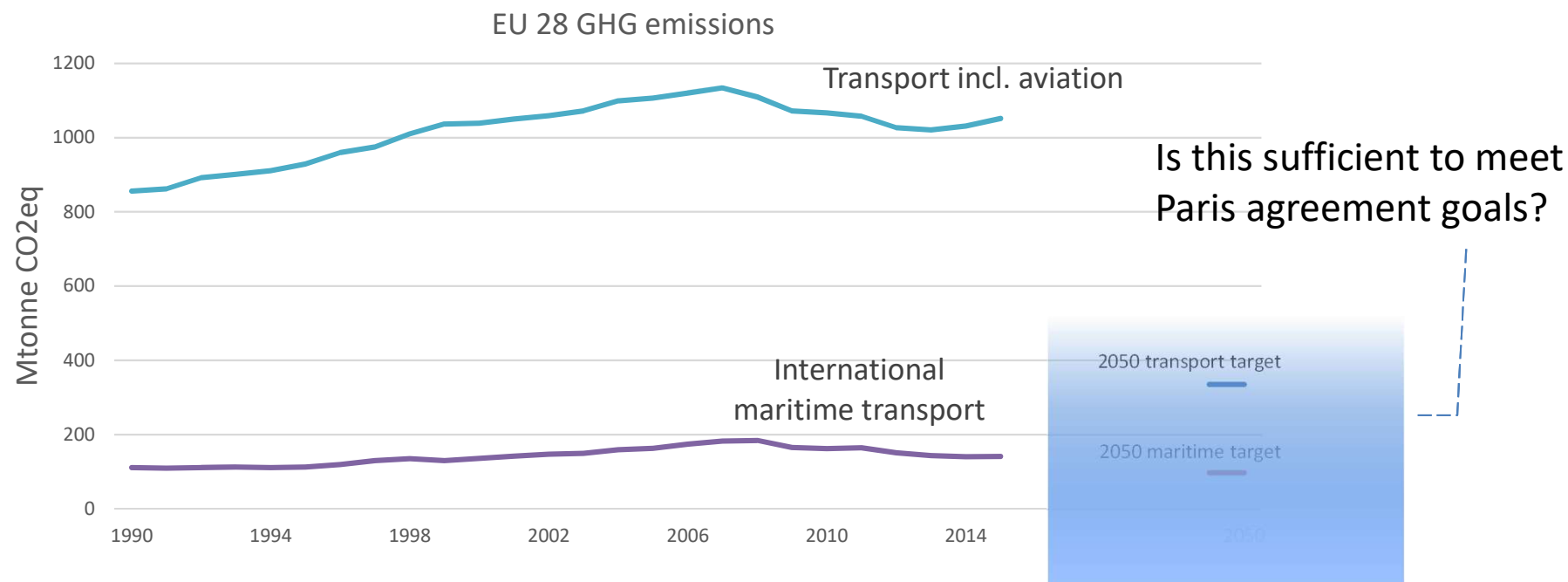
Define strategies for the further development of RESfuels based on the full chain analysis (taking into account feedstock costs and potentials, logistics, technology performance and market demand).

RESfuels refer to liquid biofuels produced from lignocellulosic feedstocks and liquid renewable fuels from non biological origin

- What is the portfolio of renewable options in the time frame 2030 and 2050?
 - Role of RES fuels
- What kind of innovations are needed to reduce the high production costs of advanced biofuels?



SCENARIO SETUP– background



- The European Commission's **2011 Transport White Paper** sets out a target of 60% reduction in transport GHG emissions by 2050 compared to 1990.
- Aviation and Maritime to reduce CO₂ emissions 50% by 2050, compared to 2005/2008 .

