

Raw materials for advanced biofuels – opportunities and challenges



HCS Group

A leading global provider of specialty hydrocarbons



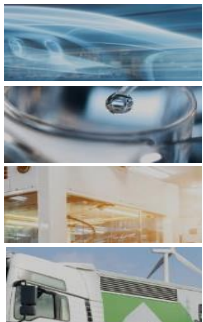
Key facts

Founded in **1859**, we are today a leading global provider of high-value specialty hydrocarbons with worldwide **500 employees**, **7 production sites** and more than **500,000 tons of global sales volume**.



3x leading brands

Three brand characteristics have formed HCS Group: **Haltermann Carless** long-term expertise and innovation, **ETS Racing Fuels** passion and dedication to low carbon fuels, and **Electrical Oil Services** (EOS) customer-service and circular offering.



4x global business units

Based on our understanding of market and customer needs we offer in-depth application expertise and tailored services in **Mobility, Life Science, Industrial and Energy**, serving local and global blue chip customers in more than 90 countries.



Front-runner in defossilisation

We offer **up to 100% renewable solutions**: from sustainable fuels, high purity hydrocarbons for cosmetics to circular solutions for renewable energy. We are **ISCC EU** and **ISCC PLUS** certified and hold **EcoVadis Gold** status.

Success factors to scale-up advanced biofuels in EU

SAF and other hydrocarbons based on advanced biomass are indispensable

S



Security of investment

- **Investor confidence requires regulatory clarity** & coordinated approach in the EU
 - Regulatory clarity (REDII/III, RefueEU, ETD, national laws)
 - Stable framework (min. 10 y)
 - Consistent blending mandates
 - Tbd: sub-mandates for "Part A" biogenic SAF
- Simplification and acceleration of SAF ramp-up via **book & claim** system
- Level Playing Field - instruments to **prevent competitive distortion and carbon leakage** e.g.
 - SAF levy for passenger flights in the EU
 - CO2 offsetting levy anchored in the European CBAM to prevent circumvention of the SAF quota obligations through non-EU hubs
 - Anti-tankering provisions

A



Access to feedstocks

- **Access to advanced feedstocks and strategic partnerships** will decide on competitive advantage and feasibility of investments
- **Commission finally published the Delegated Act on Annex IX** – consistent transposition to national laws (e.g. NL, FR, DE) is key for clarity volumes re volumes & pricing
- **Advanced biofuels are part of the solution for renewable chemicals and fuels** – "lived" technology openness in policy making is key, i.e. stronger backing of advanced biofuels besides PTL focus
- **Clear sustainability criteria and independent certification** – customers demand high transparency re feedstock origin and GHG reduction
- Avoid cannibalization of raw materials with sectors that can be electrified

F



Financing

- **Solve financing paradigm – EU mandates alone will not lead to sufficient investments**
- Business models to **increase "bankability" of off-take agreements**
 - Consortia and public-private partnerships
 - Long-term "take-or-pay"
 - **De-coupling of pricing mechanisms** from fossil Jet-A1
- **Funding of breakthrough projects** to mitigate first mover disadvantage (ETS Innovation Fund, BMDV etc.)
- Government incentives to **generate a liquid SAF market** e.g. CfDs, double auction model like "H2Global"
- Reduce barriers to investment e.g. via low-interest subordinated loans and indemnity bonds

Challenges

Major challenges and uncertainties

Regulatory and market uncertainties impact the goal of final investment decisions

Security of investment – Regulatory uncertainty and shifting goalposts

- EU Commission finally published the Delegated Act on Annex IX on March 14, but still unclear areas and interpretation different on national level (e.g. NL, FR, DE), requiring complex BLE/Nabisy application to ensure “advanced” status of targeted feedstocks in Germany
- “Skin in the game” of German government disappeared, funding programs for advanced biofuels e.g. BDMV/NOW stopped in wake of KTF cancellation
- Better differentiation of “advanced biofuels” Annex IX Part A vs Part B required (higher SAF allowances for airlines, separate label, funding etc.)
- Potential new challenges with crop-based / 1G Ethanol producers taking the EU to court, challenging the RefueEU Aviation Regulation
- Sudden changes of legislation (large impact of Sweden lowering HVO quota)

