OMV

Bio-oil co-processing

from concept to execution

14th Nov. 2024 – Michael Schindler – ÖGEW/DGMK Herbsttagung Vienna

Bio-oil co-processing

Motivation

Development and timeline

Technological challenges

Product quality

Project scope

Outlook

Motivation

“The renewable journey often starts with co-processing.”

A quote from Topsoe Academy 2022

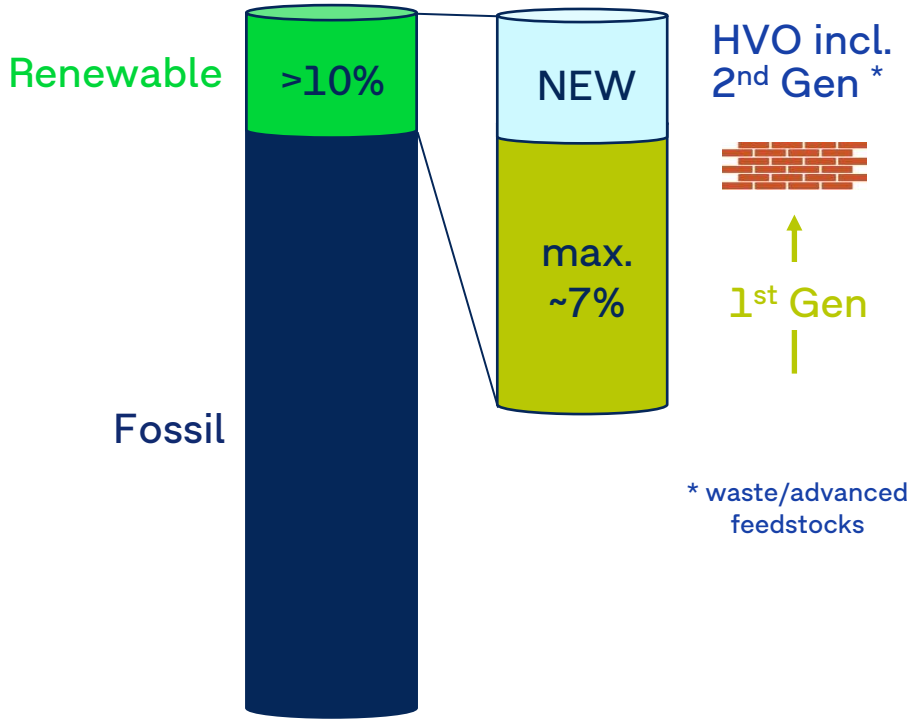
BIO-OIL CO-PROCESSING

Legislation in retrospect

2016: Compliance outlook 2020+

In **2016**, it became apparent that the **forthcoming EU directives (RED & FQD)** aimed at facilitating the decarbonization targets for the overall EU transport sector would **necessitate an increased share of renewable fuels** in OMV's fuel portfolio

- 1st Generation blending of Ethanol (E5/E10) and FAME (B7) limited by "Blending wall"
- 2nd Generation, new "Drop-in" HVO required



RED: Renewable Energy Directive
FQD: Fuels Quality Directive
HVO: Hydrotreated vegetable oil

Advantages of HVO

Hydrotreated vegetable oil is superior to conventional Biodiesel (e.g. FAME, UCOME)

- **Reduced Emissions:** HVO significantly lowers emissions of nitrogen oxides (NOx), particulate matter (PM), and carbon dioxide (CO2) compared to conventional fuel
- **Cleaner Burning:** The hydrotreatment process removes impurities, resulting in a cleaner-burning fuel that improves air quality, especially in urban areas
- **Drop-in Fuel:** HVO can be blended into EN590 diesel at high proportions (up to ~30%) and blend can be used in diesel engines without modifications
- **Longer Shelf Life**: Unlike regular biodiesel (FAME), HVO has a longer shelf life, which helps in reducing fuel degradation over time
- **High Performance**: HVO performs well in cold weather and offers high-quality performance.

Variety of feedstocks

- **Food and feed crops (1st Generation)** which includes or vegetable oils like **rapeseed,** sunflower and soy.

- **Waste and residue oils (2nd Generation Annex IX B)** like **used cooking oil** and animal fats, not fit for human consumption or animal feed.

- **Novel or 'advanced' feedstocks (2nd Generation Annex IX A)** from a wide range of sources including aquatic plants, microbial biomass, **tall oil**, animal manure, FFA (free fatty acids), **nutshells liquids** and municipal waste. Produced from waste products or cultivated in tanks, advanced feedstocks tend to demand less farmland and put less pressure on ecosystems.