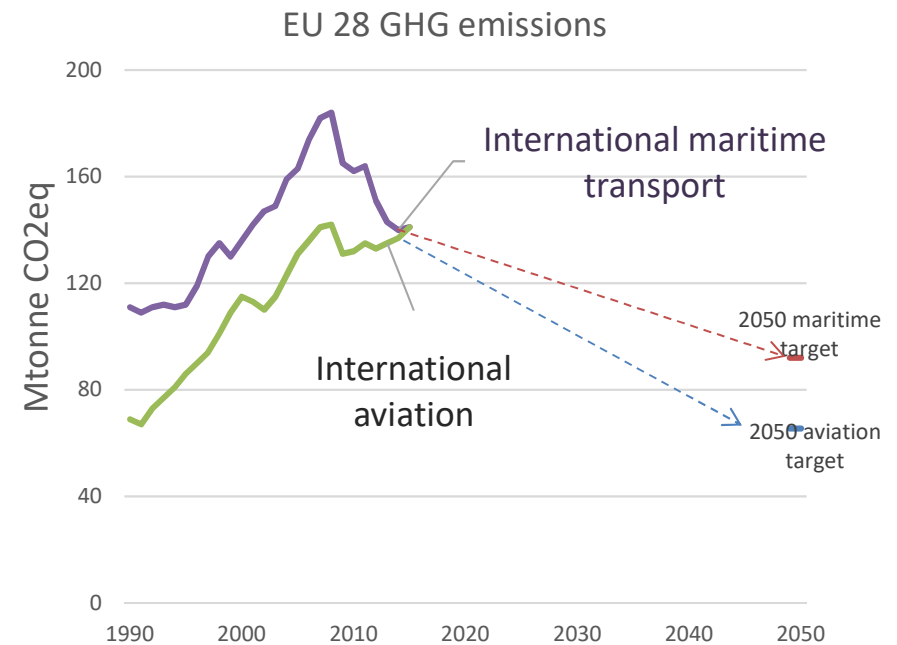
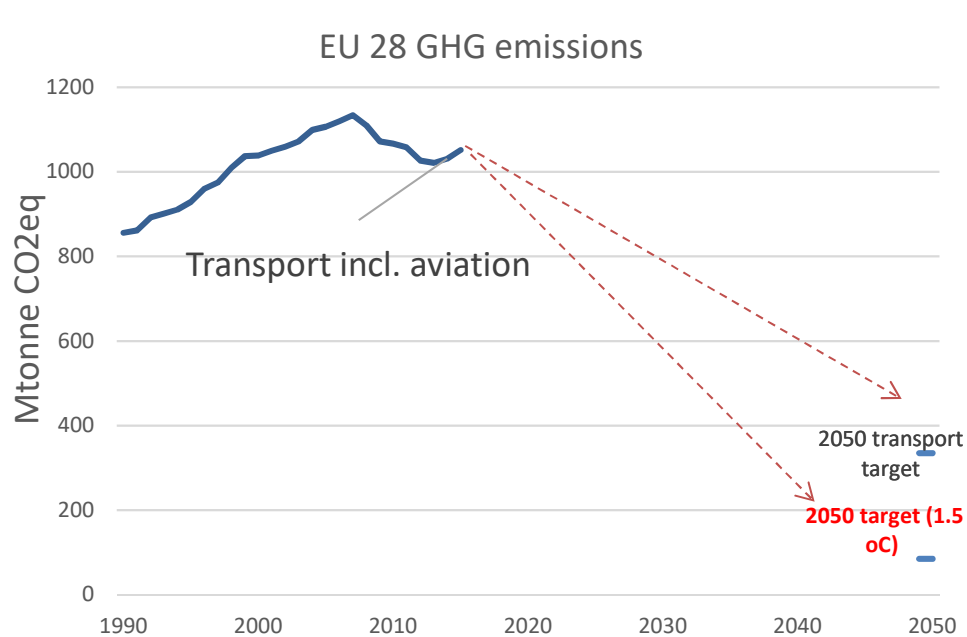


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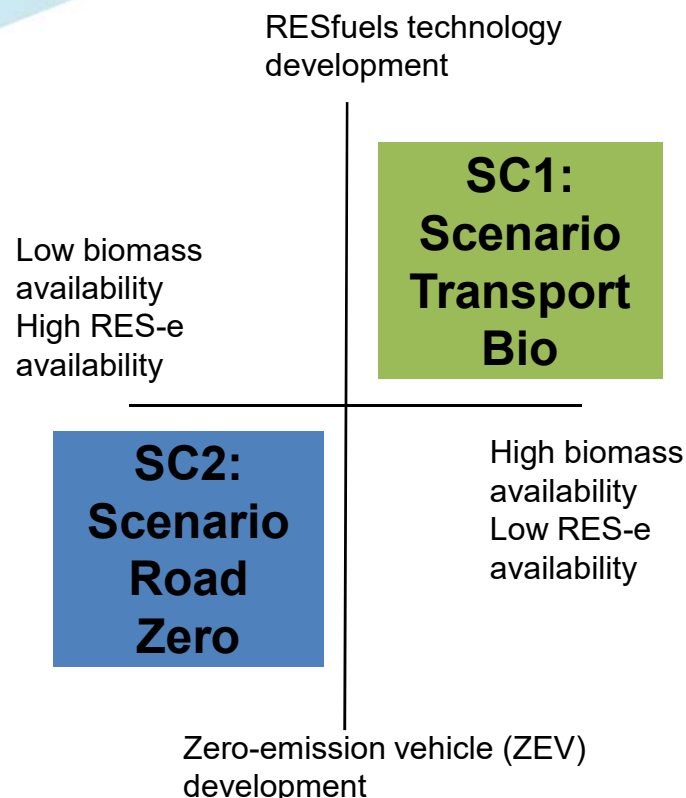
SCENARIO SETUP– Paris agreement



- The European Commission's 2017 European long term strategy document refers to **net zero by 2050 in achieving 1.5 °C**
 - **89-90% reduction** in transport GHG emissions by 2050 compared to 1990 (excluding international maritime).
 - Aviation and maritime to reduce CO₂ emissions **50%** by 2050, compared to 2005/2008 .



