

Market Outlook & Drivers

thyssenkrupp Uhde

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Recap – what happened over the past 6 months!

Upside

EU RED III Directive came into force on November 20, 2023

Final draft of Hydrogen strategy by South Korea – Japan to follow in next 2 months

EU ETS Market outlook price EU emission allowance to reach \$146/t by 2030 and \$194/t by 2035

Portugal opens tender for hydrogen blending in gas network

Japan has proposed 10% SAF targets by 2030

European Hydrogen Banks first auction announced

63% of EU countries have already published their Hydrogen strategies

Treasury Department and IRS in the US published Section 45V

New IRA guidelines for EV

Energy

Fertilizers

Mobility

Commodity

Downside

Focus of ETS-II was sustainability, priority of ETS-III is energy security

Risk of intensifying geopolitical tensions – Russia-Ukraine; Middle East tensions; Asian war

If I'm paying €8 per kilogram, compared to €1 [for grey hydrogen], you know there is something to be absorbed," – Total CEO

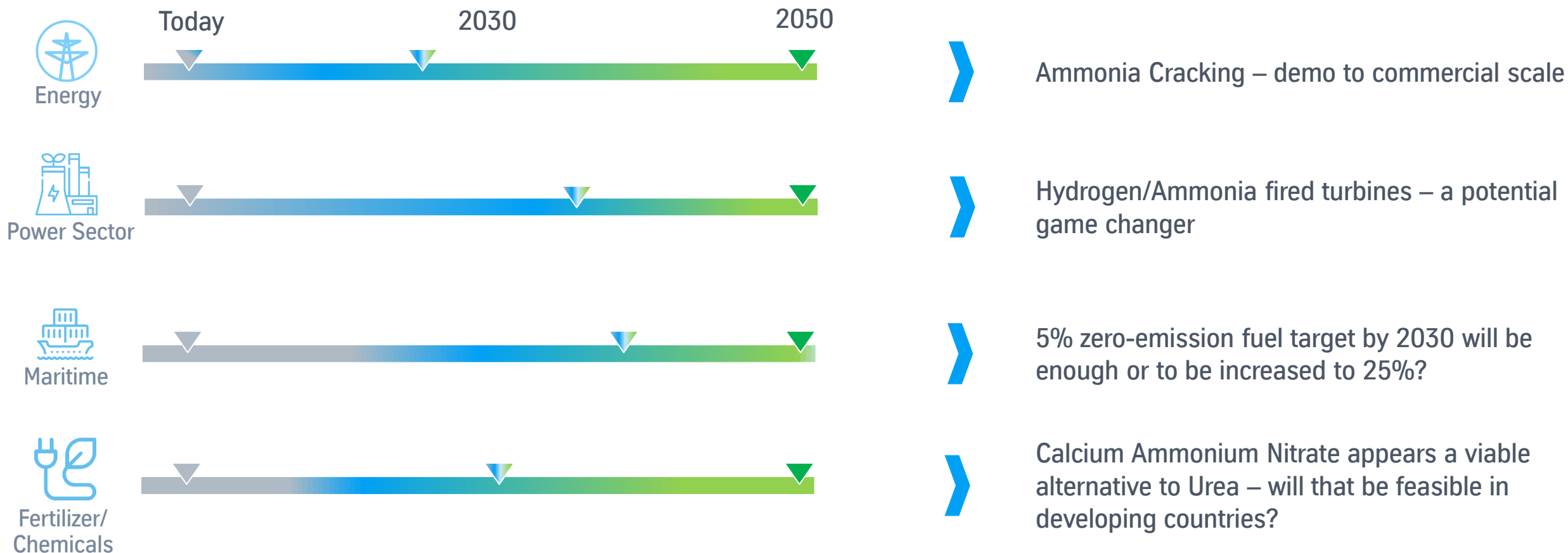
A major reason for the slow build-out is the mismatch between how much renewable hydrogen costs to produce and what offtakers are willing to pay – PwC

Top oil executives took to the stage of a major energy conference on Monday to vocally oppose calls for a quick move away from fossil fuels, saying society would pay a steep cost to replace oil and gas – Reuters



Based on growth projections Ammonia & Methanol appears front runners in the sustainable transition

