Renewable fuel markets – from policies to business

Esa Sipilä AFRY Management Consulting

24 OCTOBER 2023 | Future of biofuels 2023 | Copenhagen

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ABOUT AFRY MANAGEMENT CONSULTING

Leading advisor for the transition of the energy and bioindustry sectors

Presence	Revenue	Projects	Staff	Backed by
5	1,160 million	>100	600+	19,000
continents	SEK in 2022	countries	management consultants	experts at AFRY

Energy transition

– Global transition towards decarbonised energy system
– Sector integration due to decarbonisation and electrification (e.g. mobility, industries, cities)
– Need for smart infrastructure to enable transition and new decentralised business models

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Transition to Bioeconomy

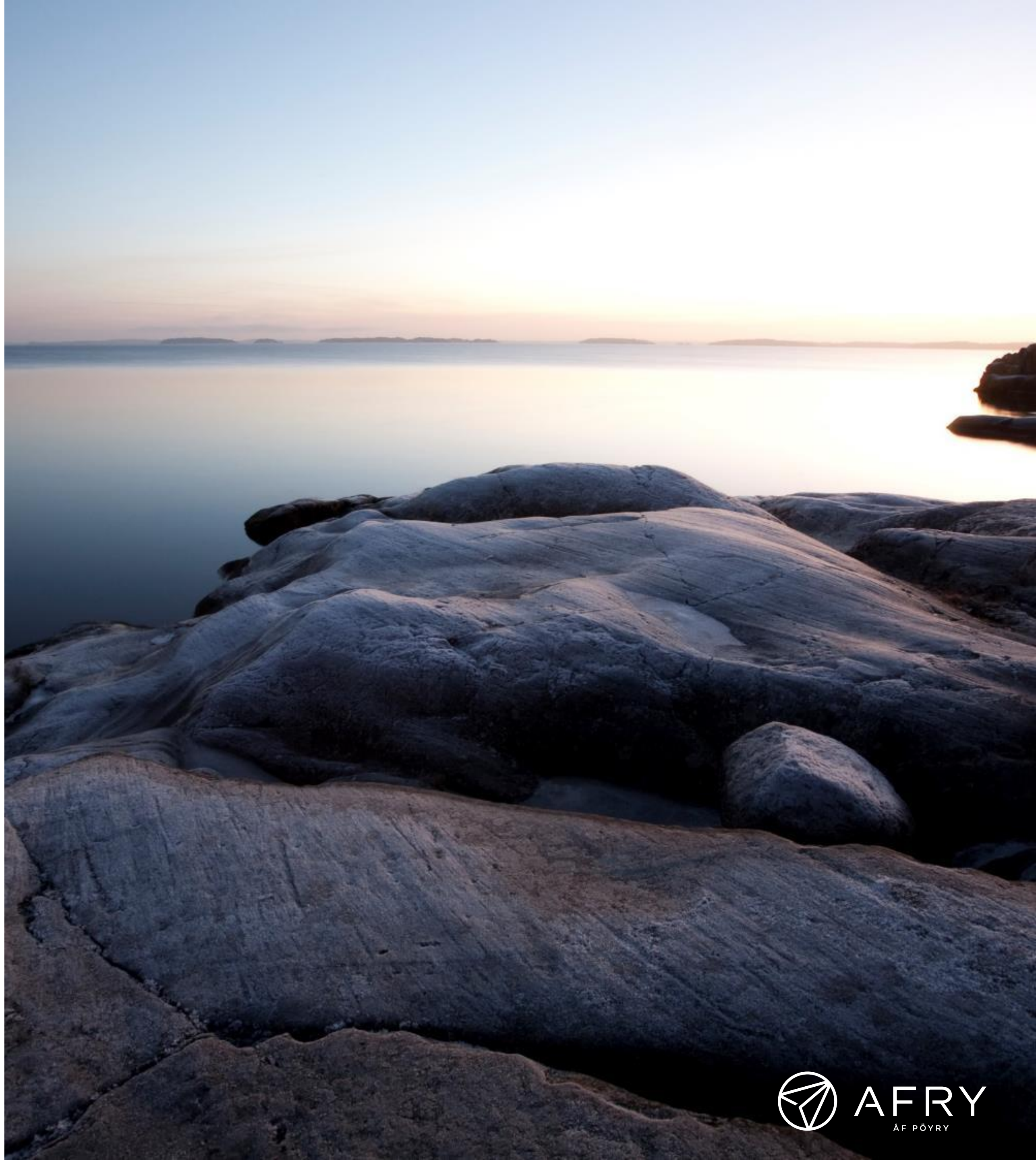
– Growing sustainability awareness and commitment
– Global shift in demand and products
– Need for green carbon to ensure full decarbonisation
– Resource scarcity