SCENARIO SET UP-main elements



REFERENCE scenario : Assumes policies for 2030 are implemented, no further policy objectives

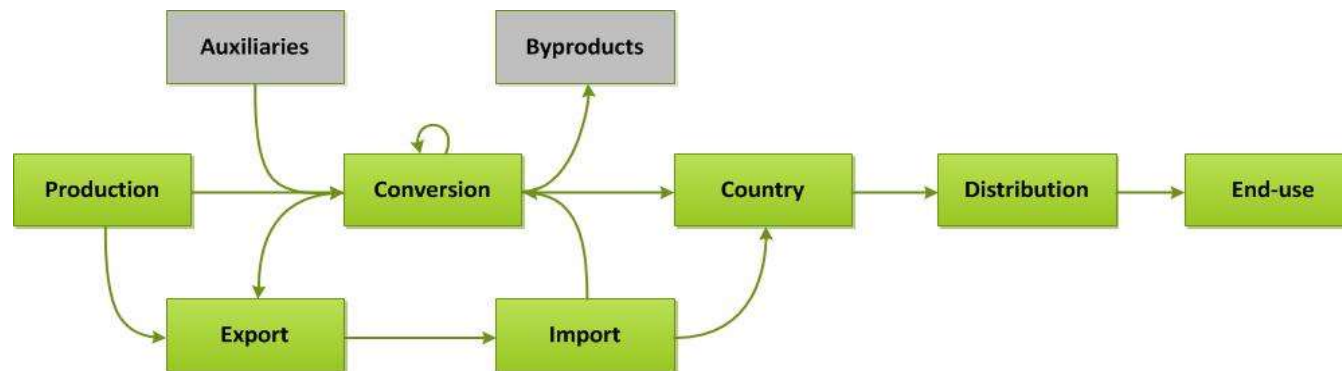
- REDII & EE
- CO₂ standards light duty and HDVs

	Transport Bio	Road Zero
Conversion step	More optimistic learning	More pessimistic learning
Feedstock potential	IEE Biomass Policies domestic supply & import potential Will be updated with FP7 S2Biom	25% reduction in forestry feedstocks Import from the US set to zero
Demand sectors	Electricity, H&C and biobased products	
ZEVs	Reference	Massive electrification
PtX	Electricity price 65 €/MW in 2030 60 €/MW in 2050	Electricity price 45 €/MW in 2030 40 €/MWh in 205
Caps	1.7% cap to UCO based diesel/HVO 6% cap to food crop based biofuels No palm oil import beyond 2030	



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RESolve-Biomass the modeling tool



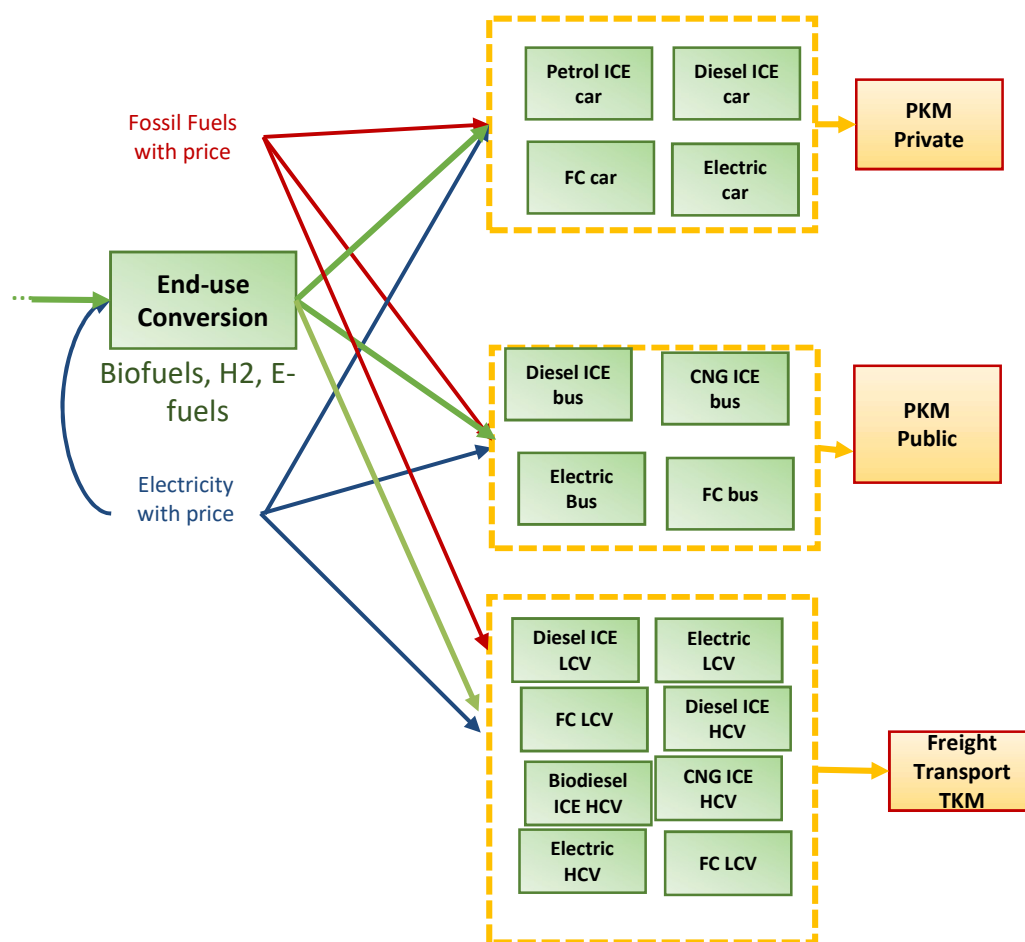
Production	Domestic biomass supply in NUTS2 level Import potential	Cost supply curves for different feedstock types (IEE Biomass Policies , FR7 S2Biom)
Conversion	Several conversion technologies covering all sectors	Techno-economic performances, learning effects, economies of scale
End use	Electricity, heating and cooling, Biobased products & Transport sector	Transport sector: Road and rail transport, maritime and aviation
Regulatory framework	Biofuel targets, caps/multipliers, CO ₂ emission reduction targets	