Rapidly growing customer base in the targeted markets with new applications



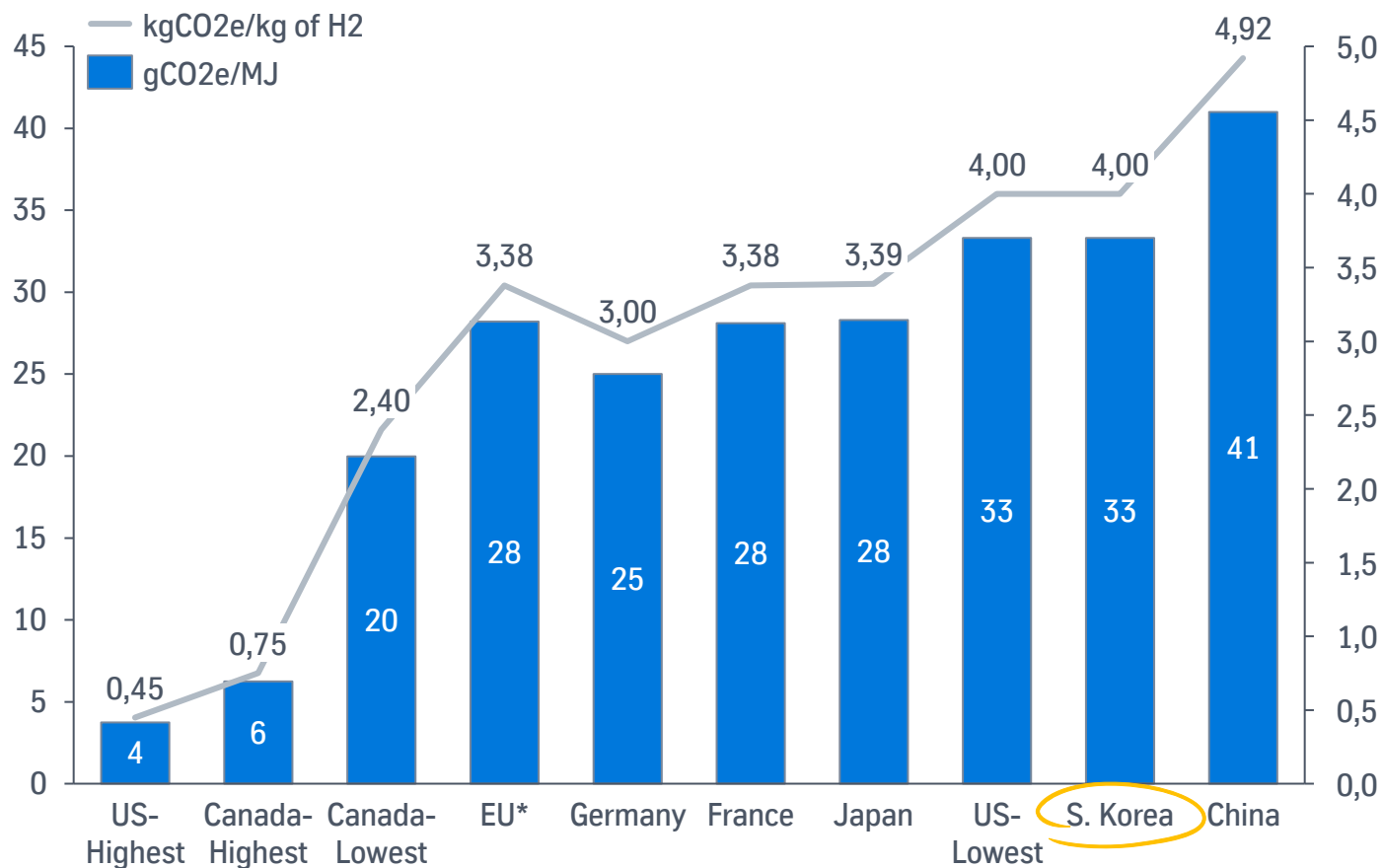
Blue Ammonia will act as a transitional step for different industries as they gradually advance towards green ammonia



