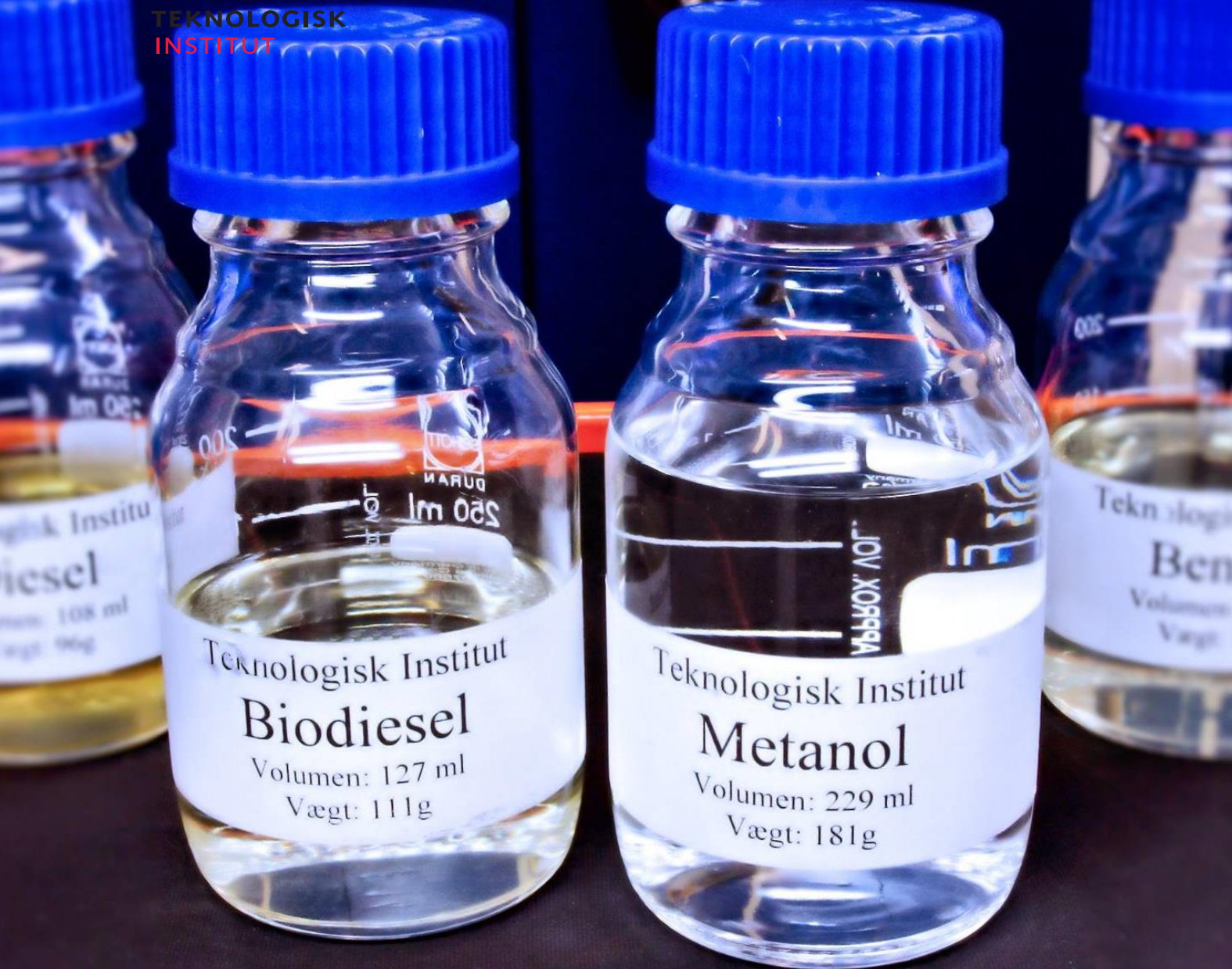




TEKNOLOGISK
INSTITUT



Fremtidens marine- brændstoffer

Seniorspecialist Kim Winther

Esbjerg 12. April 2024



100 EJ = 3 MILLIARDER TONS PER ÅR

- Efterspørgslen efter transportydelser stiger
- Mængden af energi til transport stiger
- 96 % af energien stammer fra fossile kilder
- Privatbiler står for 50%
- El og brint klarer det ikke alene!