Cost of advanced hydrocarbons / SAF - The calm before the storm

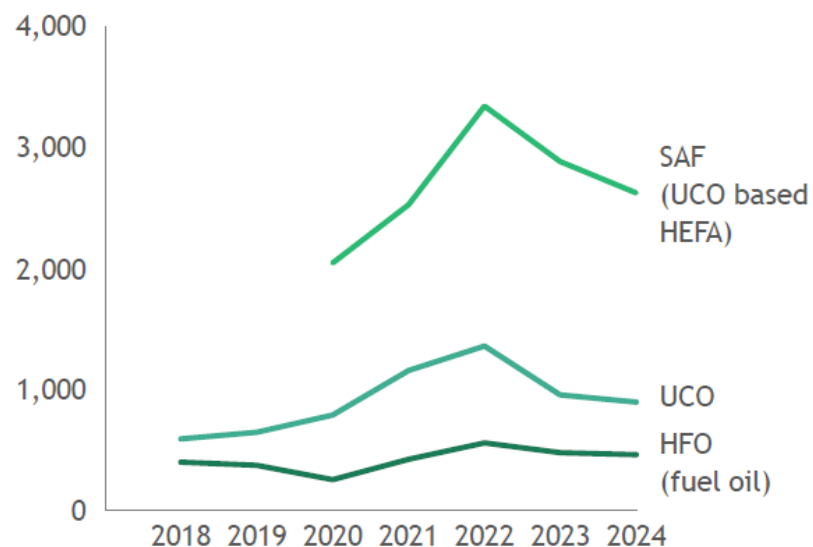
- Renewable hydrocarbons based on advanced biomass are very competitive vs PTL, but will be more expensive compared to HEFA/HVO routes (incl. disadvantage of high stoichiometric input factor (1.6 ton Ethanol per ton of ATJ SAF, 2.2 ton Methanol per ton of MTJ SAF)
- Current HEFA SAF price comparably low, potentially suggesting declining SAF costs to end customers, showing low willingness for long-term commitments
- BUT: SAF mandates will go into effect in 2025 and penalties for not meeting mandates in place (definition of “market price” still open though)
- Significant price increases expected in next 3-5 years
- Outcome of investigations into potential fraud related to high imports from Asia could further exacerbate prices



SAF Price expected to strongly increase

Range of 2k to >5k \$/t following onset of quotas and UCO HEFA undersupply

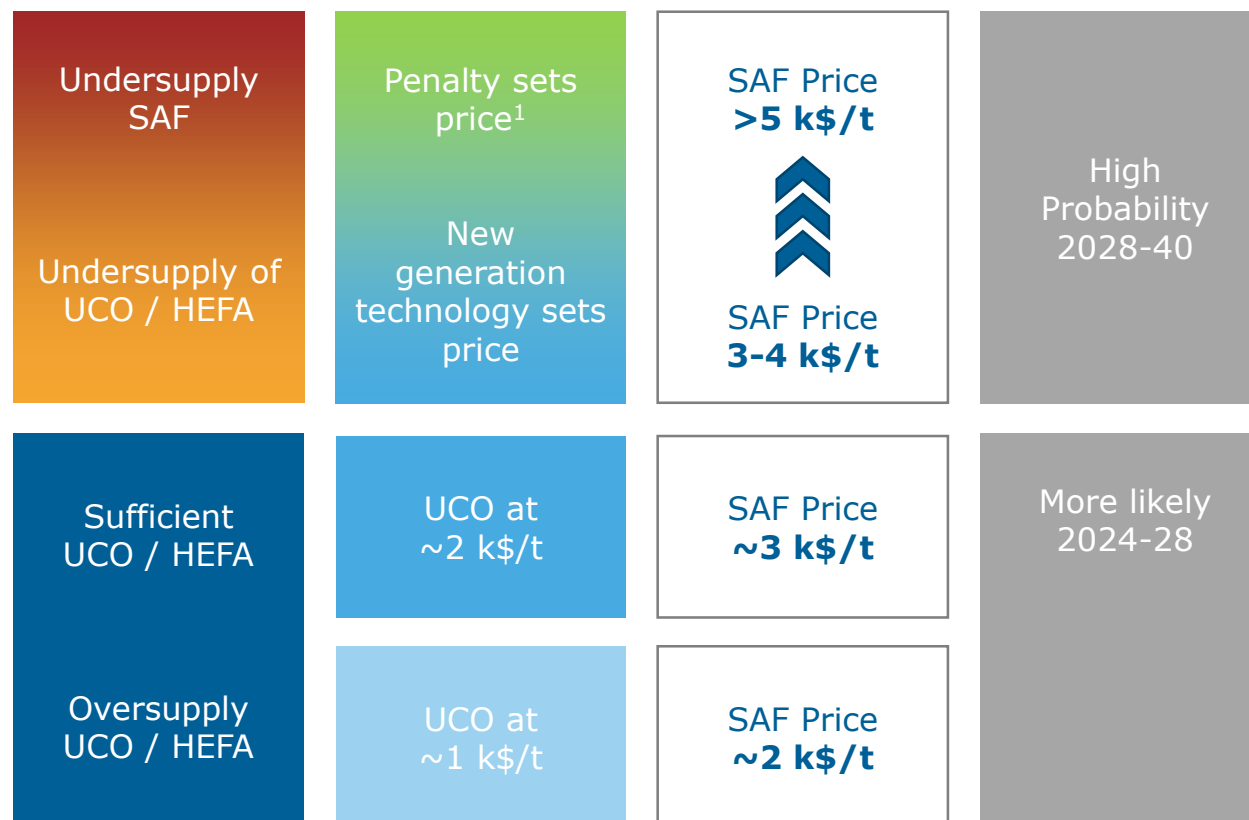
Historic Price Development [\$/mt]