Policy decisions globally triggering demand for low carbon hydrogen

Intensity of CO2 emissions and its impact on technology deployment

Emission Allowance



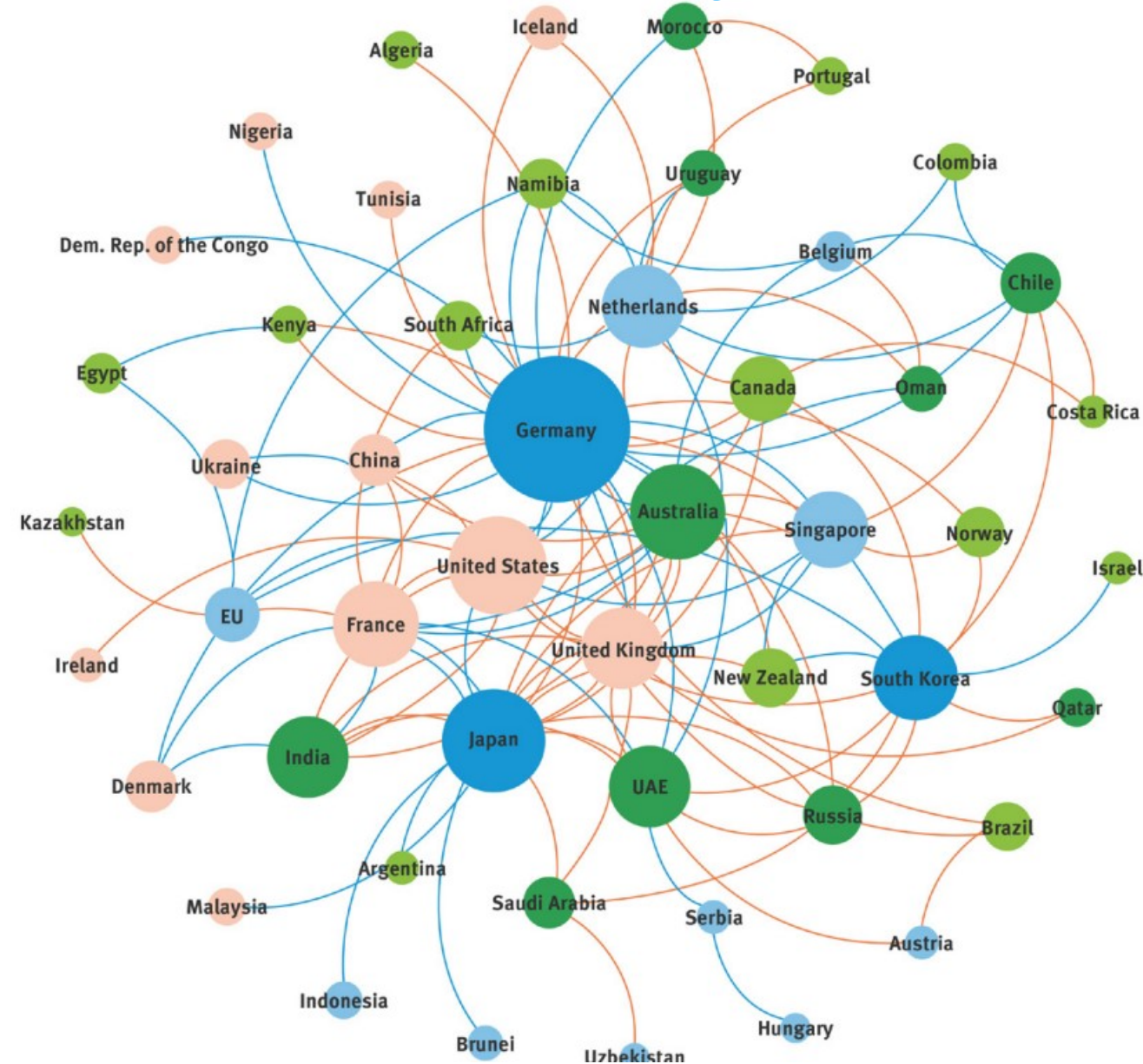
* Well to Gate

Key Observations

- Technology deployment influenced via emission allowance
- Well to Wheel limits also includes emissions during transport of Hydrogen (boil-off considerations and fuel used for transport)
- Mid to long term its not going to be “either or” but a healthy mix of all sustainable alternatives
- CO2 utilization alternatives will have impact on competitiveness of “clean” molecules



Possible Future Global Hydrogen Trade



Demand for green H₂ is particularly high in Japan and the Republic of Korea; Germany considering the use of blue hydrogen as a transition technology