AFRY Management Consulting

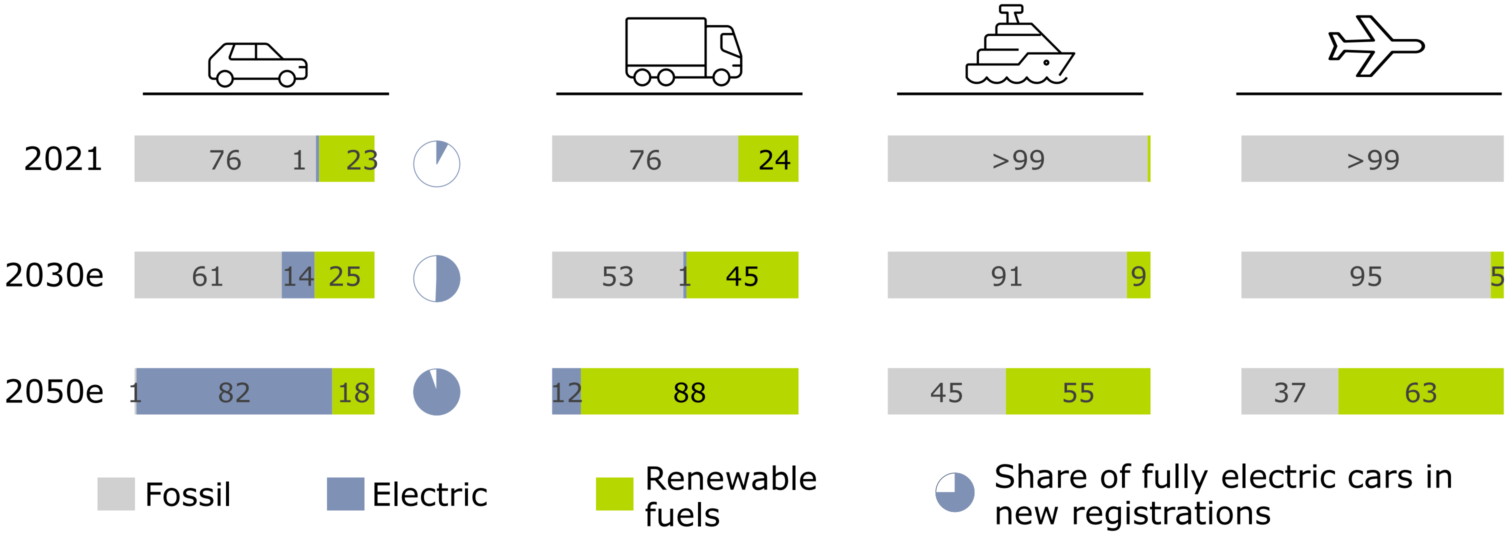
- Forward looking market analysis
- Strategic advice
- Operational and digital transformation
- M&A and transaction services

Renewable fuel markets – from policies to business

1. Role of biofuels in decarbonisation
2. Supply and demand outlook
3. Competitiveness
4. Key takeaways



SHARE OF TRANSPORT ENERGY TYPES UP TO 2050
CASE FINLAND



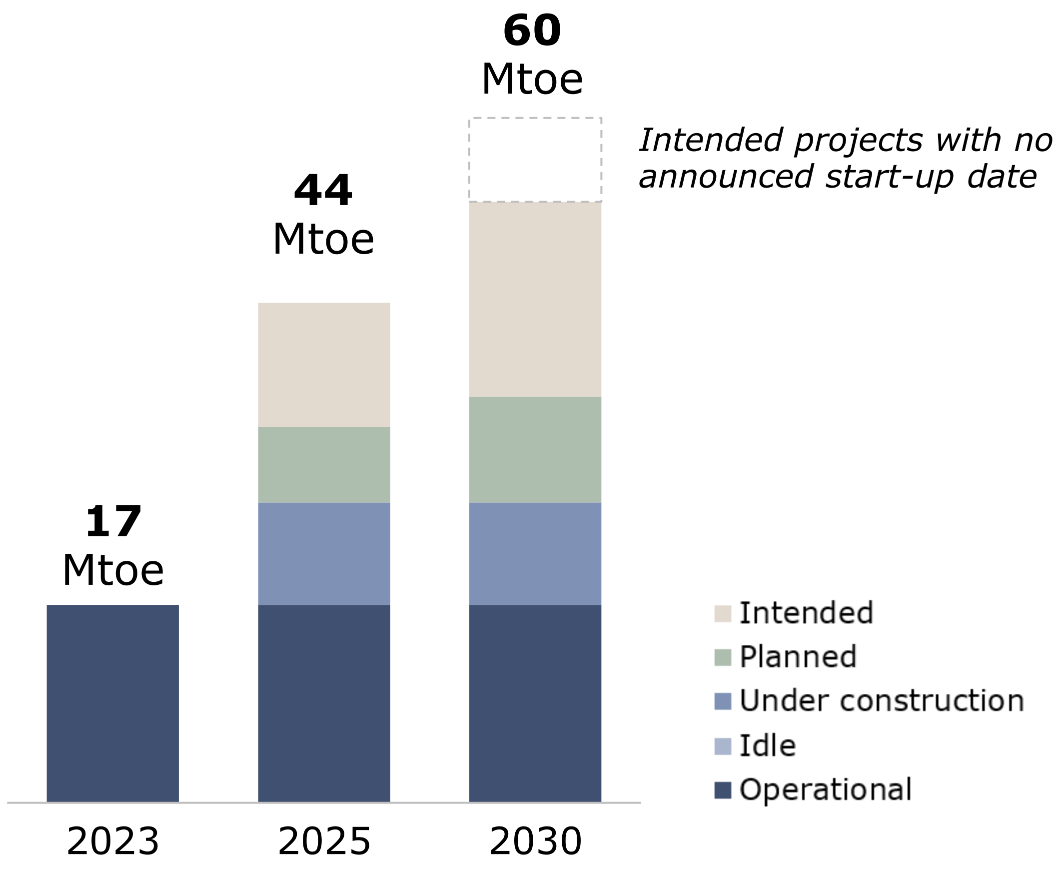
Renewable fuels consist of liquid biofuels, biogas and synthetic e-fuels.

Measures for reducing emissions must be tailored to various modes of transport and vehicles of different ages

