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A BIOFUEL CONSULTING AND BROKERAGE COMPANY

European Renewable Diesel and Emerging Feedstocks

May 2019 - Denver, USA

The 8th Annual Jacobsen Conference

FORECASTING AGRICULTURE AND BIOFUELS INTERPLAY

The European biodiesel market will keep momentum for 2020 - 2030

+35%

BIODIESEL
DEMAND UP

BIODIESEL FEEDSTOCKS
RESHUFFLING

ADVANCED BIOFUELS
ENTERING THE MARKET

In this context, Greenea is helping Oil & Gas multinationals to navigate in the EU biofuels market

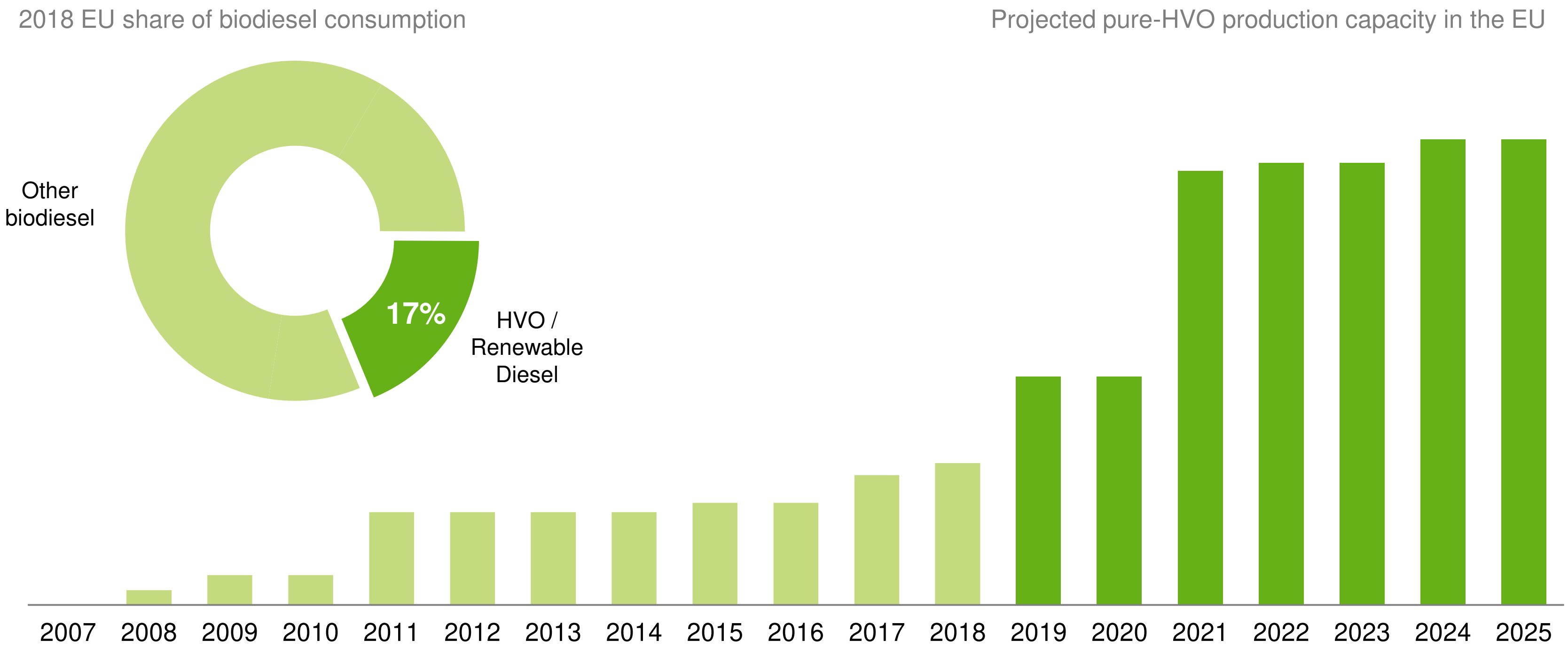
''We help our clients make significant investment decisions in the EU, by bringing biofuels expertise, market visibility and latest updates, crucial in the decision making process and allowing them to understand biofuels maket mechanisms.''