SAF vs

UCO	-	-	1,253	1,368	1,982	1,926
HFO	-	-	1,789	2,101	2,779	2,403

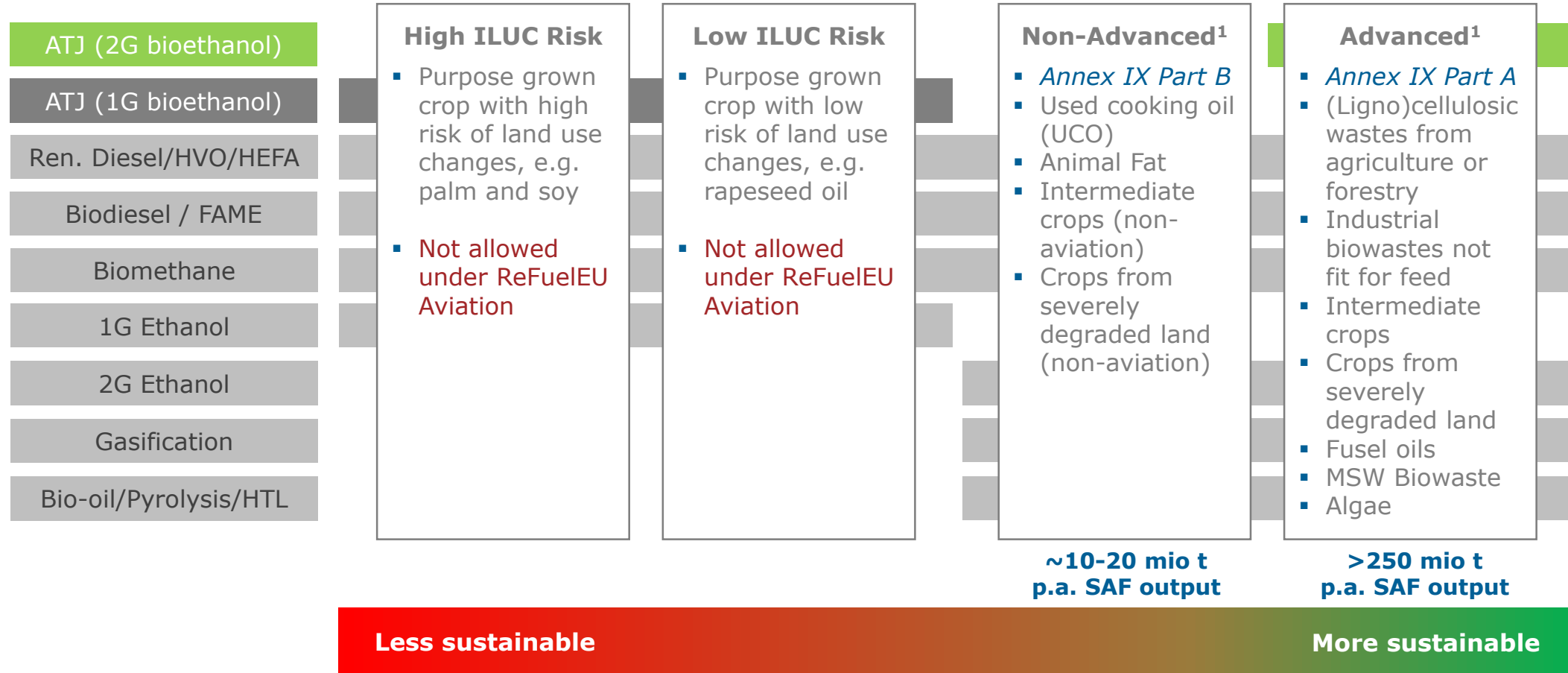
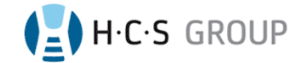
Demand vs. supply outlook scenarios and price implications



Opportunities

Advanced biomass is a truly sustainable feedstock...