Electrification alone is not enough

Supply Development

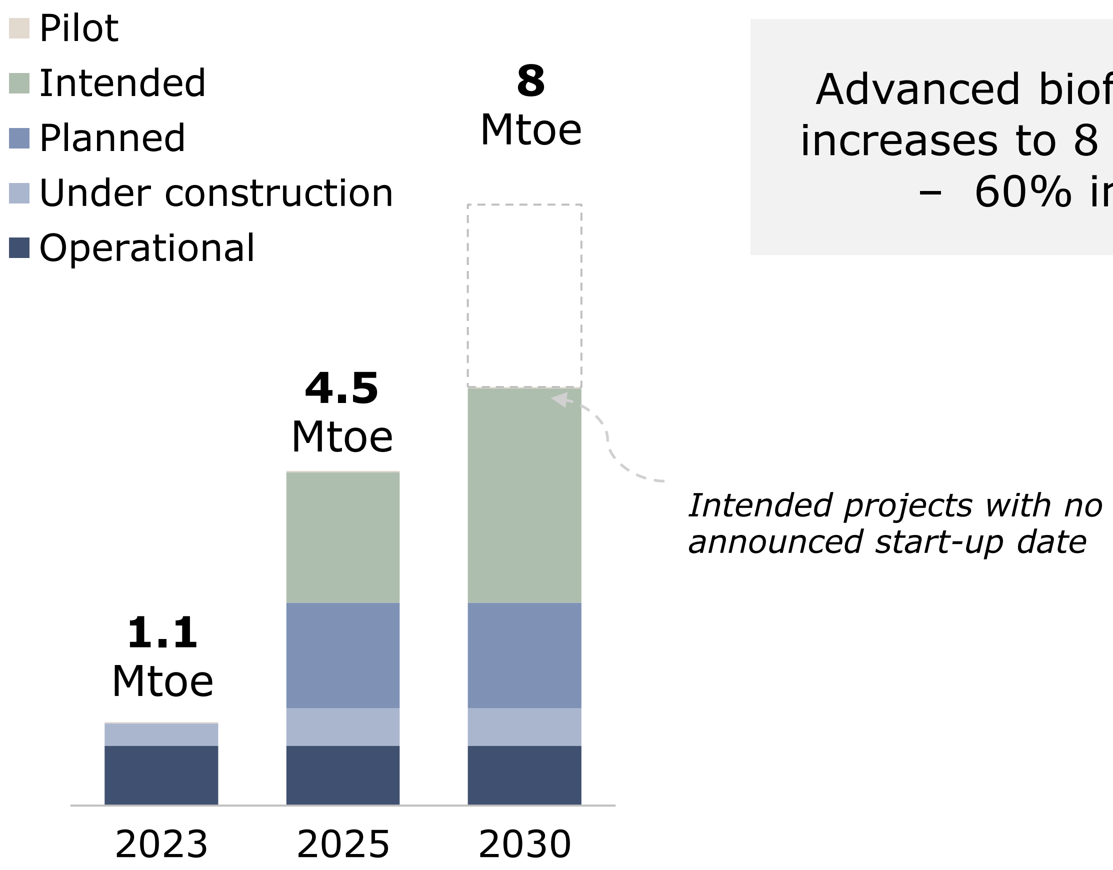
GLOBAL HVO / HEFA BIOFUELS CAPACITY, 2023 - 2030



Source: AFRY project database

Boom in HVO investments continues, although some companies are switching focus away from HEFA

GLOBAL ADVANCED LIQUID BIOFUELS CAPACITY 2021-30

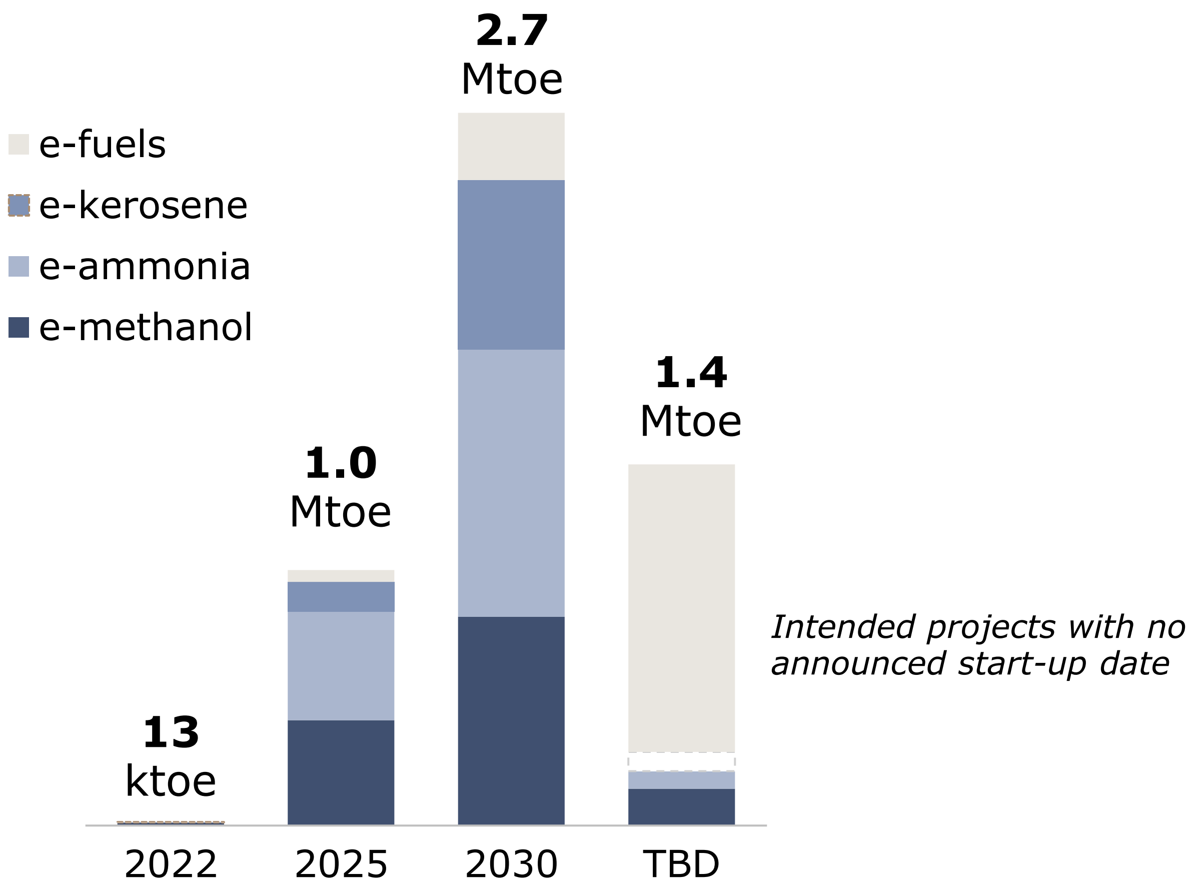


Advanced biofuels capacity increases to 8 Mtoe by 2030 – 60% in Europe

Source: AFRY biofuels database

Advanced biofuels pipeline is showing growth but there is a huge need for new capacity around the corner