On the export side, **Australia, India, the United Arab Emirates (UAE), Saudi Arabia, and Chile** have also established a robust network with other countries

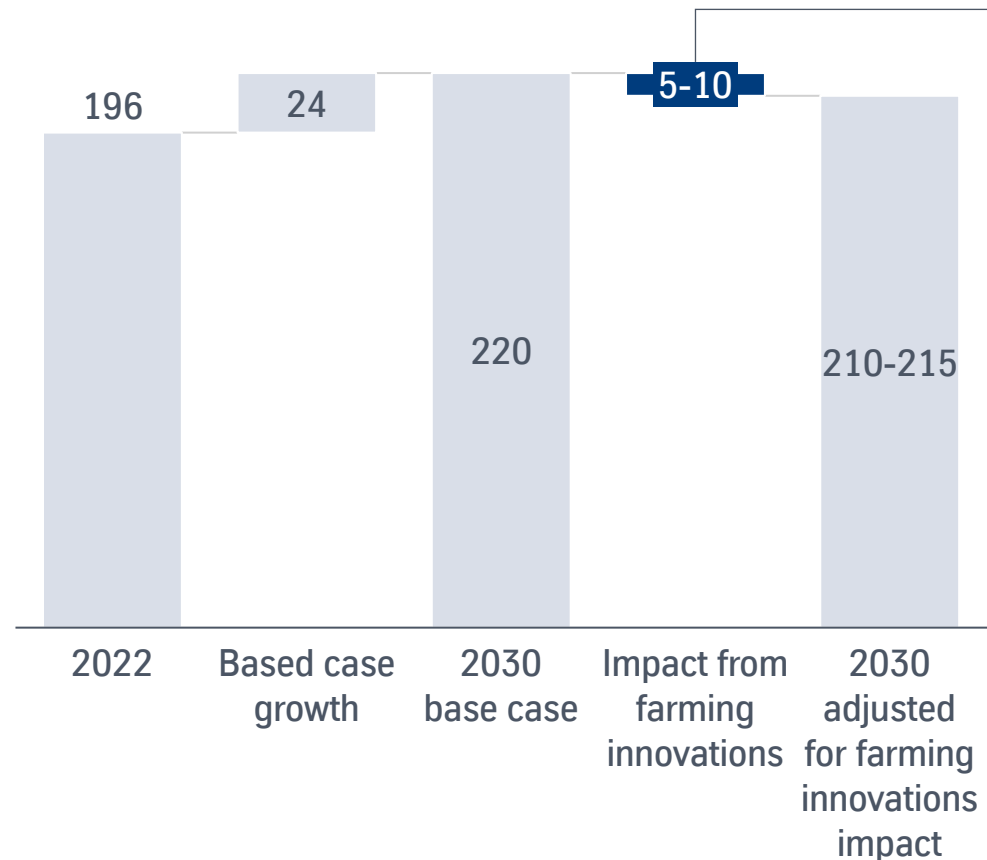
Blue hydrogen could **extend the timeline of green H2 adoption** - represent **challenges for developing countries** that are heavily reliant on green H2 exports