...NABIS biomass strategy prioritizes areas with no other option for defossilization



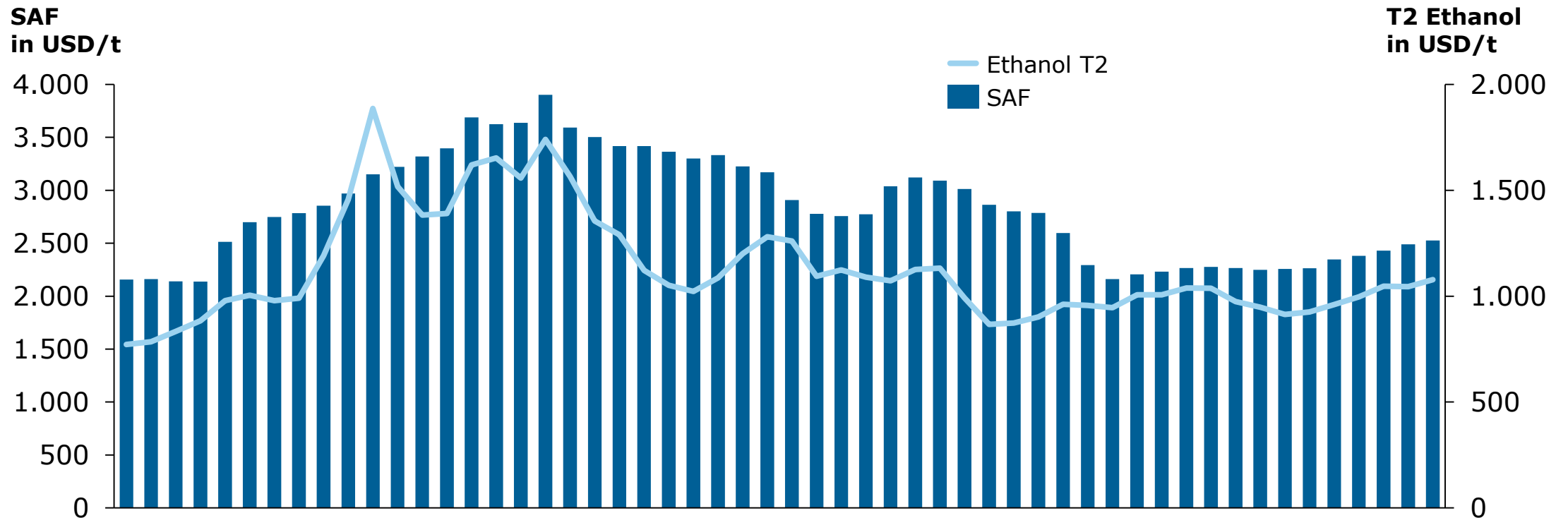
Pricing mechanisms for renewables developing

Synchronized pricing formulas on supply and customer side as risk mitigation

Ethanol index as increasingly reliable underlying bio-based commodity supporting SAF formula based pricing

- Transparency of published Ethanol T2 as underlying index for formula pricing – synchronizing supply and customer side
- Hedging possible with increasing liquidity in forward markets
- New global capacity for advanced ethanol feedstock (incl. revamp of 1G facilities) and decline of ethanol blend gasoline usage expected to lead to decrease in ATJ feedstock cost

Ethanol and SAF Monthly Development Jan 2021- June 2025 (FC)

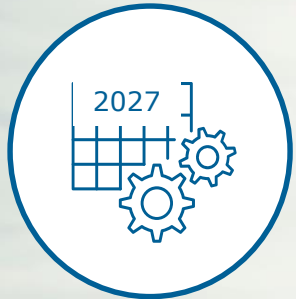


HCS Group is ready to contribute to defossilization in aviation with SAF “made in Germany”

Project AMELIA

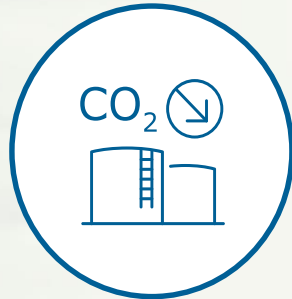
Objective: First large-scale production of Alcohol-to-Jet (ATJ) SAF in Germany with targeted output of 60,000 mt of ATJ SAF and renewable hydrocarbons by 2027