RFNBO CAPACITY IN EUROPE, 2023 – 2030 (EXCL. HYDROGEN)

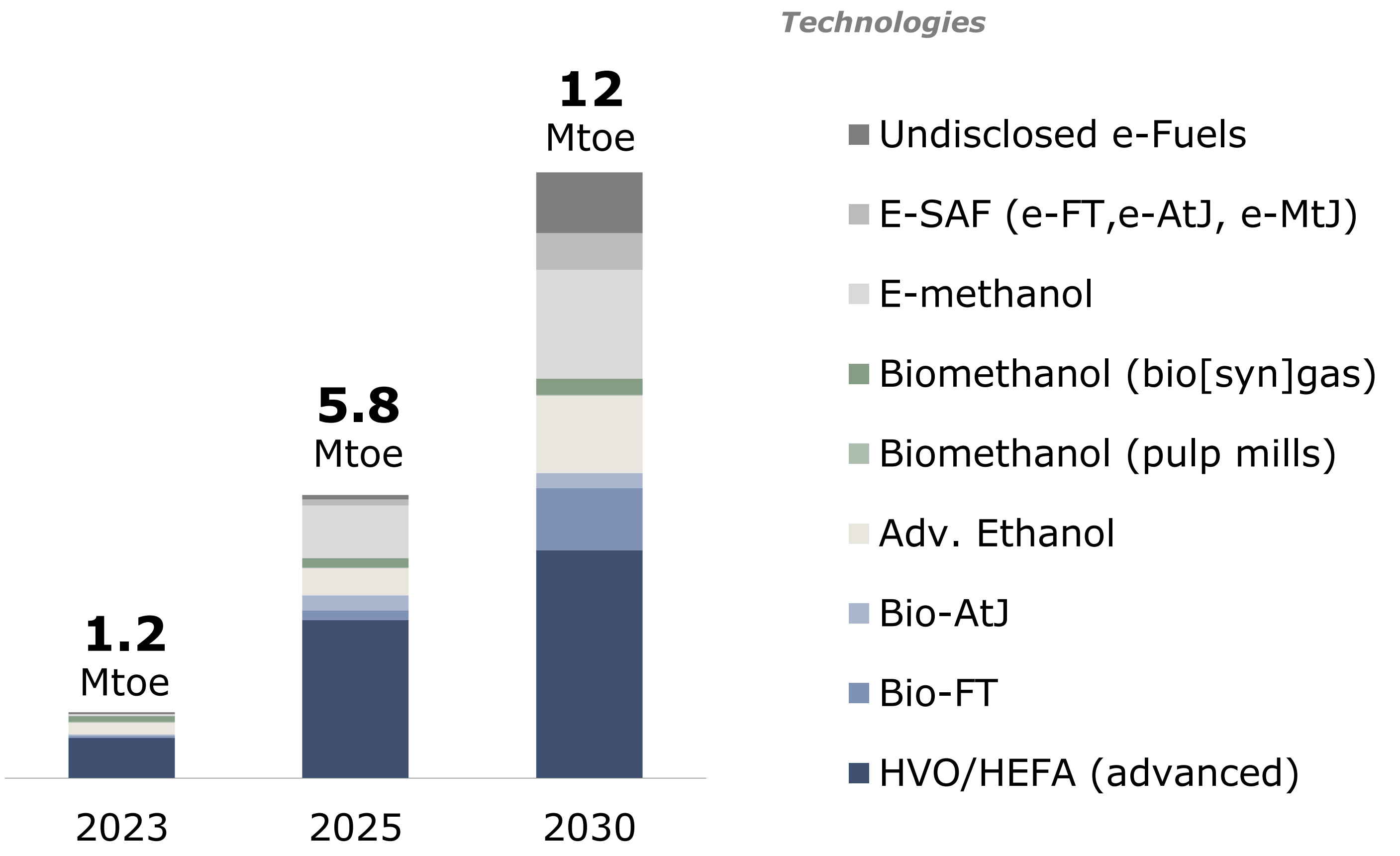


Source: AFRY project database

RFNBO pipeline is showing growing number of projects

Current volumes are still small while new projects are announced continuously

GLOBAL ADVANCED RENEWABLE FUEL PRODUCTION CAPACITY OUTLOOK



1. Source: AFRY analysis.

There is an investment pipeline of 11 million toe and 60 billion EUR by 2030

Are the projects bankable?

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Demand outlook

KEY REGULATORY DEVELOPMENT WITH RENEWABLE FUELS

- Delegated acts on co-refining, RFNBO'S electricity and GHG emission reductions
- Proposed additions and changes to Annex IX A and B feedstock lists
- CO_2 emission standards for heavy-duty vehicles
- RED III, FuelEU Maritime and ReFuelEU

EU regulations are introducing more restrictions on the supply while responding to more ambitious climate targets

RED III

2030 Targets	RED II	RED III provisional agreement, June 2023
Overall renewable energy target	**32 cal-%**	**42.5 cal-%** + indicative 2.5 cal-%
Transport sector target	**14 cal-%** (road and rail only)	**29 cal-% or 14.5 % GHG reduction**[2] (all transport fuels)[3]
Advanced biofuel target (Annex IX Part A)	**3.5 cal-%**	**5.5 cal-%** of which
RFNBO sub-target	**N/A**	**min. 1 cal-%**
UCO & Animal fat biofuels cap (Annex IX Part B)	**max. 1.7 cal-%**	**max 1.7 cal-%** (can be higher per MS if approved by Commission)
Food and Feed biofuels cap	**max. 7 %** (1 % point higher that consumption in 2020 in the MS)	**max. 7 %** (1 % point higher that consumption in 2020 in the MS)[4]