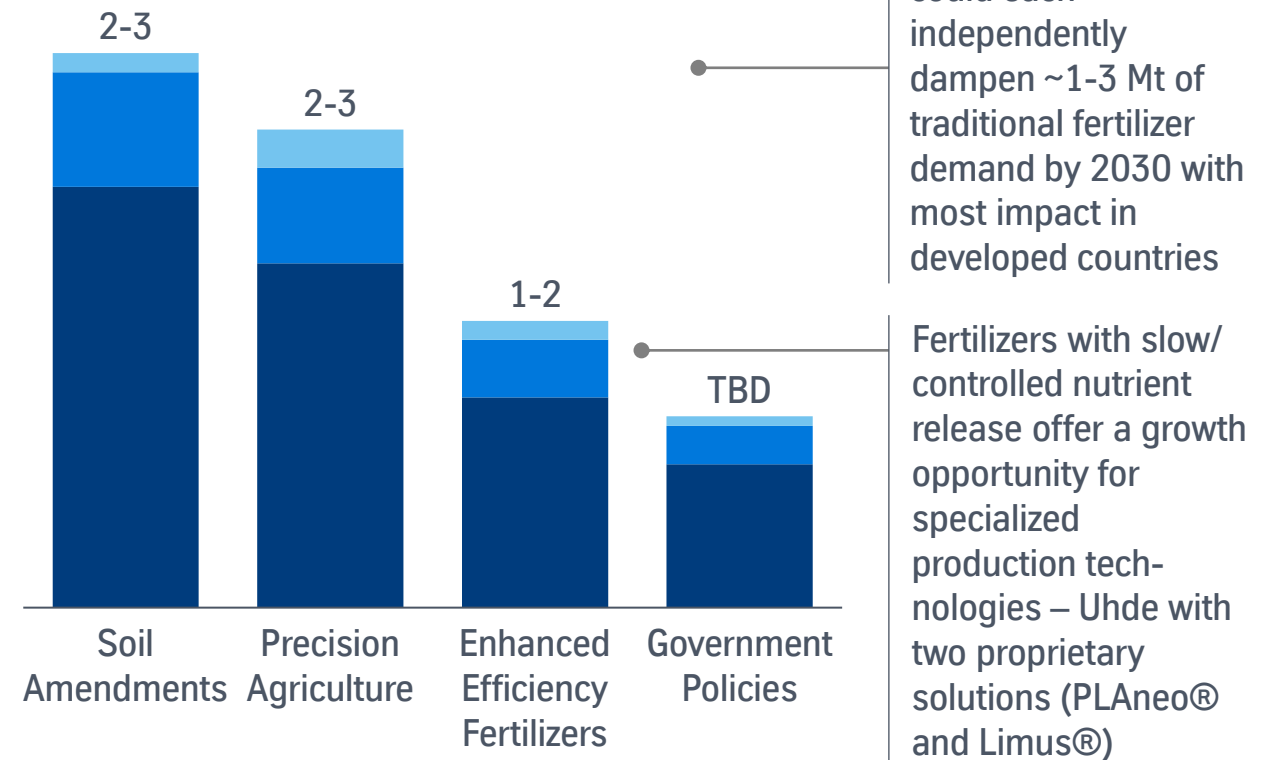
Farming innovations – Up to 0.5% of total fertilizer demand or 1/3 of global growth from 2022 to 2030 is at stake due to changing technologies and farming practices

K P N

Fertilizer demand 2022-2032,
in Mt nutrient¹



Potential impact of disruptions on fertilizer demand until 2032¹,
in Mt nutrient¹