RESolve-Biomass tool



Road Transport



Vehicle	Fuel Options
Petrol ICE car	Petrol and EtOH blend
Diesel ICE car	Diesel and (bio)blend
Electric car	Electricity
FC car	Hydrogen
Diesel ICE bus	Petrol and EtOH blend
CNG ICE bus	Compressed Natural Gas
Electric bus	Electricity
FC bus	Hydrogen



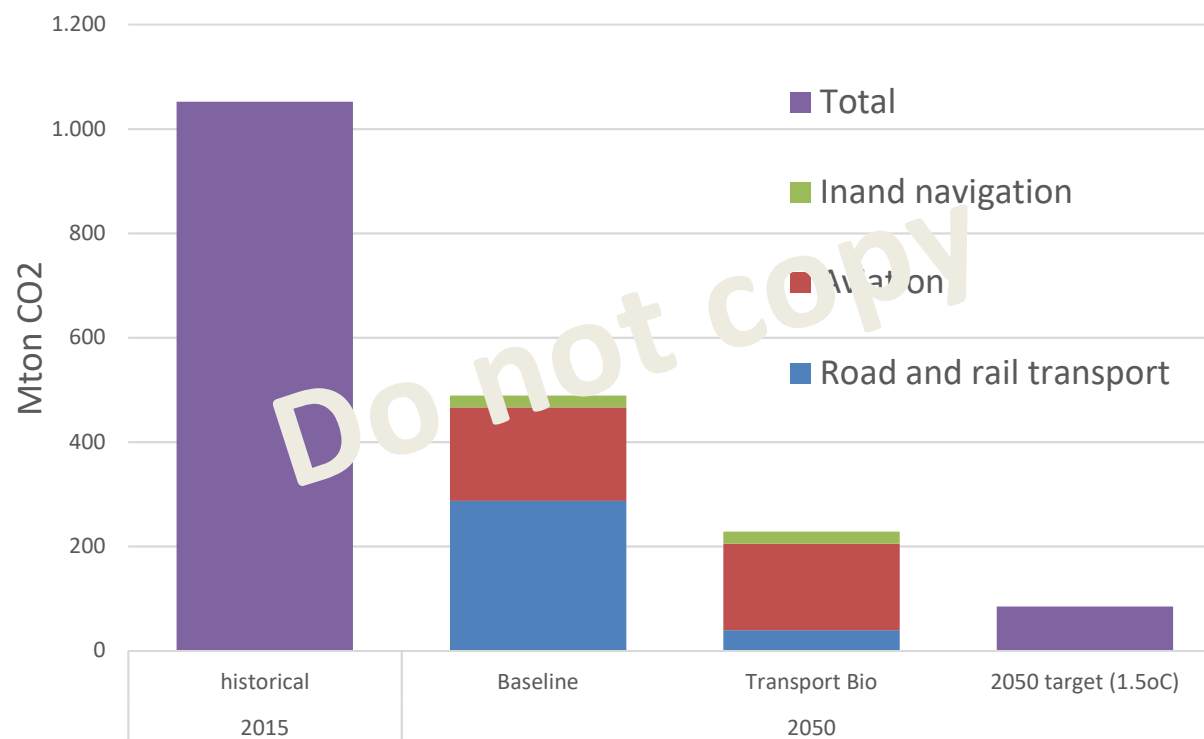
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Scenario assessment-initial results