RED III continues to promote the role of advanced renewable fuels

The targets become more complex by including all transport modes

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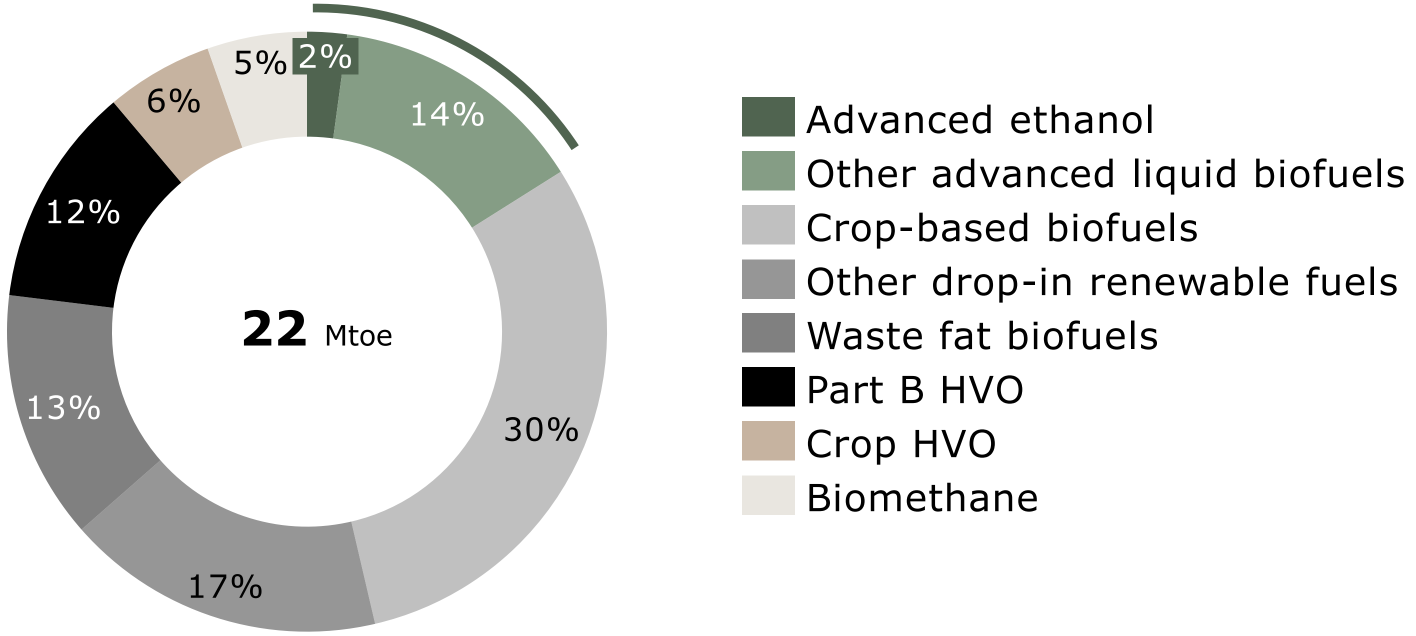
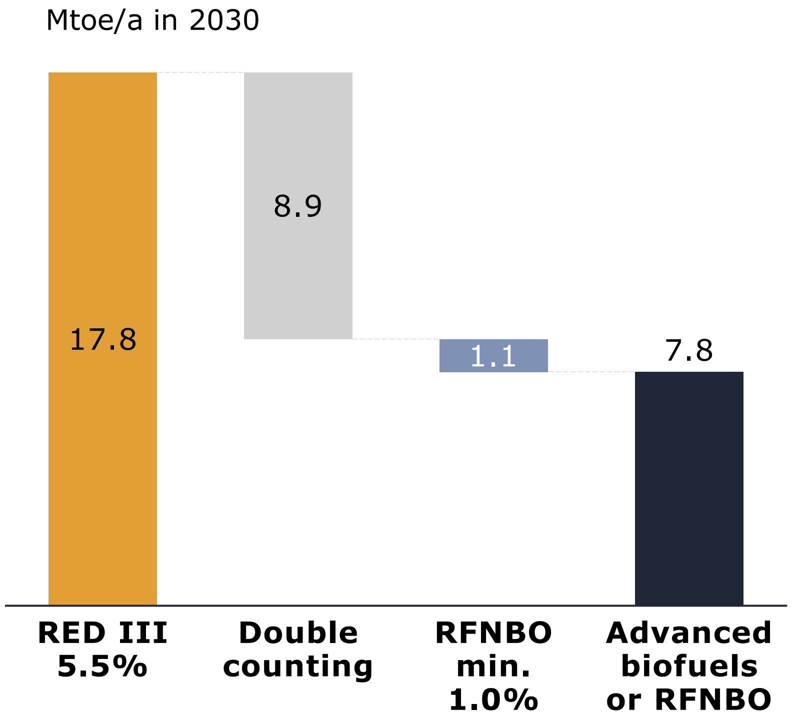
EU "TOP10" RENEWABLE FUEL DEMAND BY 2030 IN ROAD TRANSPORT



Demand for renewable fuels is estimated to reach 22 Mtoe in top 10 European countries by 2030

Advanced biofuel demand in 2030, according to RED III



- Target of **6 vol-%** sustainable aviation fuels (SAF) by 2030
- No food or feed crops, PFAD, intermediate crops, palm and soy-derived materials or soap stock

- Target of **6 GHG-%** intensity reduction for energy used on-board ships by 2030
- Biofuels from non-food feedstocks, RFNBOs and RCF fuels

