Mabanaft GmbH & Co. KG | Sustainable Fuels

eSAF: Co-processing & free allocation

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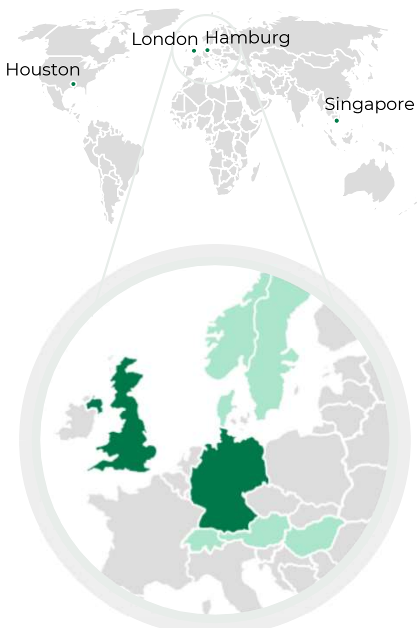
A

Mabanaft Group snapshot



Global presence with roots in Germany and core activities in north-west Europe

- **8m tons** throughput in German and Hungarian terminals
- **16m tons** energy products sales
- **267** truck stops in 5 countries
- **c. 1,350** employees
- **€290m** product margin
- Solid earnings and strong balance sheet

Integrated

Independent

Innovative

Investable

Unlocking Mabanaft's full current and future potential in the energy transition

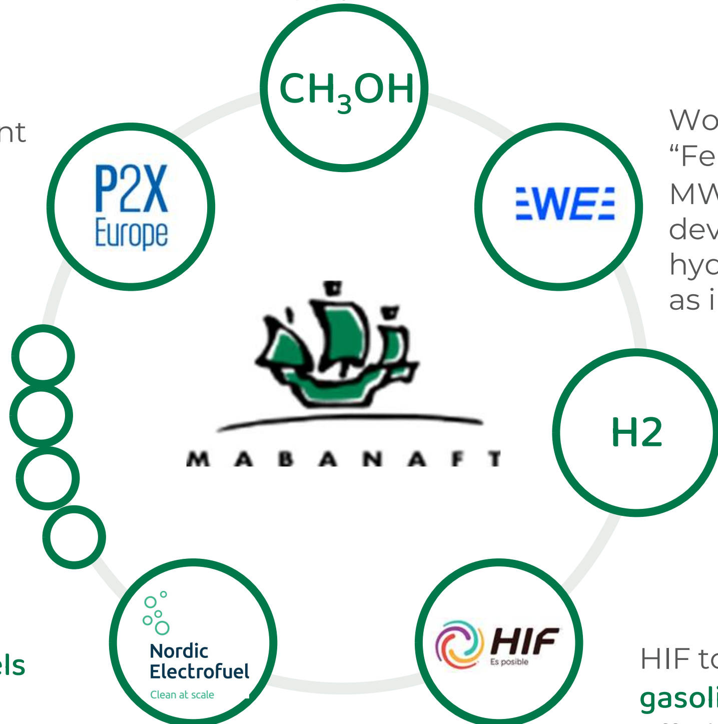
1. Germany, Hungary and Denmark

Sustainable fuels focus & project pipeline

Green methanol & green ammonia bunkering infrastructure & supply to maritime customers

Sourcing and marketing the PTL (e-fuels) products in Europe; pilot plant in Hamburg to start production in 2023; commercial scale plants in Iberia under development

Wolf Energetik develops an innovative "Feredox" **Hydrogen storage technology**. 1 MW standard storage module under development. Potential application for hydrogen and electricity storage, as well as in PTL production.



Further sustainable projects/leads under development

Small-scale Hydrogen projects in Germany to start offering green hydrogen to our customers in transportation sector

NEF is developing a PTL **e-fuels** production plant in Norway; Mabanaft as offtaker (via P2X E)

HIF to produce up to 500.000 cbm **e-gasoline** in Chile. Mabanaft as logistics & offtake partner.

ReFuel Aviation

Year	ReFuel Aviation*	
	Minimum share of SAF (in %)	E-Fuel Sub-target
2025	**2%**	**-**
2030	**6%**	**Min. 0,7% (an average share over the period of 1.2%)**
2031	**6%**	**Min. 0,7% (an average share over the period of 1.2%)**
2032	**6%**	**Min. 1.2% (an average share over the period of 2.0%)**
2033	**6%**	**Min. 1.2% (an average share over the period of 2.0%)**
2034	**6%**	**Min. 2.0% (an average share over the period of 2.0%)**
2035	**20%**	**5%**
2040	**34%**	**10%**
2045	**42%**	**15%**
2050	**70%**	**35%**