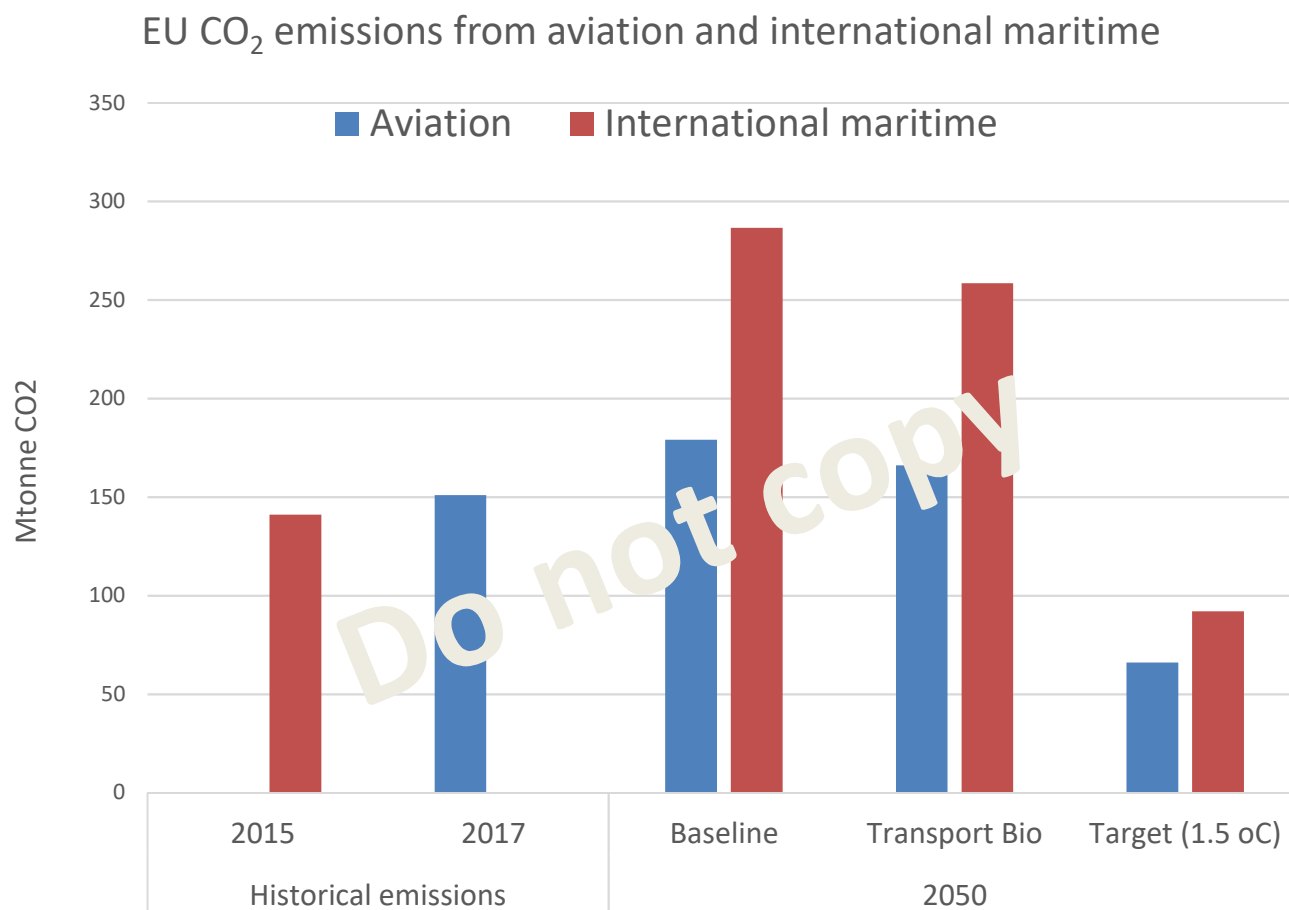
EU28 CO₂ emissions from transport sector exc international maritime



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Scenario assessment-initial results



Even in high biomass scenario these sectors appear very challenging !