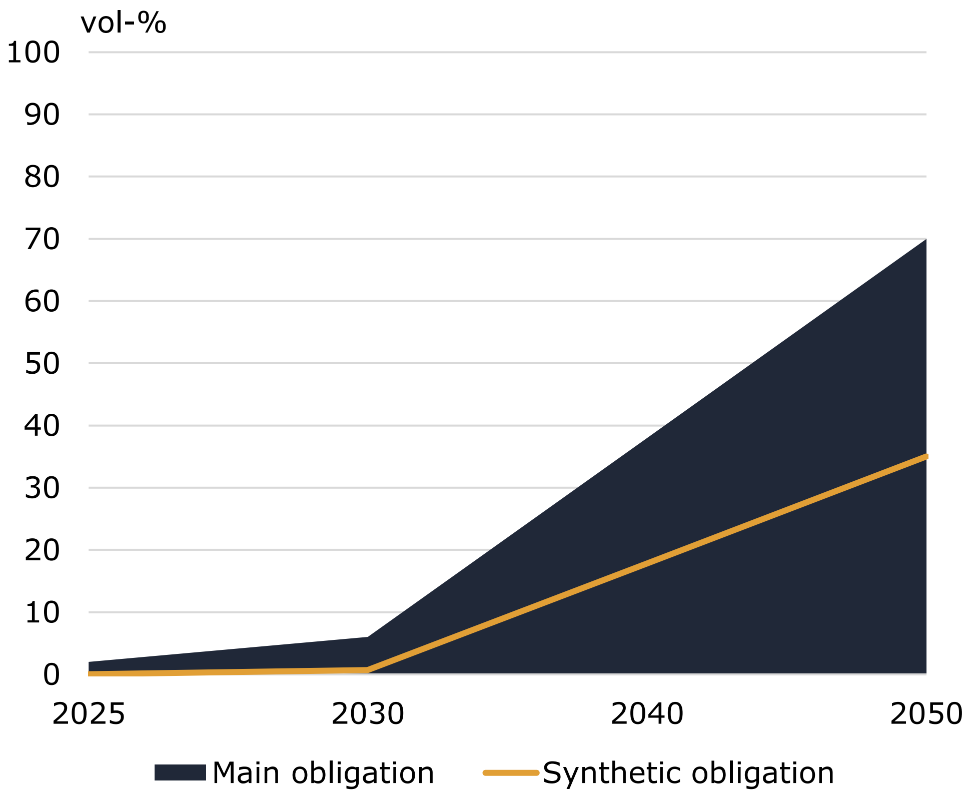
2.8 Mtoe

SAF in 2030, EU-27

Max. 2.5 Mtoe

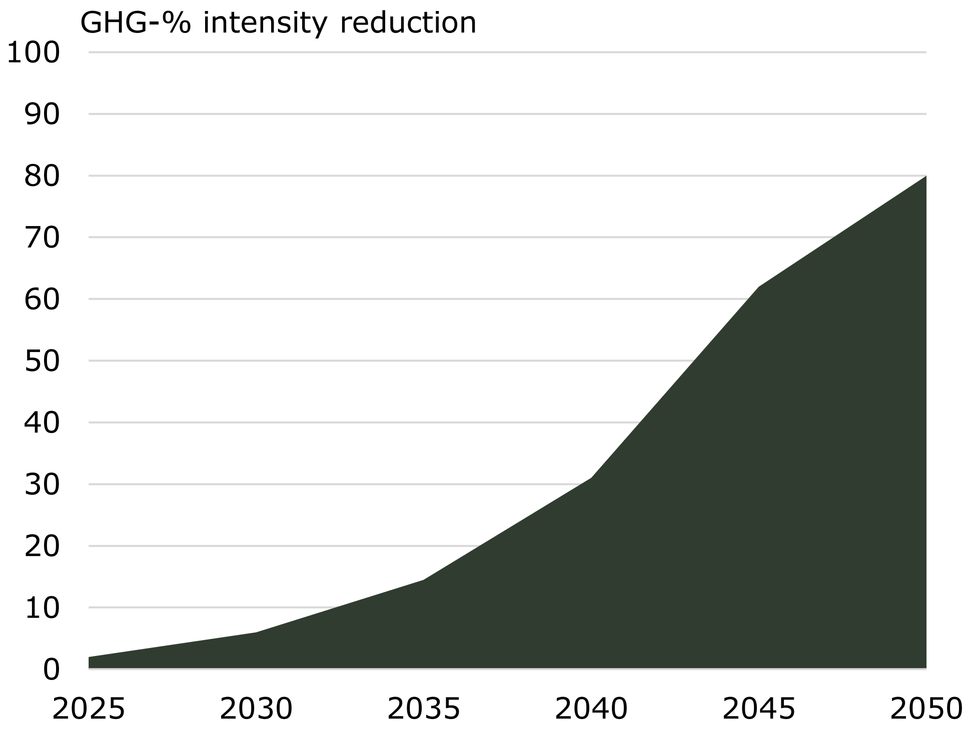
Sustainable Marine Fuel in EU-27

ReFuelEU Aviation Regulation



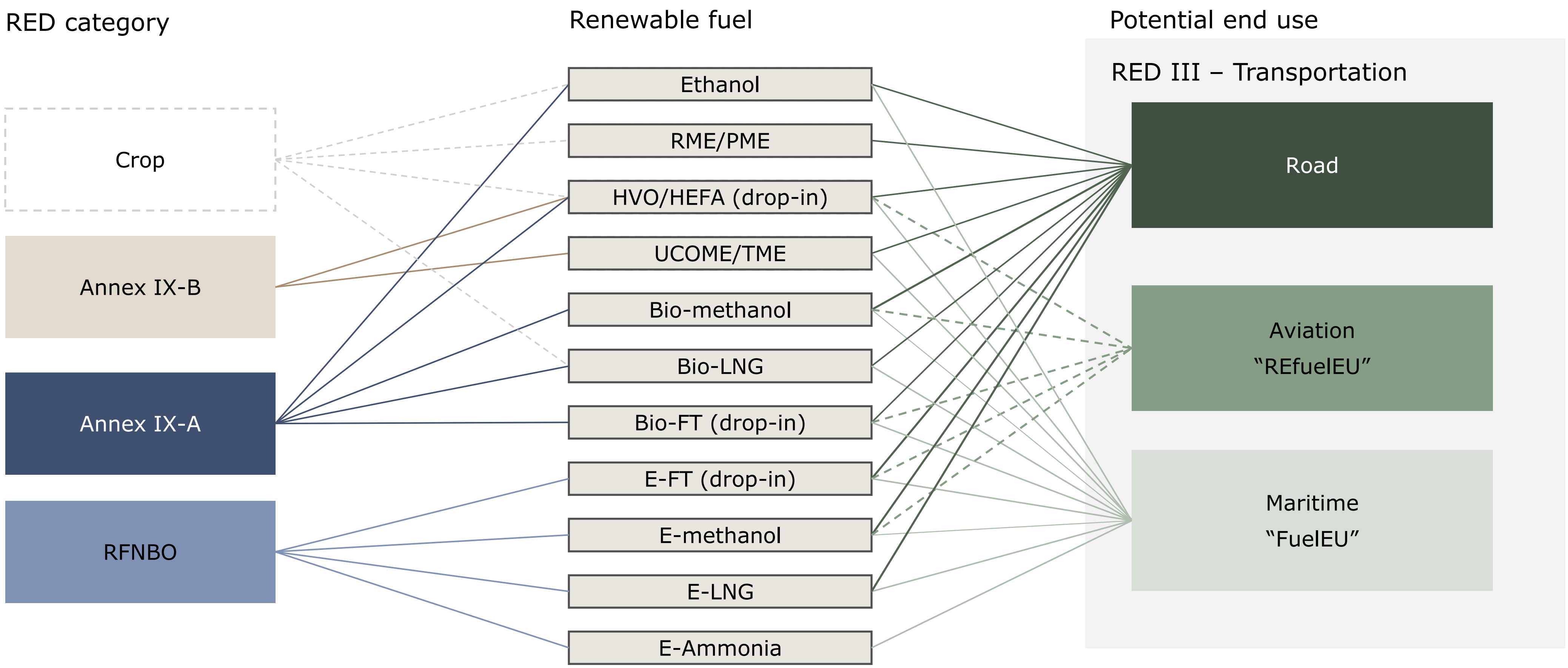
Note: Synthetics average obligation 1.2% for 2030 – 2031.
If min. 0.7% in 2030, obligation needs to increase to 1.7% in 2031

FuelEU Maritime Regulation

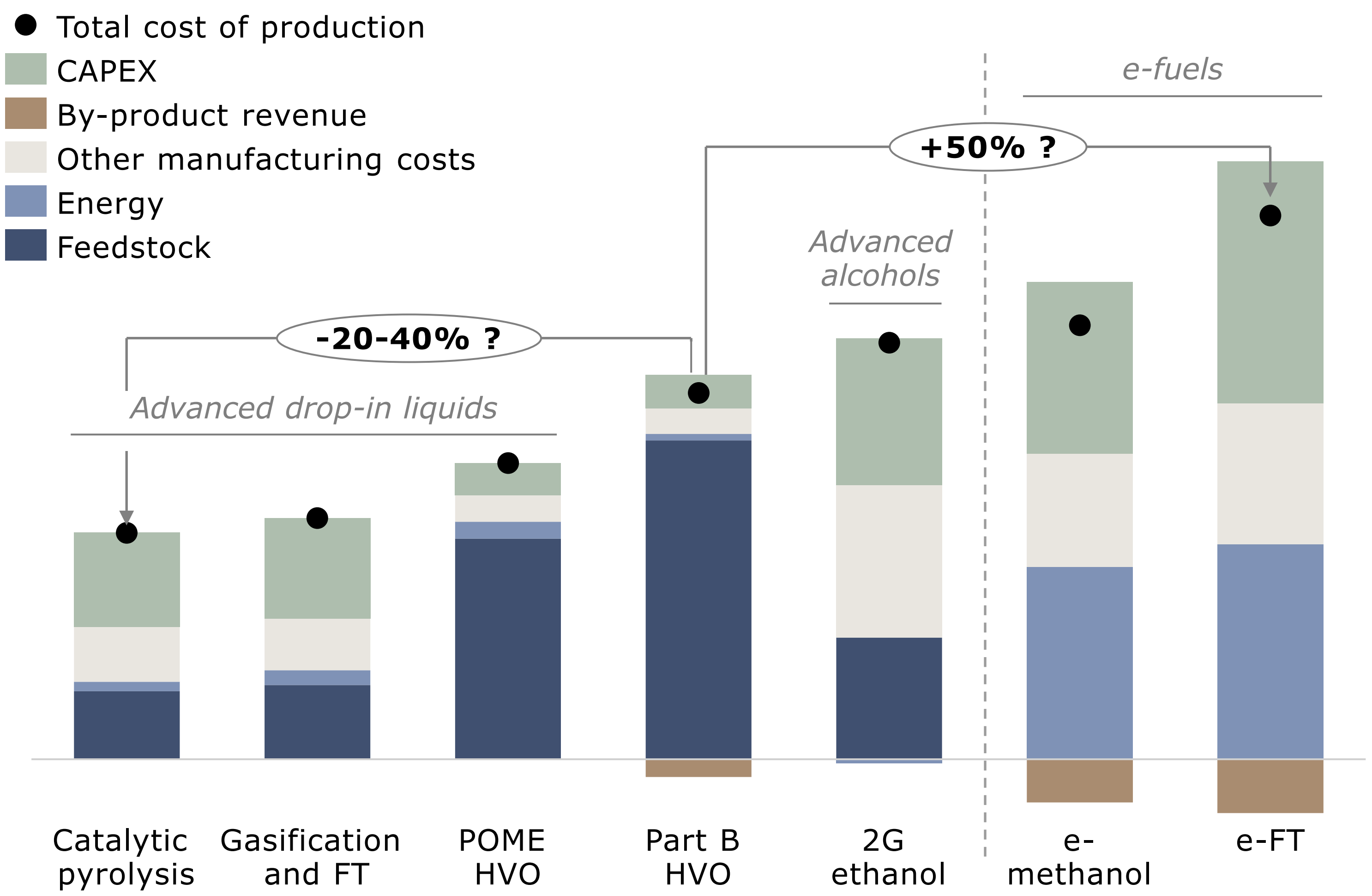


There used to be talk on regulatory and market risk – Technology and capital risks are becoming critical again for investors and lenders

Future of renewable fuel markets is forming to become extremely complex – especially the pricing dynamics will be “intersectoral” and pan-European



INDICATIVE PRODUCTION COST BREAKDOWN IN THE NORDICS



Advanced biofuels and e-fuels are capital intensive with new technologies

What are the substitutes and who is most competitive?