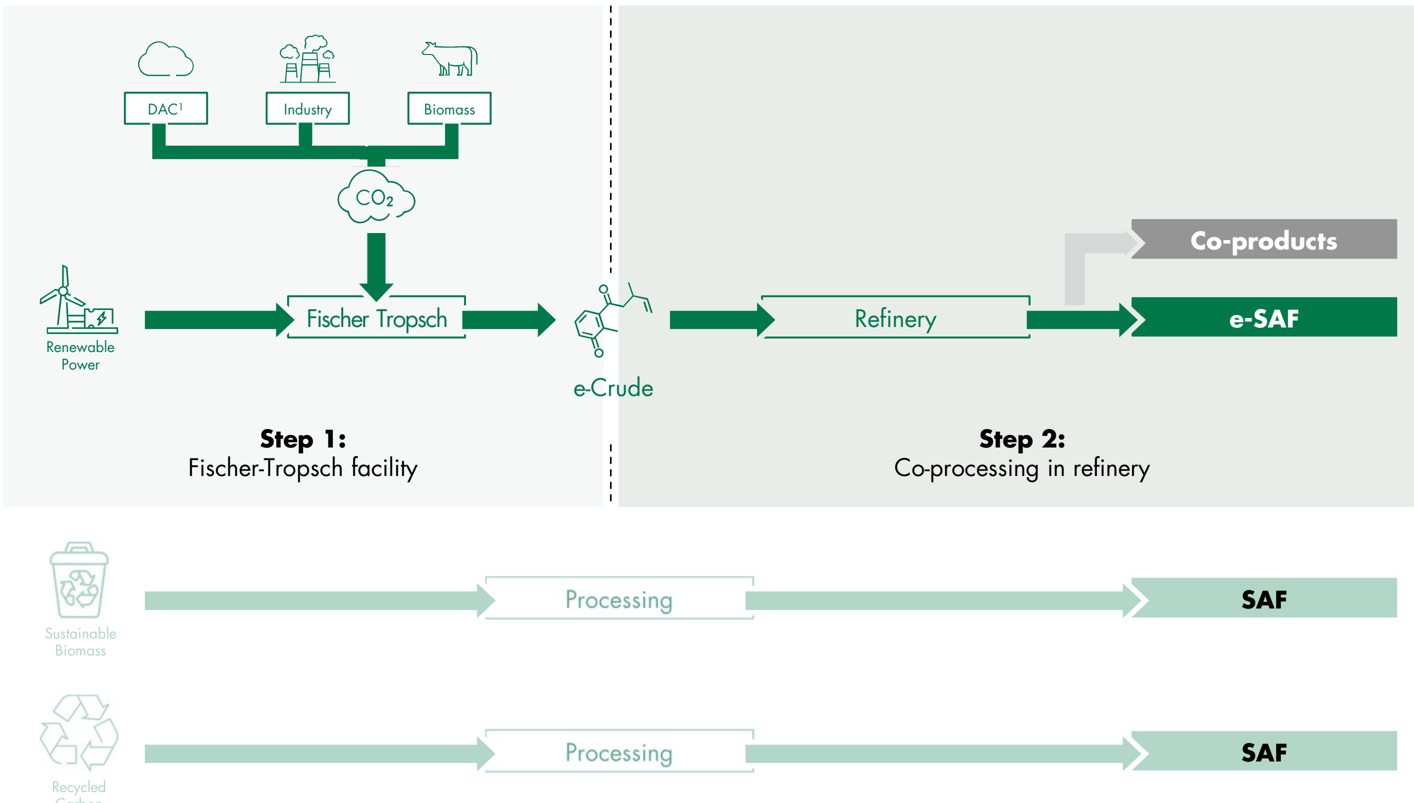
The legislation will oblige:

Aircraft fuel suppliers at EU airports to gradually increase the share of sustainable fuels (inc. SynFuels) that they distribute.

*Source: https://www.consilium.europa.eu/en/infographics/fit-for-55-refueleu-and-fueleu/

B

Fischer-Tropsch synthesis (FTS) is the most mature pathway for e-SAF production today, but produces e-Crude as an intermediate



C

It's not commercially feasible to refine e-Crude in the same FTS facility and must be done in conventional refineries (co-processing)

The Fischer-Tropsch synthesis for e-SAF is **not yet quite mature** to be deployed at commercial scale[1]

The average size of first planned RFNBO FT e-SAF plants is **10-50 ktpa e-Crude**

Average refinery capacities are **~200-500 times the e-Crude output**

– this makes integrating greenfield refineries into RFNBO FT e-SAF plants of this scale commercially unfeasible

As a result, first RFNBO (FT e-SAF) plants will not be of sufficient scale to produce finished products,