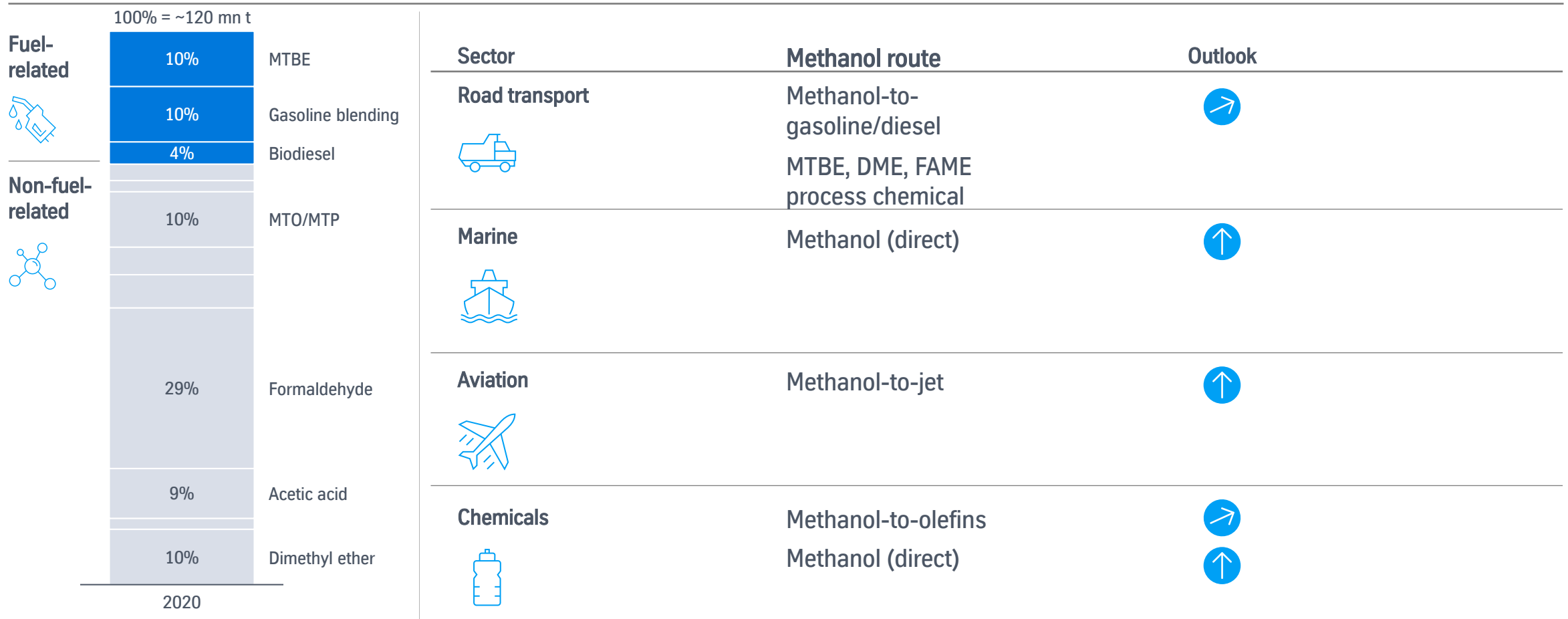


1. Including N, P and K fertilizer



Methanol applications – currently used in fuel application however limited to 25%...

...while most future methanol applications are fuel-related



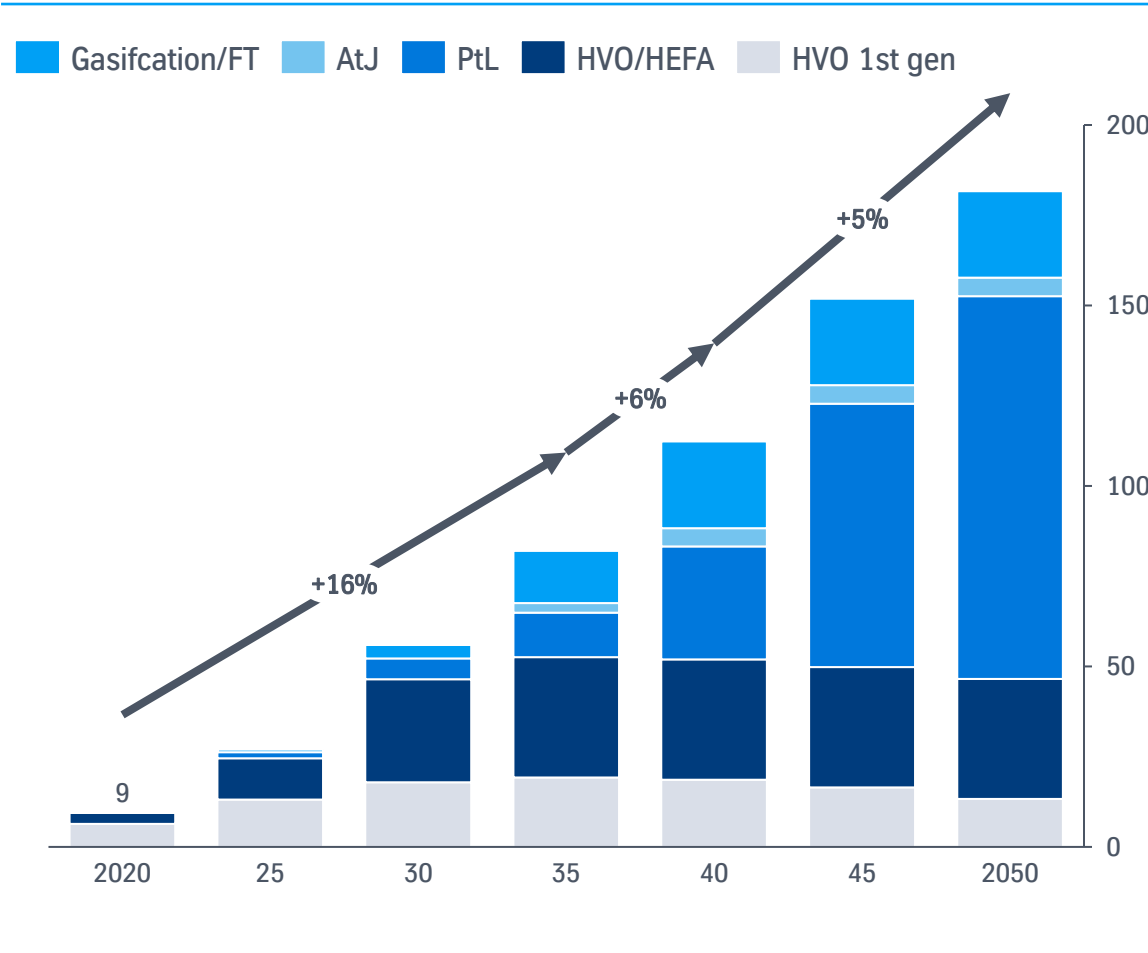
Future applications in transport sector opens up enormous market potential!