ADVANCED BIOFUELS VS. E-FUELS

ADVANCED BIOFUELS	E-FUELS
Use of solid biomass requires novel technologies	Technology combines mainly known unit processes
Feedstock sourcing based on existing and new supply chains	Additionality requirements for power and grid bottlenecks
Production costs 1500-2500 EUR/toe	Production costs 2000-4000 EUR/toe
Project mainly developed by project companies	Projects owned by utilities and big oil companies

E-fuels have more attention and project development than advanced biofuels

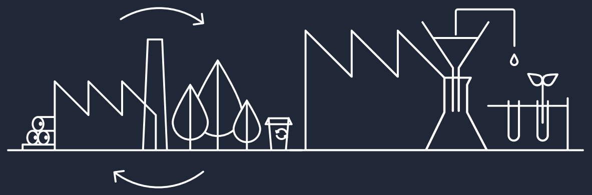
How to differentiate and work together?

Renewable fuel projects need to be properly developed in order to get their share of the 60 billion EUR investments by 2030

1 **Proven technical concept**

2 **Competitive feedstock supply chain**

3 **Investment grants & strong balance sheet**

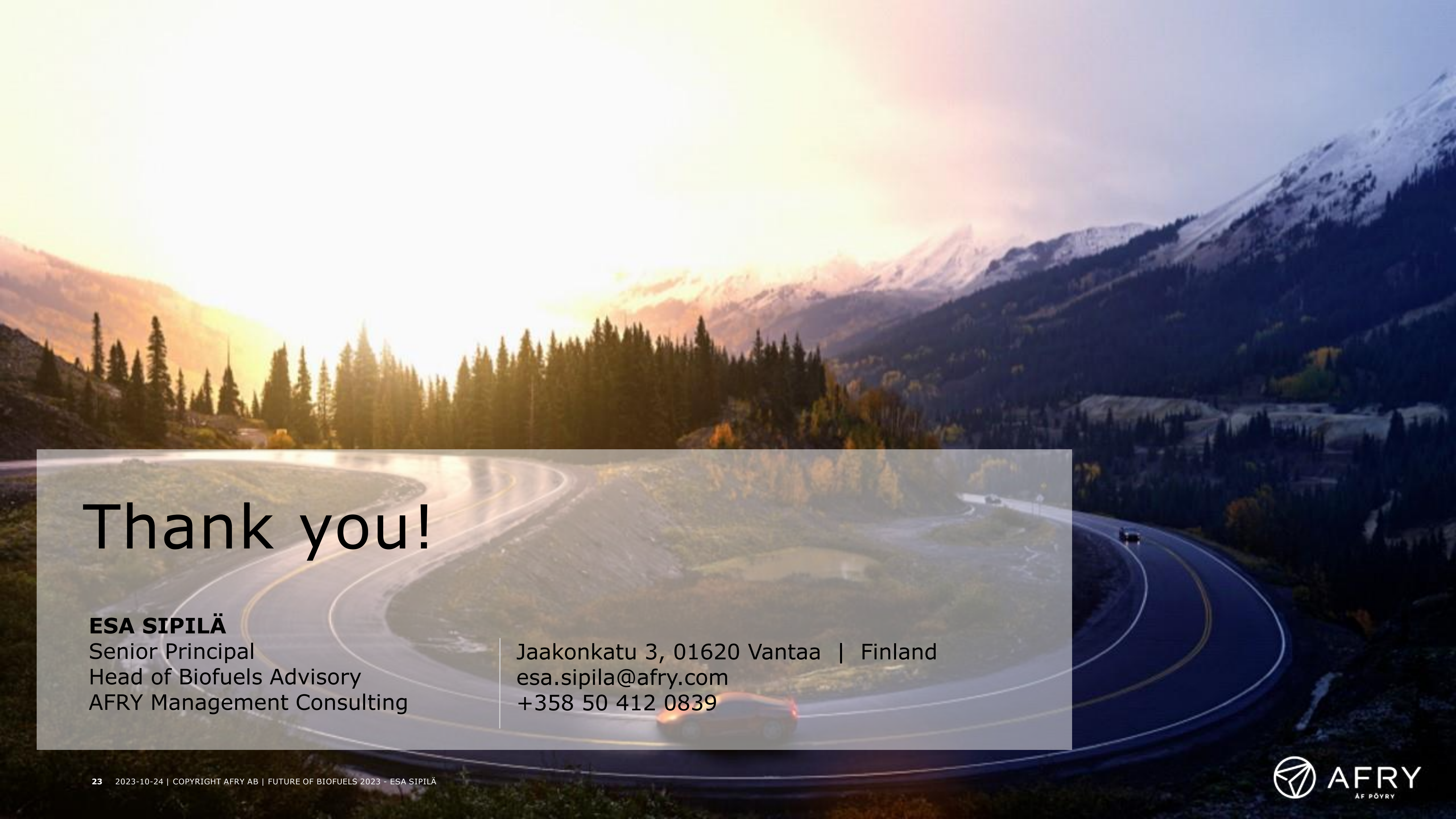


4 **Properly assessed project stages**

5 **Secured own and external resources**

6 **Off-take partners**

7 **Long-term competitiveness**



Thank you!

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