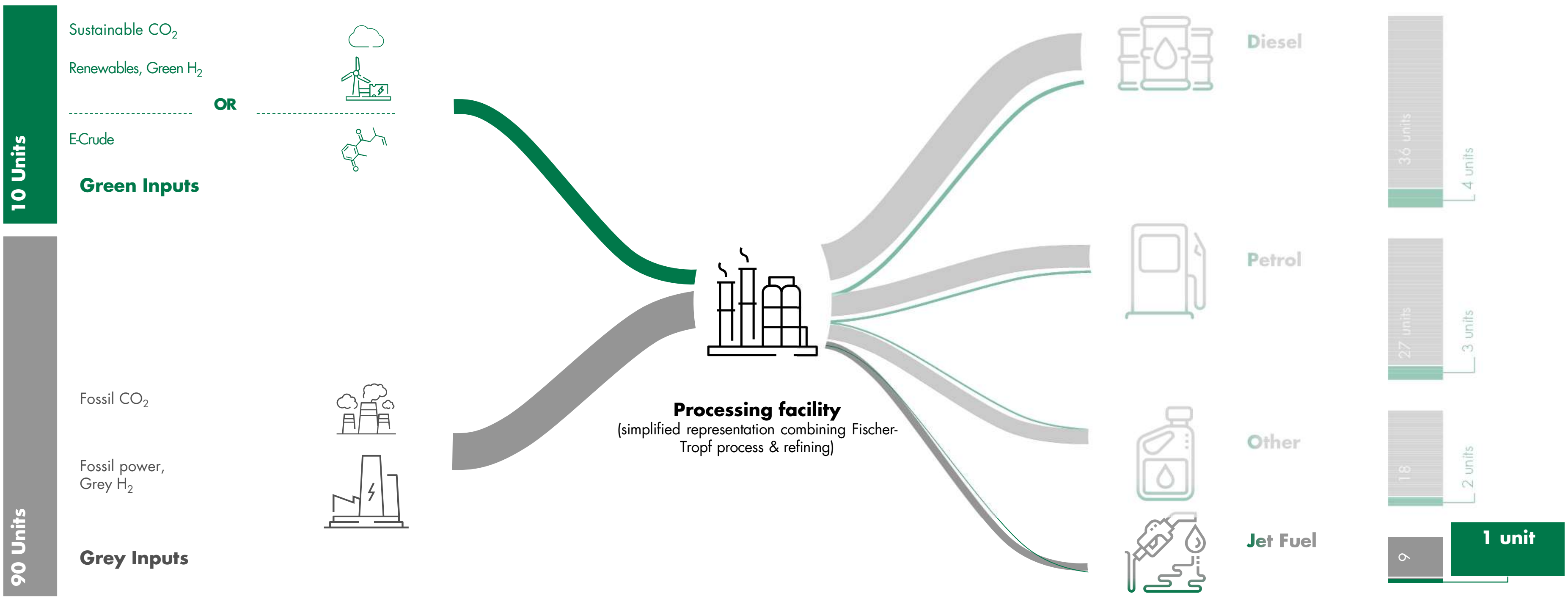
… instead they will generate intermediates (e-Crude) that need to be further processed

Converted brownfield facilities, co-processing of intermediates in existing refineries must be a core part of the supply solution