13
years of experience

Active in
50
countries

35+
consulting projects

Renewable Diesel – known as HVO - production capacity will double by 2025 in the EU and triple globally

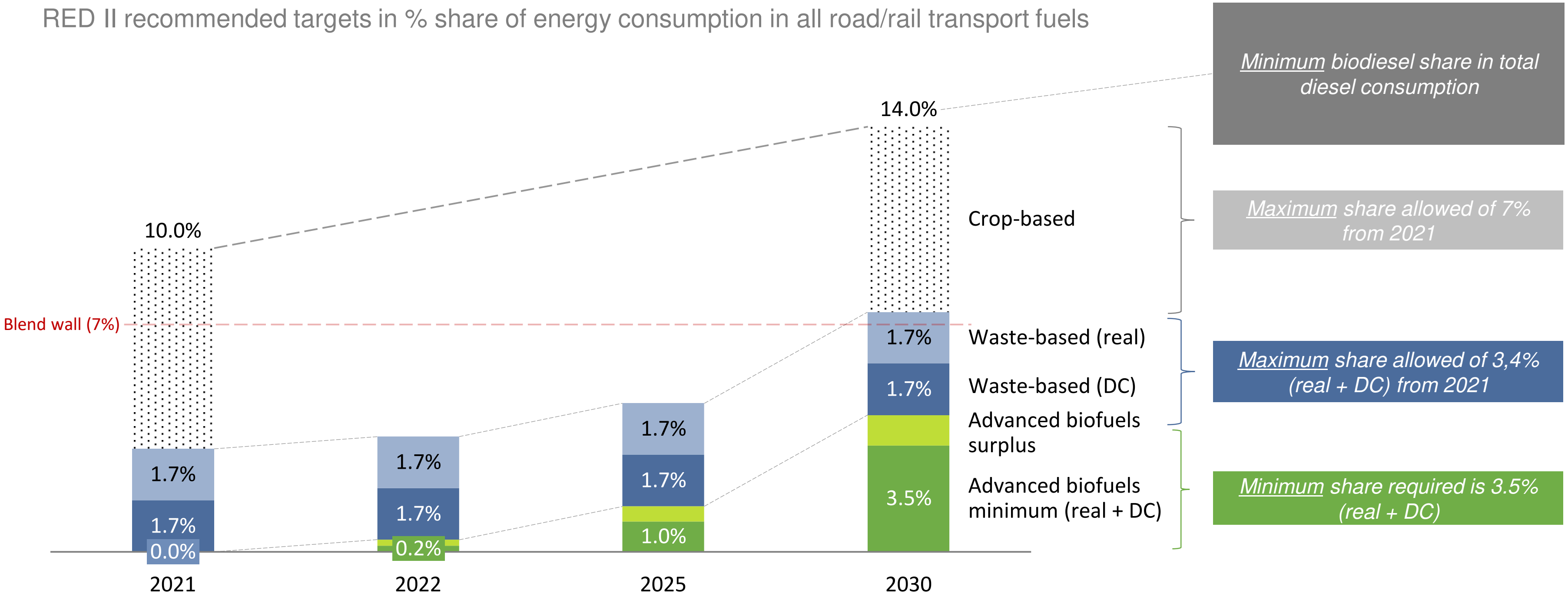


Source: Greenea Analysis
Note: this forecast does not include co-processing HVO factories; HVO = Hydrotreated Vegetable Oil