Gasification offers strong alternative to HVO/HEFA in SAF production; a potential attractive window to open up w/ investment

ESTIMATED

Estimated split of sustainable drop-in
fuels demand into technologies, Mt



- Gasification growth expected to compensate via PtL after 2040
- MtJ is likely to take a share from PtL market gives additional momentum for Methanol growth
- Currently HEFA/HVO route offers cheapest fuel however expected to see a cap from 2032 onwards – current quantities of HEFA/HVO no sufficient to meet demand
- Due to the capital intensive nature of gasification, once these plants are built, they are likely to remain cash positive and stay open despite competition from PtL

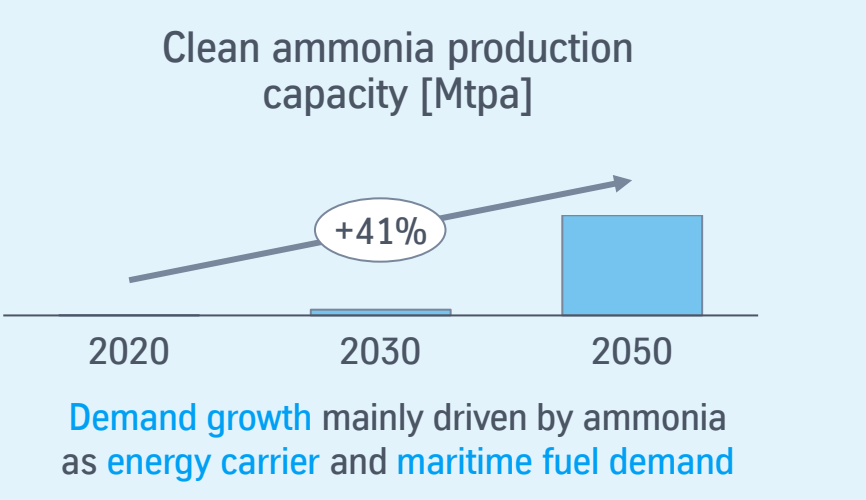


In nutt-shell | Uhde's end markets show high growth potential, as a result of energy transition & carbon circularity