1 Technology Readiness Level (TRL) 5-6 of 9 as per the International Energy Agency (IEA)

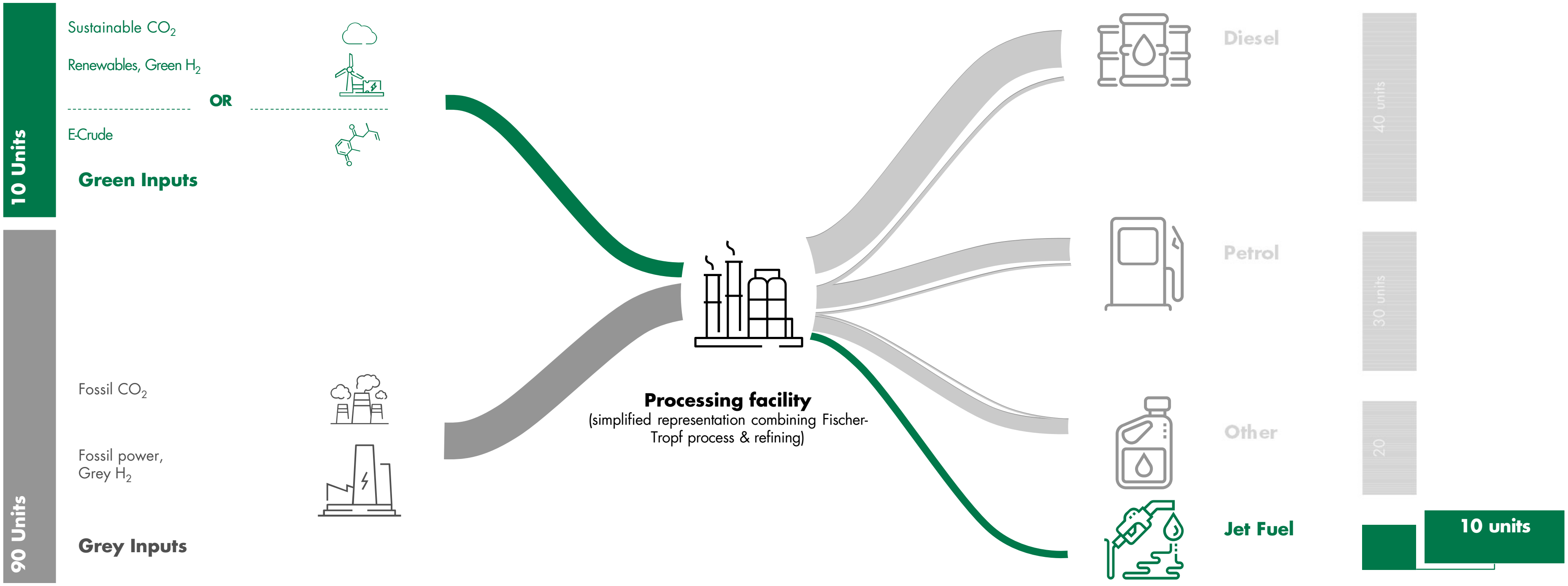
D

Processing e-Crudes to e-SAF is a bottleneck due to unclear regulations and must be unblocked to accelerate the e-SAF ramp-up



E

Conventional refineries (brownfield) need addn'l regulatory support for flexible allocation of 'green credits' to allow a gradual transition



E

Proposal for potential wording for a supplemental document

"In the case of Fischer-Tropsch facilities co-processing renewable and non-renewable inputs in a common process, the share of renewable output as well as the greenhouse gas emission intensity of the renewable and non-renewable output should be determined by an approved flexible attributional Life-Cycle-Assessment (LCA) approach (i.e. in a situation where fuels are produced in an integrated process with multiple other co-products (fuels and non-fuels), ***the renewable input as well as the greenhouse gas emissions can selectively be allocated and attributed to a specific product or products****)."*

F

Why is this important?

The proposed change is crucial for various reasons…

To fully exploit RFNBO use for Aviation & Maritime sectors

limited RFNBO production today; without free allocation, we add further bottlenecks towards producing green fuels from 1 unit of RFNBO FT e-Crude

For efficiency benefits of co-processing in existing refineries

co-processing in a local refinery instead of transporting to scarce dedicated processing plants provides cost- and CO_2*-savings for end-consumers*

To spur transition of brownfield refineries

each 10 units of RFNBO e-Crude replace 10 units of fossil crude that would otherwise be used in a refinery, thus saving CO_2

G

A broad allowance for flexible allocation comes with risks – it should be restricted to narrow application scenarios

Finite duration

… allowing flexible allocation until dedicated processing becomes available (e.g. first refineries fully switched to renewable feedstocks)

Sunset date

… only for FT facilities taken into operation **before 2035**, allowing step-by-step scale up approach for innovative FT producers

Use of FTS technology in two ways

… **in a few existing commercial-scale FT facilities globally**, where green inputs must be co-processed with grey inputs

… **in newly built FT plants**, which initially will be too small to produce the finished products (e-SAF)

Executive summary

A To meet the **EU's climate objectives** 70% of all aviation fuel[1] should be SAF, *e-SAF should contribute >35%* (ca. *18 Mt)* by 2050

B ***Fischer-Tropsch synthesis*** **(FTS)** is the only mature pathway for e-SAF production today[2], but produces e-Crude as an intermediate

C It's *not commercially feasible to* ***refine e-Crude*** *in the same FTS facility*[4] and must be done in conventional refineries (*co-processing*)

D *Processing e-Crudes to e-SAF is a bottleneck*[3] due to **unclear regulations** and must be unblocked to accelerate the e-SAF ramp-up

E Conventional refineries (brownfield) *need additional regulatory support for* ***flexible allocation*** of 'green credits' to allow a gradual transition

F Co-processing in existing refineries is the most efficient way to refine e-Crude into eSAF, subject to free allocation

G A broad allowance for flexible allocation *comes with risks – it should be* ***restricted to narrow application scenarios***[5]

1 for flights departing from EU airports **2** which synthesizes green Hydrogen and biogenic CO_2 to an *intermediate e-Crude* (synthetic hydrocarbon), which must then be *refined to make e-SAF to blend with jet fuel* **3** A *handful of large-scale prototypes and small demonstration plants* (~0.02 Mt in 2023) exist today **4** Due to the relatively small operational scale of FTS today (~10-50 ktpa) **5** *e.g., finite durations, sunset dates, selective technologies, companies adhering to a certified emissions-reduction roadmaps*

Mabanaft – fuelling tomorrow.

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