HVO production capacity will triple by 2025

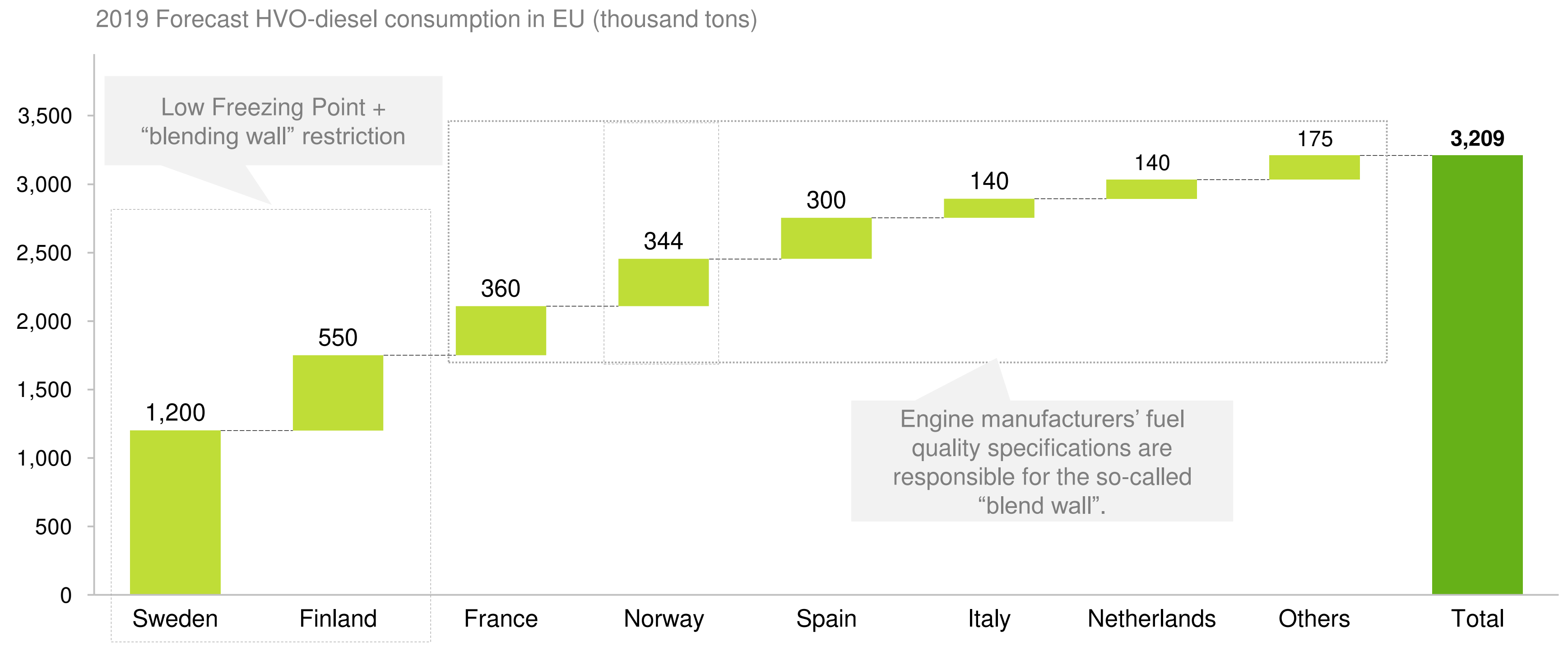
WHY ?

At short & long term: RED II directive was adopted on December 2018 – total biodiesel demand will increase by 35% in Europe



Source: European Commission, Greenea Analysis
Notes: RED II = Renewable Energy Directive II; WB = Waste-based biodiesel; EU MS = EU Member States; DC = Double Counting

European countries have chosen renewable diesel for its low freezing point and to go beyond the blend wall

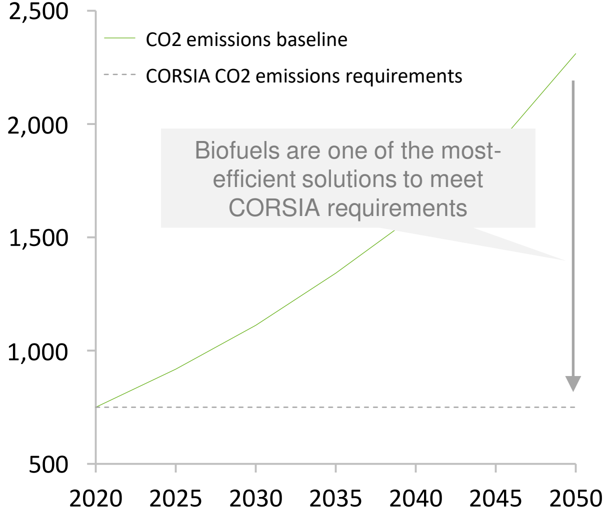


Source: European Commission, Greenea Analysis

Global frameworks such as CORSIA could trigger a sky-rocketting demand in HVO as the airline industry will have to drastically reduce its CO2 emissions

Airlines must find solutions to constrain CO_2 emissions at 2020 levels

Airline CO2 emissions (million tons)