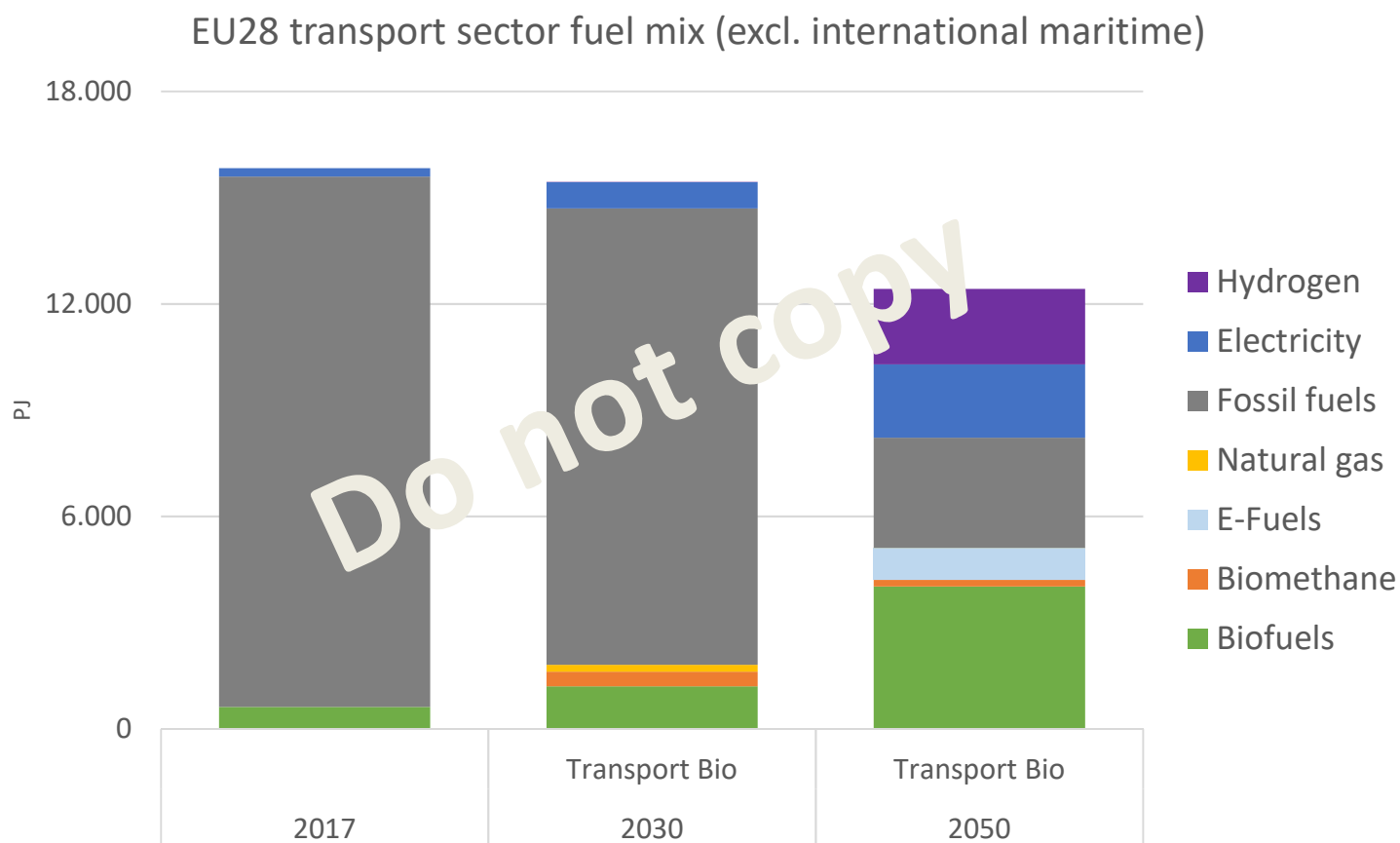




Scenario assessment-initial results



Fuel mix Transport BIO

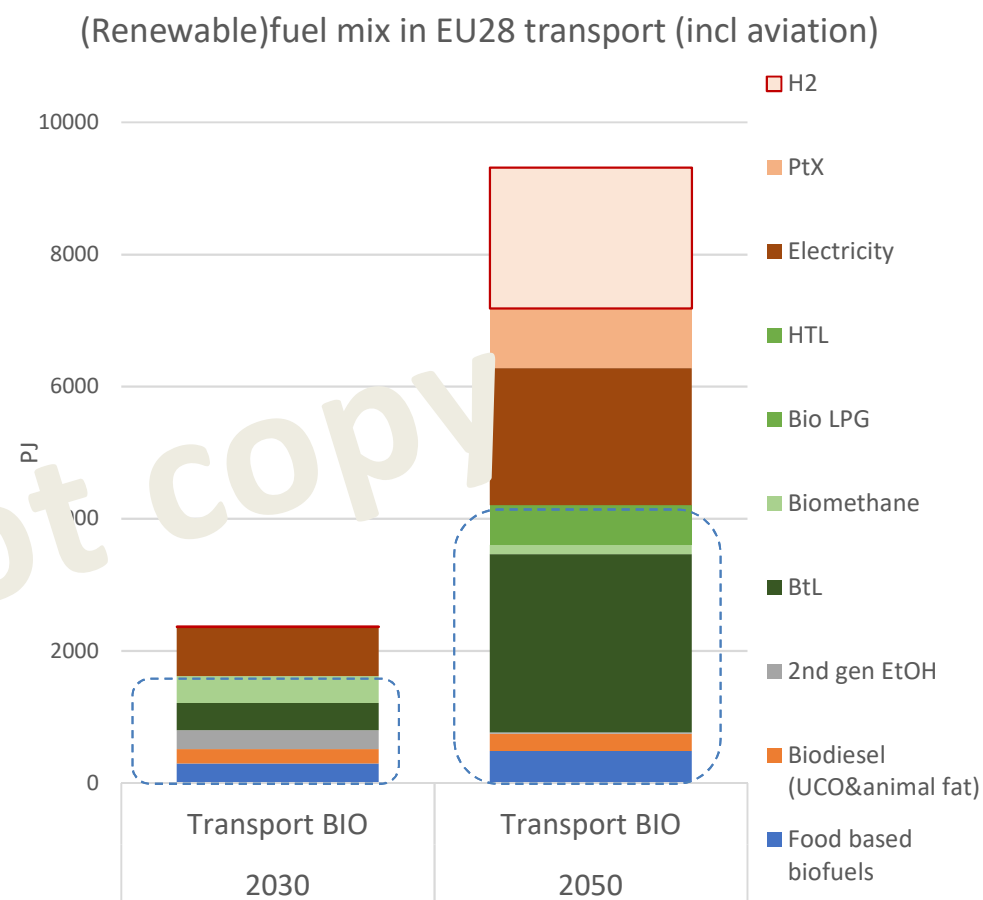
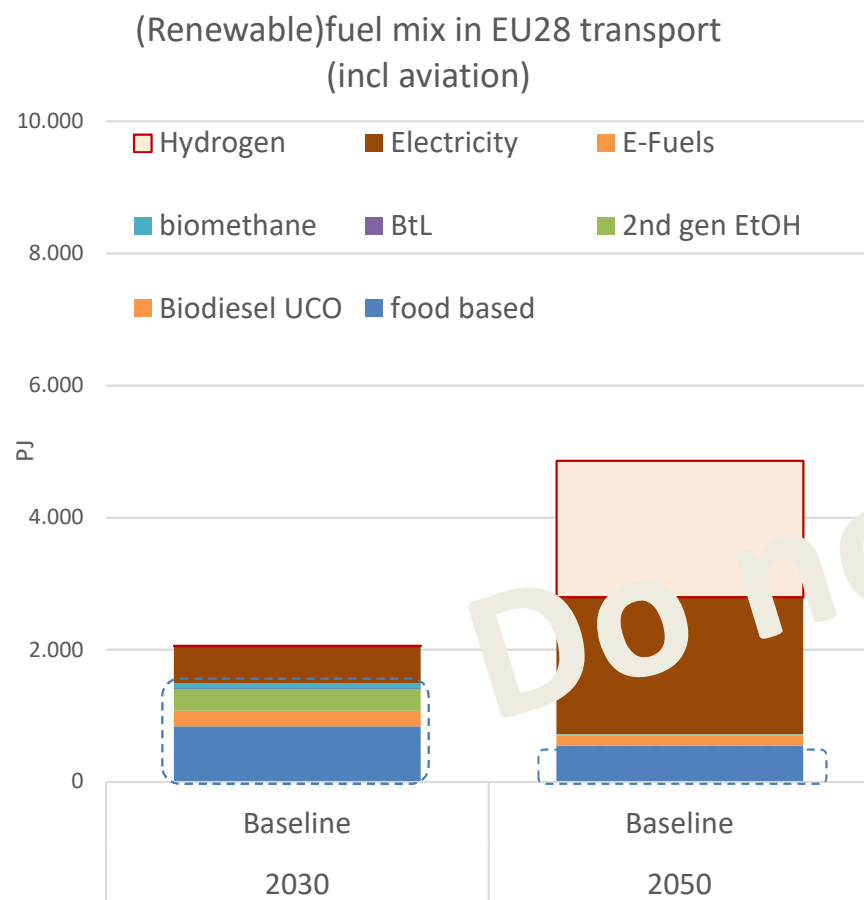