Timely



2027
Start of production

Effective



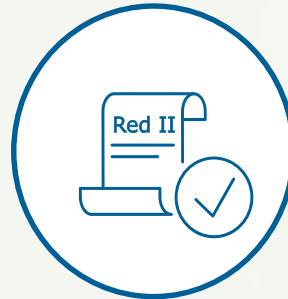
60,000 tons
Low carbon
products

Local



Low carbon logistics
from the center of
Europe

Future-proof



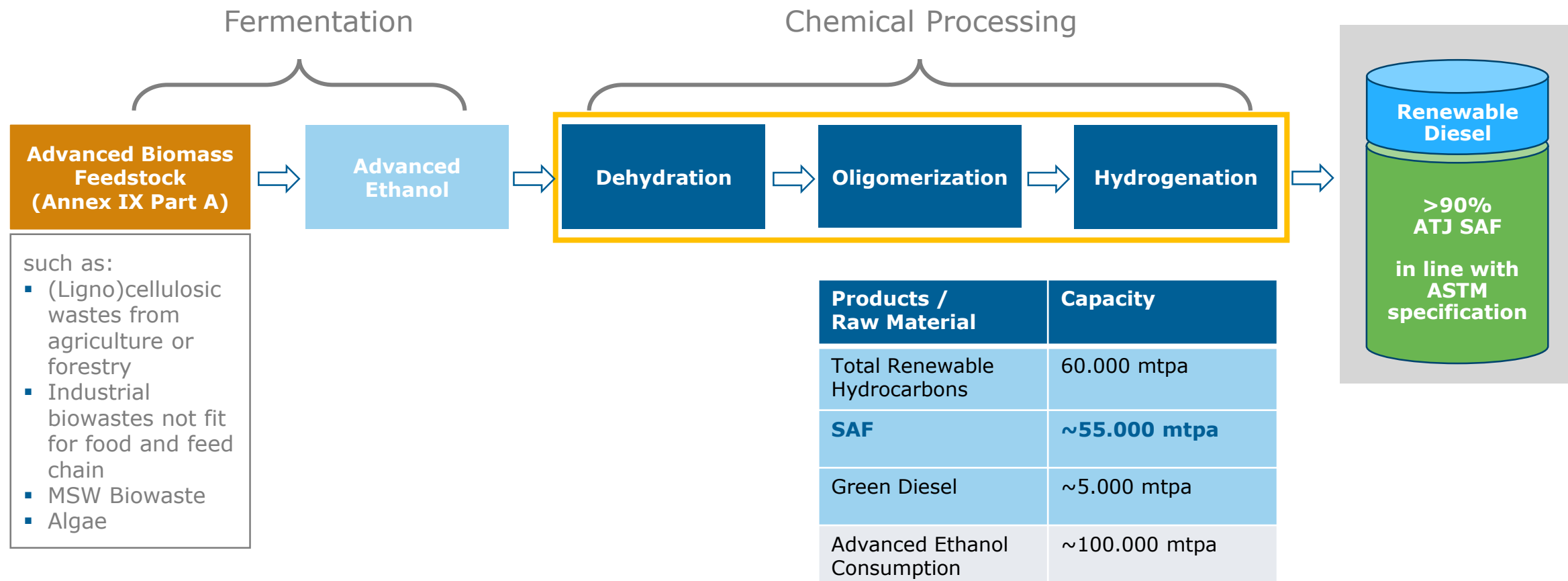
EU RED II/III
compliant



HCS Group is pursuing the ATJ process with very high SAF yield, starting from advanced biomass

Ethanol-to-Jet (ETJ) Process

Products



HCS Group's Speyer site is ideally positioned for scaling ATJ SAF "Made in Germany"

- **Strategically preferred location** directly on the Rhine, close to Frankfurt Airport & other key airports
- **Certified supply chain for drop-in SAF** from biomass to tip-of-the-wing within a 200 km radius to minimise emissions
- Permitted site with existing production of broad range of hydrocarbons
- **Existing infrastructure and logistics** for raw materials and products
- Significant advantage to lower overall investment cost and **accelerate time-to-market**
- AMELIA is only project for biogenic SAF focusing on waste-based biomass in compliance with **Annex IX Part A**
- **Strong partnerships along value chain**



**Pioneering solutions
for a fossil free world.**





H·C·S GROUP

PASSION PRAGMATISM PARTNERSHIP