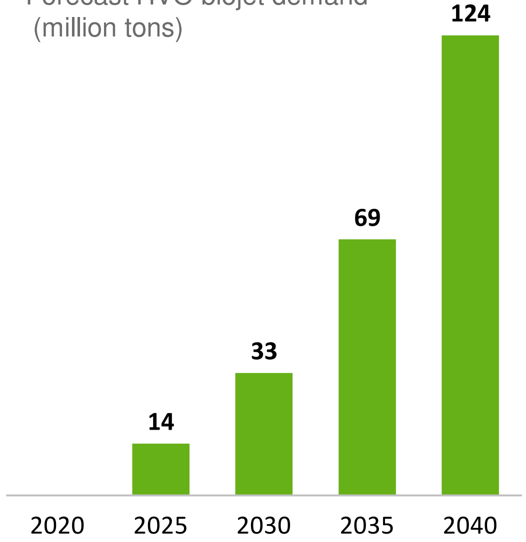


HVO / HEFA has already demonstrated its potential as a top quality renewable jet fuel

- More than 1000 flights with Lufthansa, KLM, SAS airlines
- Available at some European airports such as Oslo with 50% blend with conventional biofuel or Schiphol Rotterdam
- Already available at industry scale
- For the first time, renewable jet fuel is delivered into plane via the airport's hydrant system

Biofuel democratization for airlines could trigger a sky-rocketting demand in HVO

Forecast HVO biojet demand (million tons)



Source: Greenea Analysis

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Biofuel demand will inevitably grow: sourcing of feedstock will be challenging in the EU due to a lack of feedstock resources and a too optimistic legislation

1G - Crop-based

Low iLUC-risk biofuels: Production is capped at +1pp from 2020 levels and cannot exceed 7% share of total feedstock production.

High iLUC-risk biofuels: production at 2019 consumption levels until 2023, followed by a gradual reduction to zero by 2030

6% GHG target in carbon intensity of road transport fuels in 2020

France and Norway to **stop considering palm oil** based fuels **as biofuels** from 2020

Opportunity for the US to export soybean offsetting palm oil EU imports ban and high GHG saving ethanol

2G - Waste-based

Importations: there is a risk of supply shortage if high collecting countries (China, US, India) increase their local consumption of WB biodiesel

UCO volumes still to capture in the EU are mainly from households but volumes will be limited and will require a major investment

EU to rely on other waste-based feedstocks

3G - Advanced bio-feedstocks

First estimations of EU advanced bio-feedstock resources show that biofuels producers are going to struggle for their acquisition.

Infrastructures and processing technologies for current bio-feedstocks will not necessarily be suitable for 3G bio-feedstocks.

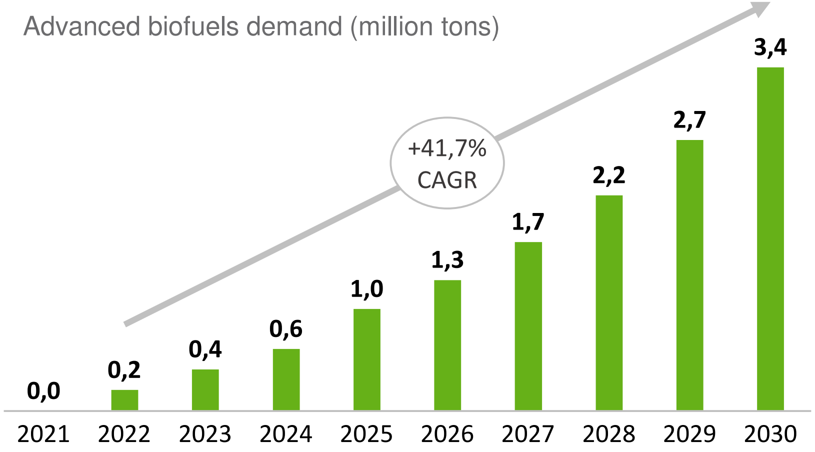
The EU legislation RED II is too optimistic regarding the adoption of advanced biofuels, limited opportunity for the 1G / 2G producers

Source: Greenea Analysis

Note: 1G = First generation biodiesel; 2G = Second Generation biodiesel; 3G= Third generation biodiesel

Advanced Biofuels Case: European legislation to be more liberal than annouced

Advanced biofuels demand is set to boom according to the European legislation RED II…



… but advanced bio-feedstocks are not available at scale compared to the previous generation – 2nd generation - of bio-feedstocks

2nd generation feedstocks	Avaibility in 2020 - 2030
UCO	Medium High
Animal fat CAT 1 & 2	Medium

Advanced bio-feedstock (non exhaustive list)	Avalibility in 2020 - 2030
Algae	Low
Glycerin	Low / Medium
Bleaching Earth	Low
Straw	Medium
POME	Medium
Biomass fraction and industrial biowaste	Low

Regarding advanced biofuels, REDII objectives may not be reached – EU legislation to be softer than announced. Solutions will certainly not come from the traditional liquid biofuel.