Not to scale

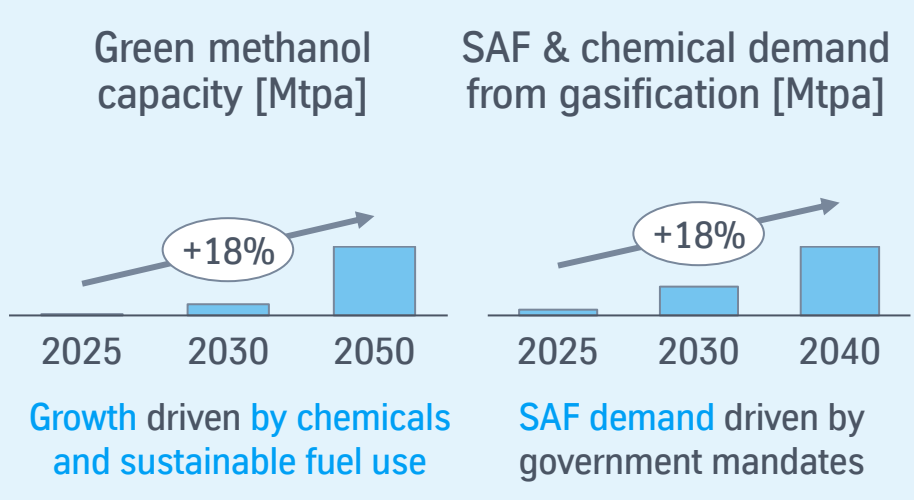


Ammonia for
fertilizer, fuel,
end energy



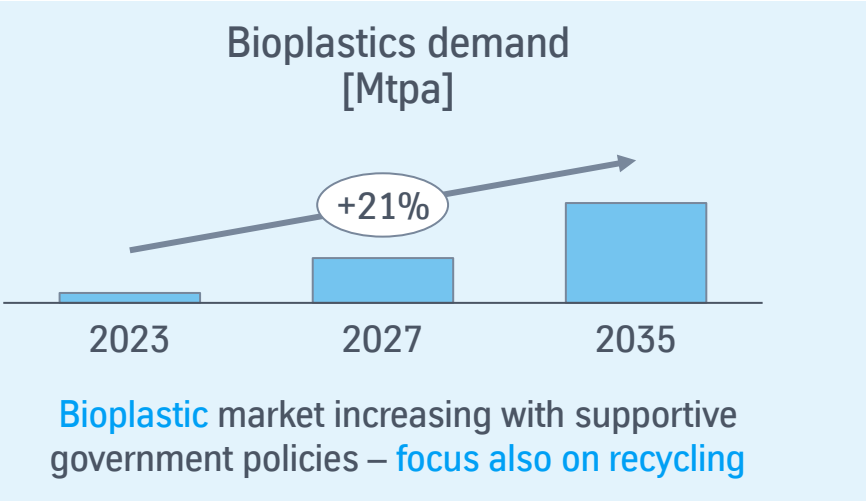


Clean Fuels &
Chemicals



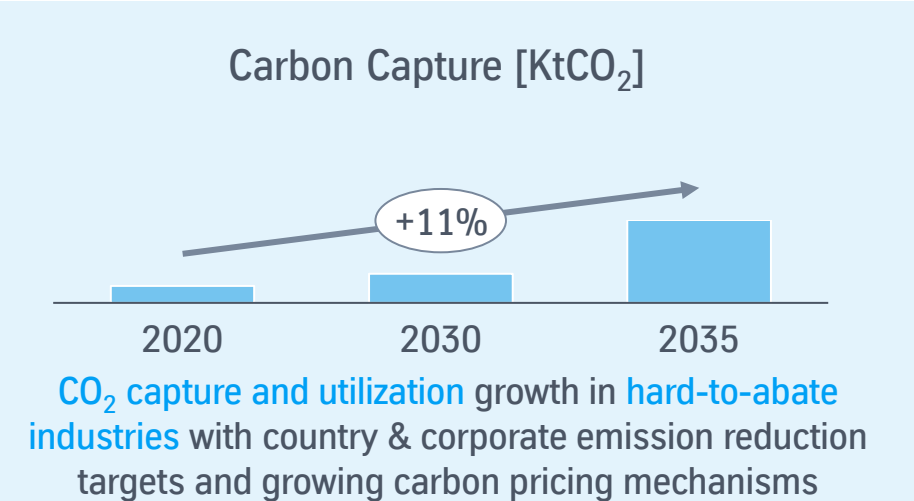


Sustainable
Plastics





Emission
Reduction



Approximation in consensus with: IRENA, McKinsey Energy Insights. European Bioplastics 2023, European Environment Agency, FACTMR 2023 xx% CAGR



Summary

1

Global policy decisions are solidifying global Hydrogen demand – US, Japan, South Korea has now been joined by Germany

2

Ammonia as a fuel has highest tractions followed by Ammonia as H₂ carrier and Fertilizer/Chemicals

3

Maritime is a potential game-changer – however will take at least 1-2 years to show early results; interim solution seems to be Green Methanol

4

E-Methanol sees clear growth due to policy decisions and at the locations where CO₂ sequestration is not an option; Biomass Gasification with FT for SAF appears competitive route – first installations at commercial scale are in discussions

5

Plastic waste management and circularity get additional focus in the country specific policies in coming years



Thank you for your attention



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