Technical options

Preference for co-processing

Pathways to HVO

Purchase HVO from a third party and perform **blending**

Pros:

- Low costs: Minimum investment
- Simplicity: Technically easy to implement

Cons:

- Dependency: suppliers, market price, product availability
- **Lost opportunity: No value creation in biofuel production**

Revamp existing hydrotreater unit for **co-processing**

Pros:

- **Medium costs: Modifications required, high synergies**
- **Capacity: Total hydrotreater throughput is retained**

Cons:

- Marketability: HVO only available in blended form
- Creditability: Certifiable determination of bio-content to be developed

Build new, **standalone HVO unit**

Pros:

- Flexibility: Unit can be tailor-designed, can be outside refinery
- Marketing: Sales possibility of pure HVO and byproducts

Cons:

- **High costs: Large investment necessary for new unit and new auxiliary facilities**
- Lower synergy: Does not integrate with existing refinery hydrotreater units

Revamp **existing hydrotreater into HVO** unit

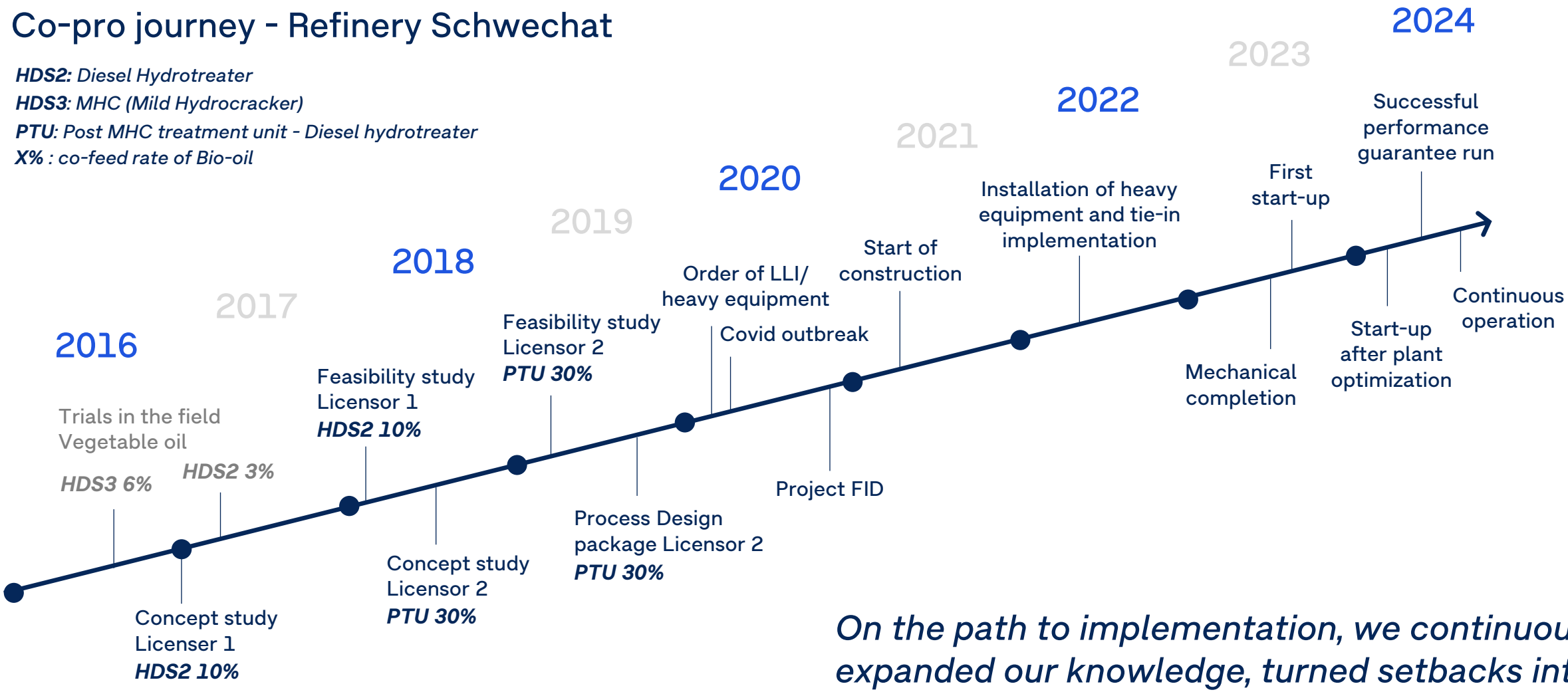
Effectively requires fossil hydrotreating unit that is fully idle and no longer in use as a basis for revamp