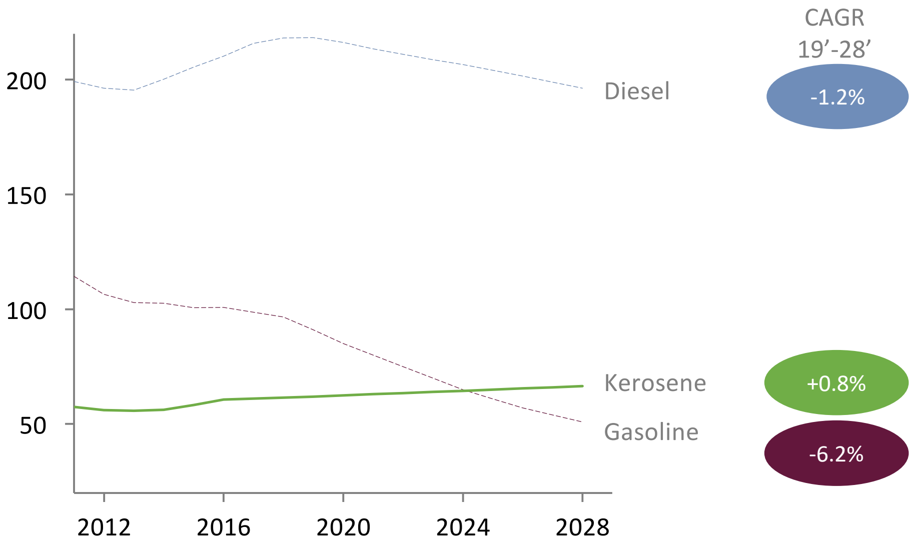
Source: Greenea Analysis, EU Commission
Note: CAGR = Compound Annual Growth Rate

At long-term, a risk for the biodiesel industry is the transition towards hybrid and electric, while kerosene fuel is set to steadily keep growing

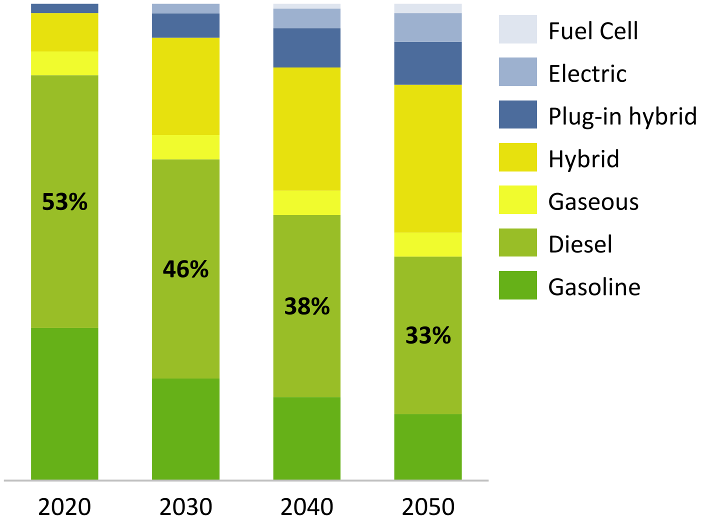
Kerosene is the only fuel segment projected to grow in the EU in the next 10 years…

… while diesel use is going to steadily decline in the European Union, from 53% to 33% of the total share of fuels

EU transportation fuel consumption (million tons)



Forecast of fuel type shares in the EU (%)



Source: Greenea Analysis, EU Commission

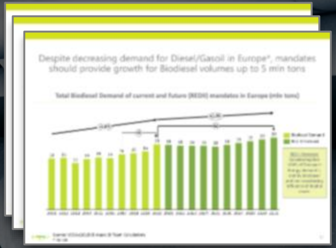
Greenea Consulting helps global and regional oil & gas players define their biofuel strategy

How to enter/expand in the biodiesel EU market?

How to secure your supply chain?

What is HVO competitive advantage and future market share?

Demand projections according to RED II and evolution of EU MS policies



Biodiesel prices drivers and forecast

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