Scenario assessment-initial results



Renewable fuels in baseline and Transport Bio

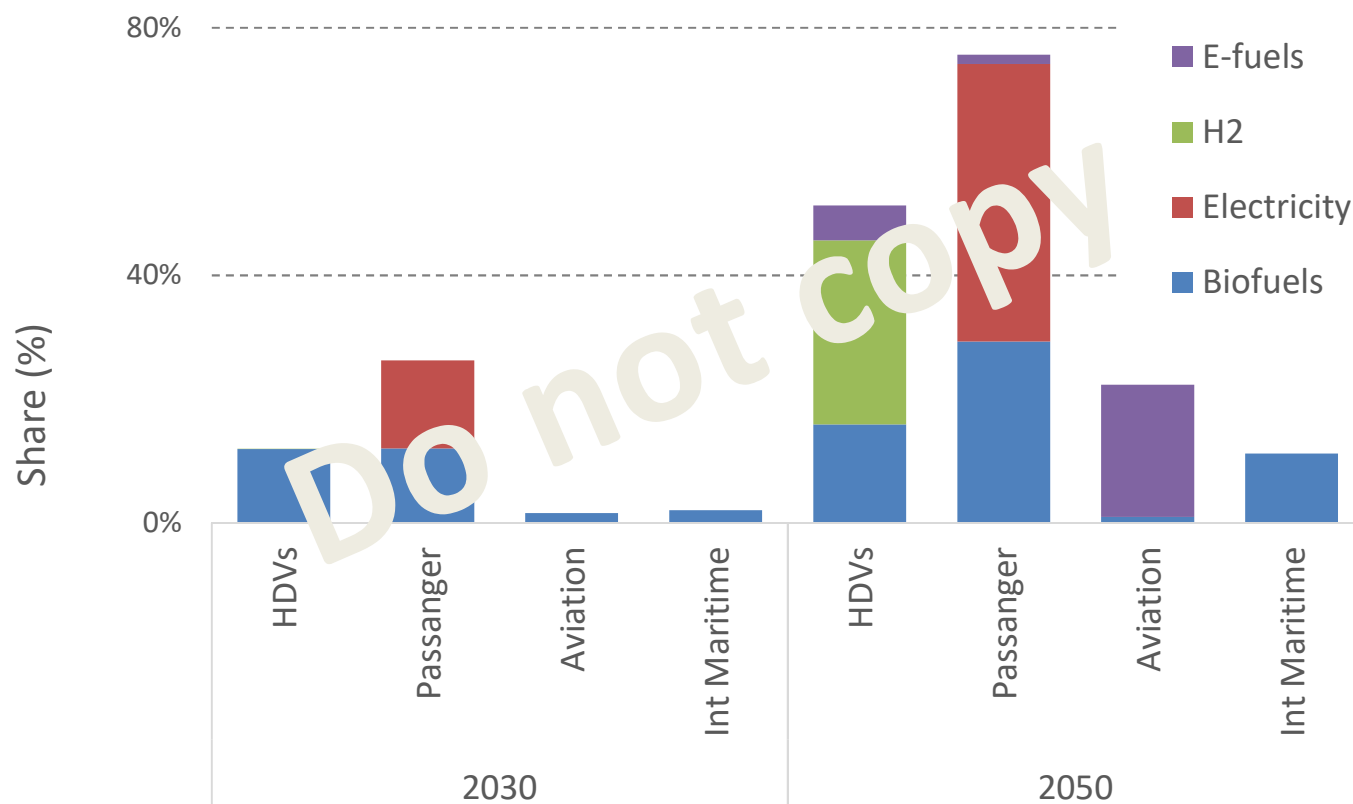


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Share of biofuels per sector according to Transport BIO