No short-term option for OMV due to high utilization of existing assets

Project timeline

Co-pro journey - Refinery Schwechat

HDS2: *Diesel Hydrotreater*
HDS3*: MHC (Mild Hydrocracker)*
PTU*: Post MHC treatment unit - Diesel hydrotreater*
X% *: co-feed rate of Bio-oil*



On the path to implementation, we continuously expanded our knowledge, turned setbacks into solutions, and ultimately achieved our goal

Technological challenges

Co-processing requires modifications in a conventional, fossil diesel hydrotreater

1) Fouling

2) Corrosion

3) Lower recycle gas purity

4) Poisoning of catalyst

5) Plugging of catalyst

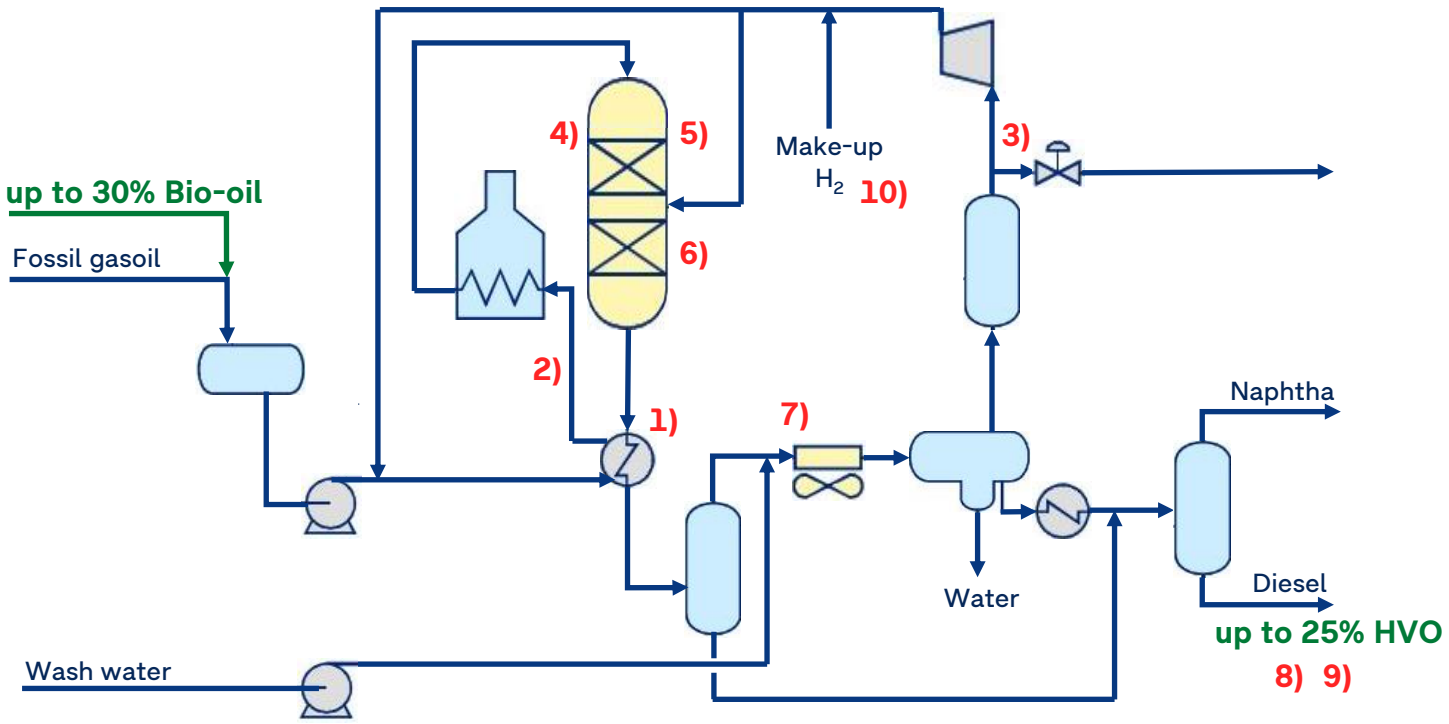
6) Heat of reaction from deoxygenation

7) Corrosion

8) Verification of renewable share (C14)

9) Deterioration of cold flow properties

10) Additional hydrogen demand



Typical Diesel Hydrotreater unit

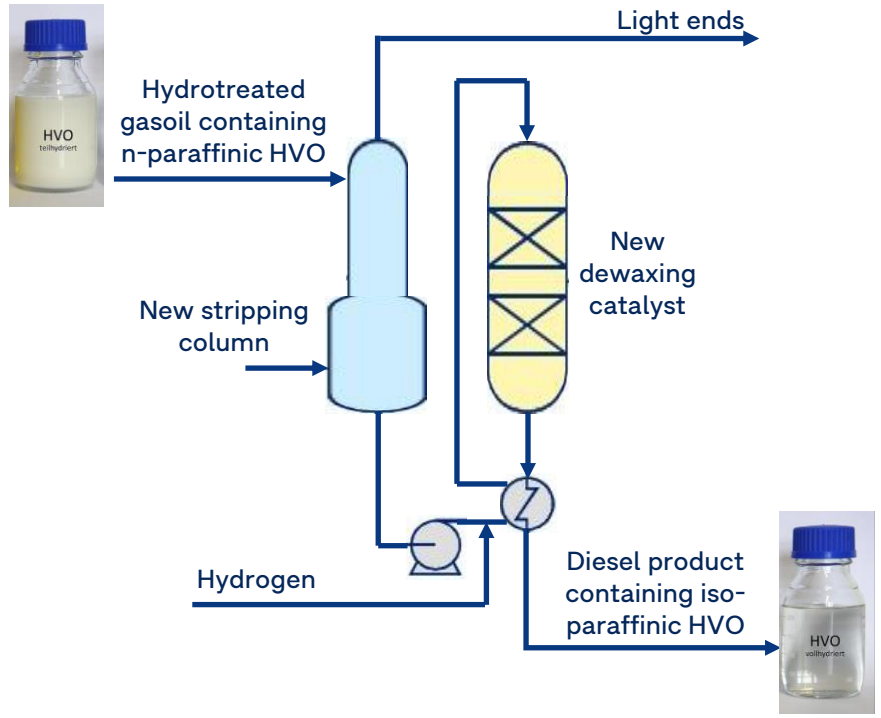
Product quality assurance

Turning a disadvantage into an opportunity

- **HVO is paraffinic in nature**: Simple hydrotreating or co-hydrotreating of fats, oil, greases will result in a waxy product, with unfavorable cold resistance. Melting point of pure HVO can be above 20 °C
- **Cold resistance required.** Diesel in OMV region requires cold performance (CFPP) of min -22°C in winter season.

→ **Sweet dewaxing solution:** Normal-Paraffins from hydrotreating step are converted effectively into iso-paraffines. Stripping upstream removes catalyst poisons and ensures high activity.

  – Zeolite-based catalyst for selective isomerization of long-chain paraffines
  – Group VIII Metals. Platinum, Palladium enhance the isomerization process



PTU co-processing produces a high cold resistant, high cetane diesel with renewable share of up to 25%