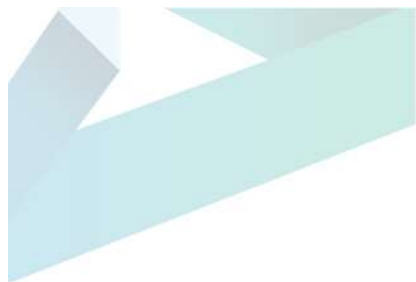
Share of (renewable) fuels in different end uses



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Main conclusions

- 2030 RES targets for transport are a good way forward but not sufficient to pave the way to deep CO₂ reductions needed
- Deep CO₂ reductions in transport sector requires all renewable options to be deployed
- Aviation sector appears very challenging.
- Results show significant demand for biomass resources to be met by all demand sectors
- Neither other demand sectors for PtX nor for electricity are included to this assessment
- Increasing the efficiency of the transport system and shifts towards more energy efficient transport modes appears as equally important

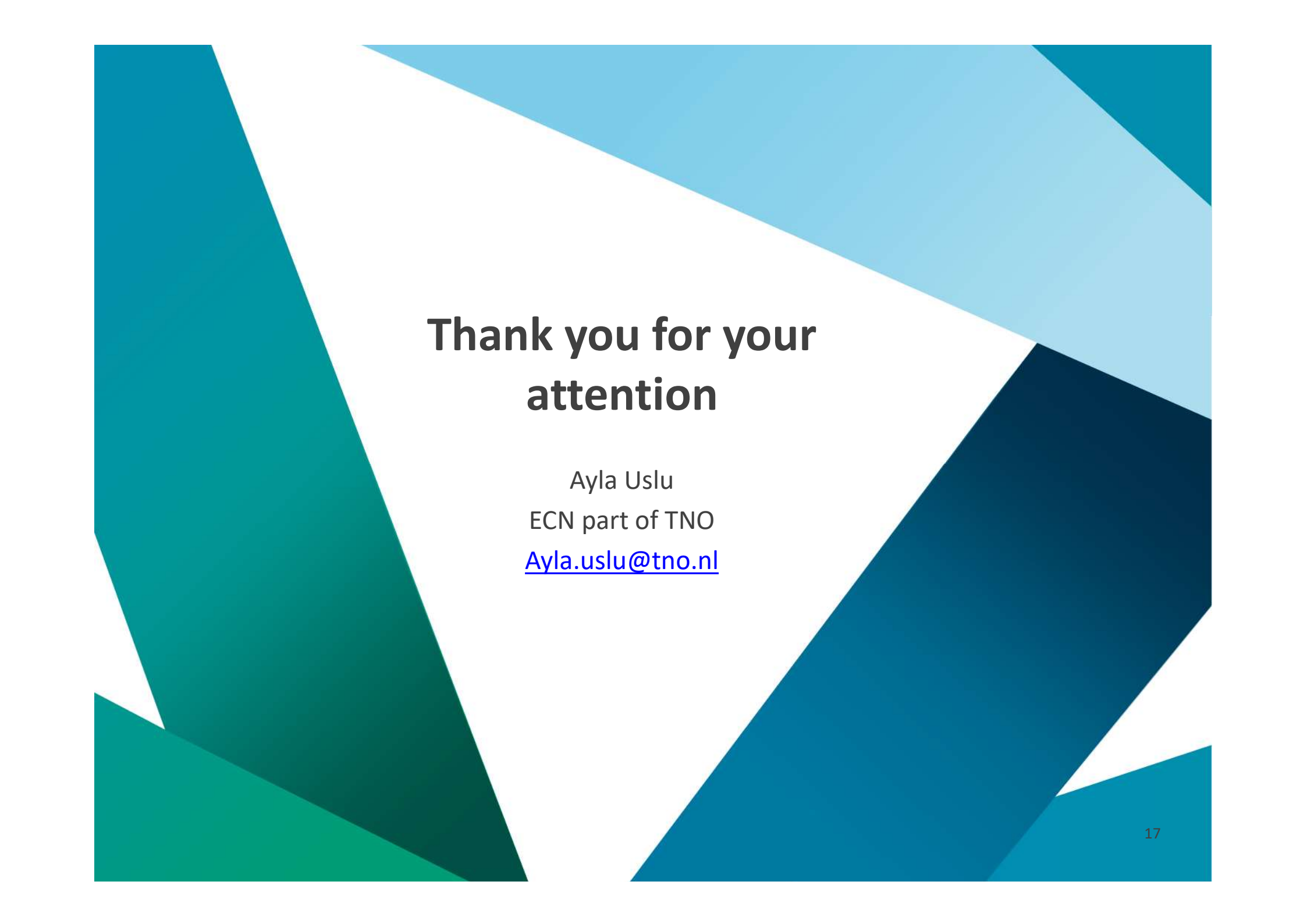


Next steps



- Update the scenario analysis
- Conduct sensitivity analysis (i.e. feedstock prices, fossil fuel prices, etc)
- Answer what is questions
- Define/model innovations to reduce total costs of RESfuel production
 - Feedstock supply
 - Conversion technologies
 - End use
- Carry out life cycle GHG emissions and employment effects
- Define strategies and policy recommendations





**Thank you for your
attention**

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