MAXX Motion Performance Fuels

CFPP: Cold filter plugging point

Project scope

Capacity increase
Steam Methane Reformer Unit

more H_2 is required

Co-processing → PTU hydrotreater revamp

Fossil oil

Bio-oil

Modifications in product tank farm

High quality Bio Diesel

Bio-oil

Modifications in feedstock tank farm

Danube pipeline

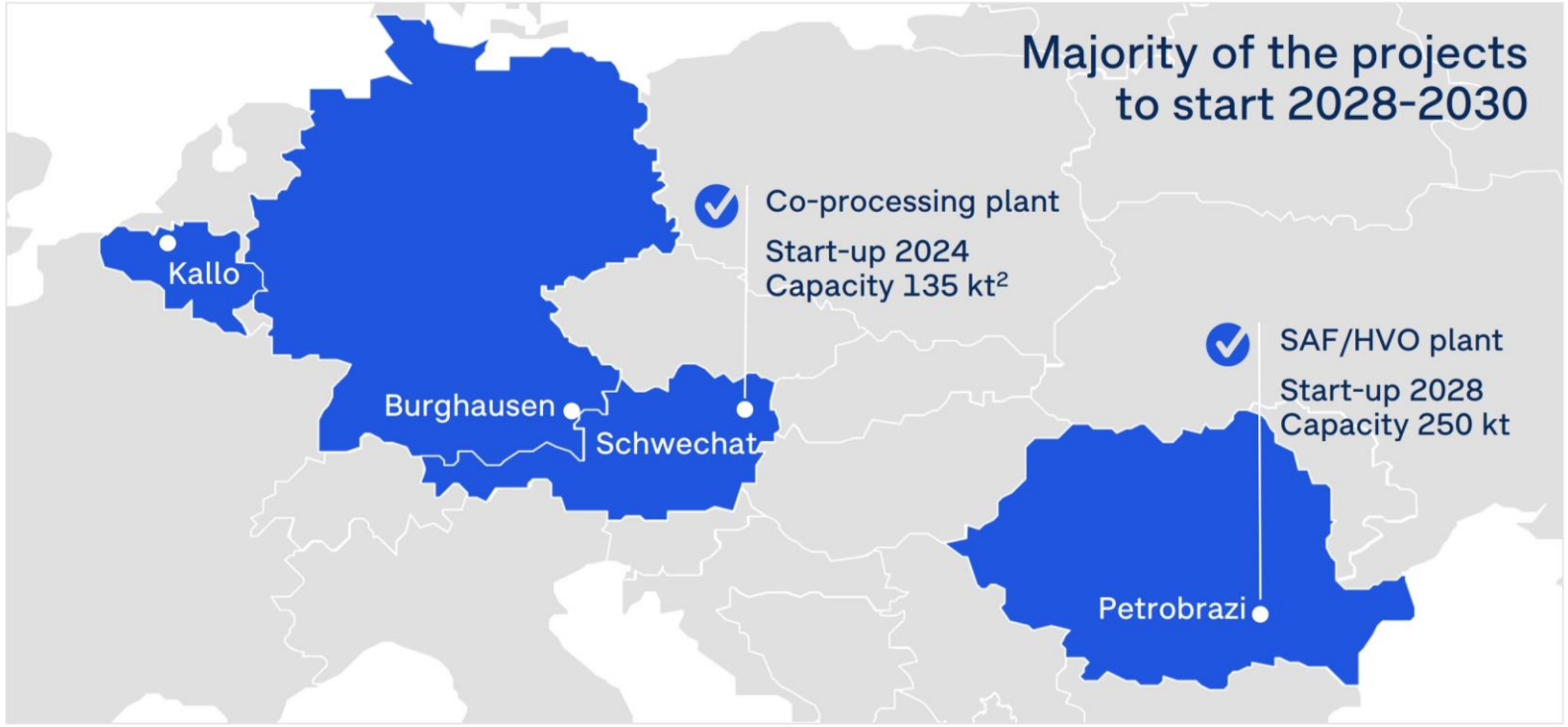
Blue = Project scope

Co-processing unit

Refinery Schwechat PTU co-processing unit

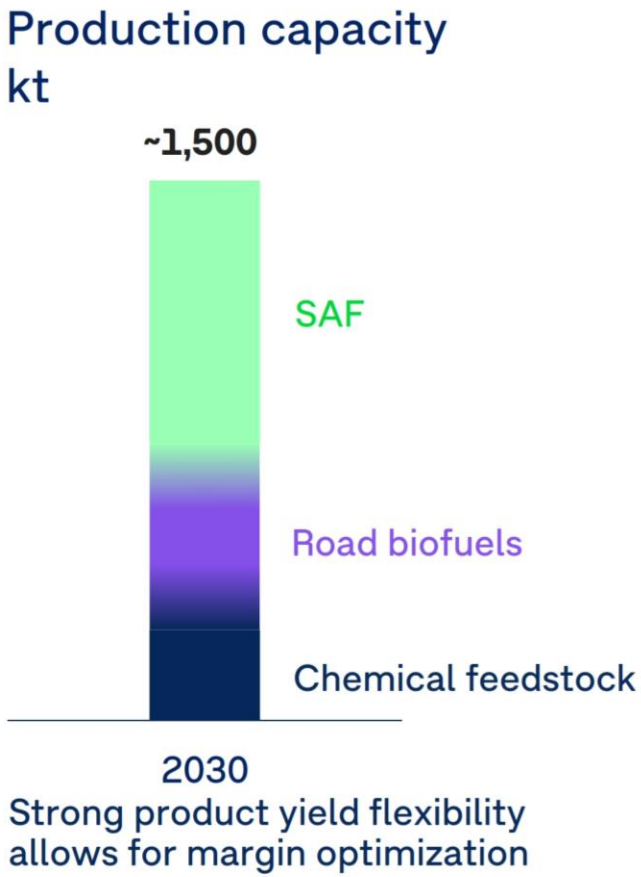
Outlook, OMV Strategy 2030

Progressing project pipeline for renewable fuels and chemical feedstock



~300 kt	~300-400 kt		~300 kt	~500 kt
Kallo, Belgium[1]	Burghausen, Germany[1]	Schwechat, Austria[1]	Petrobrazi, Romania	Outside Europe[1]

[1] Project currently in conceptual phase, subject to FID [2] Plant feedstock processing capacity is 160 kt p.a.



Source: OMV capital markets day, June 13, 2024

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