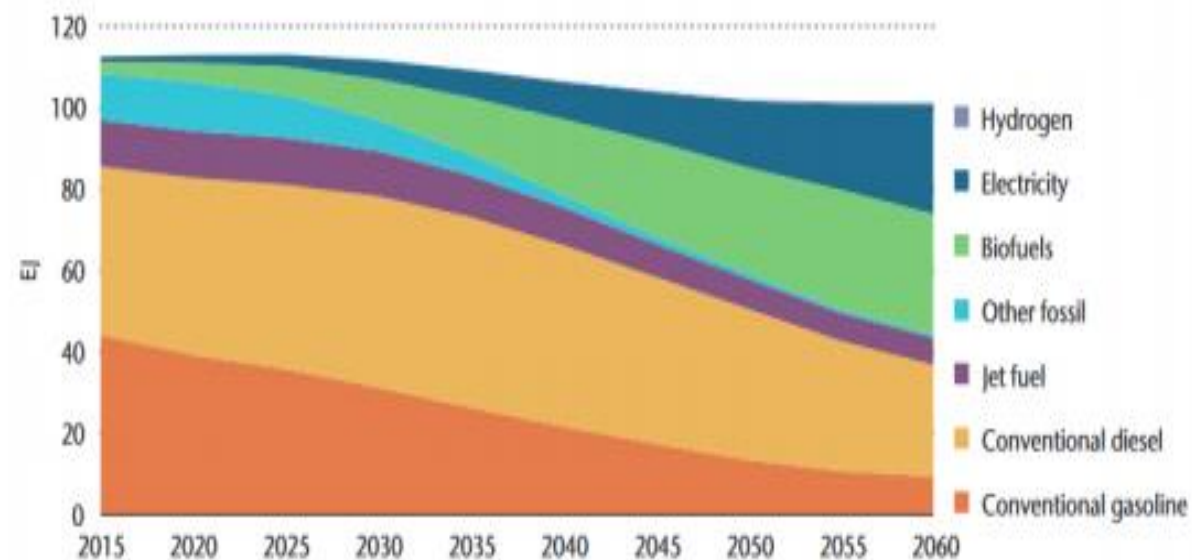
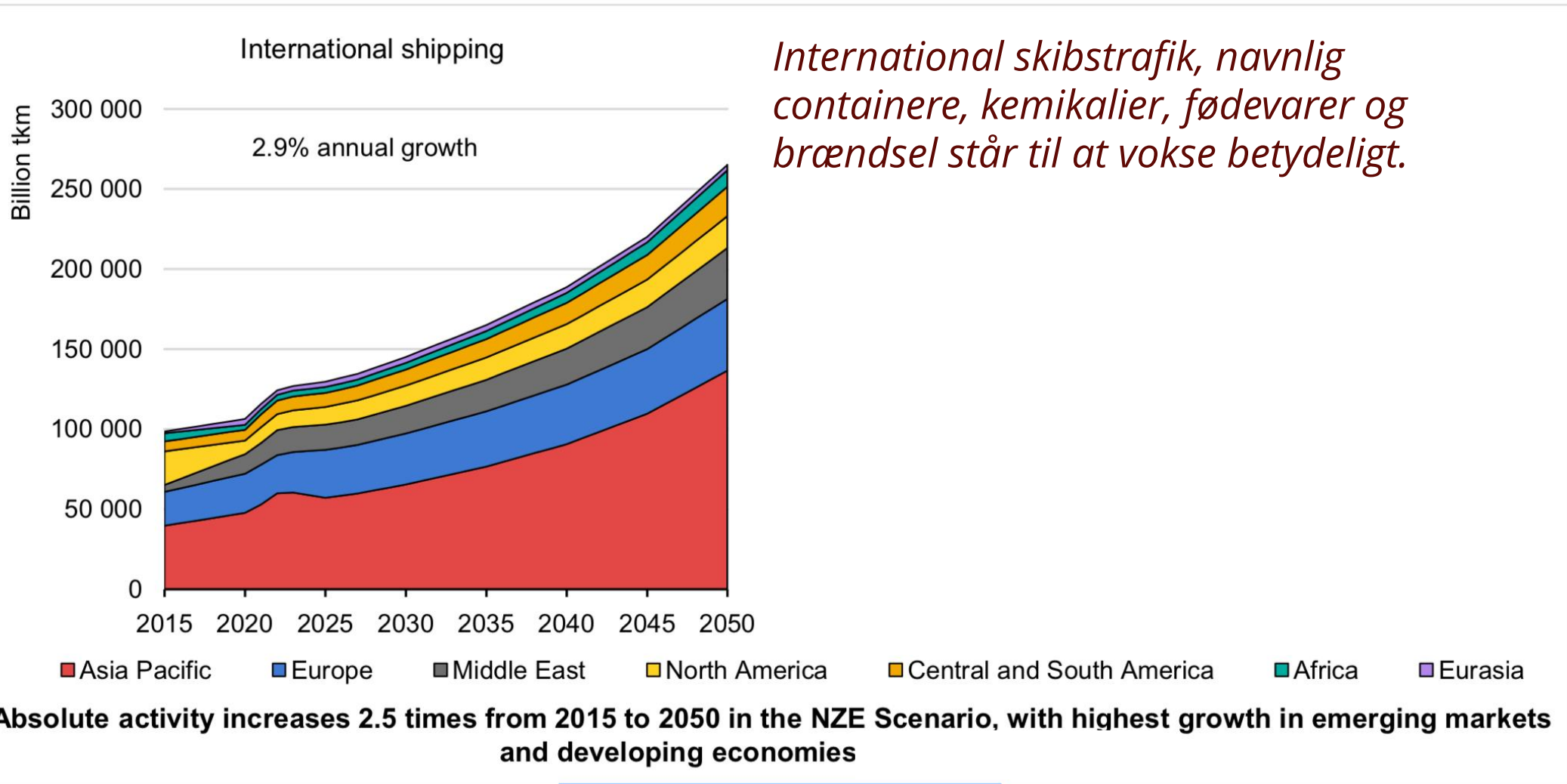


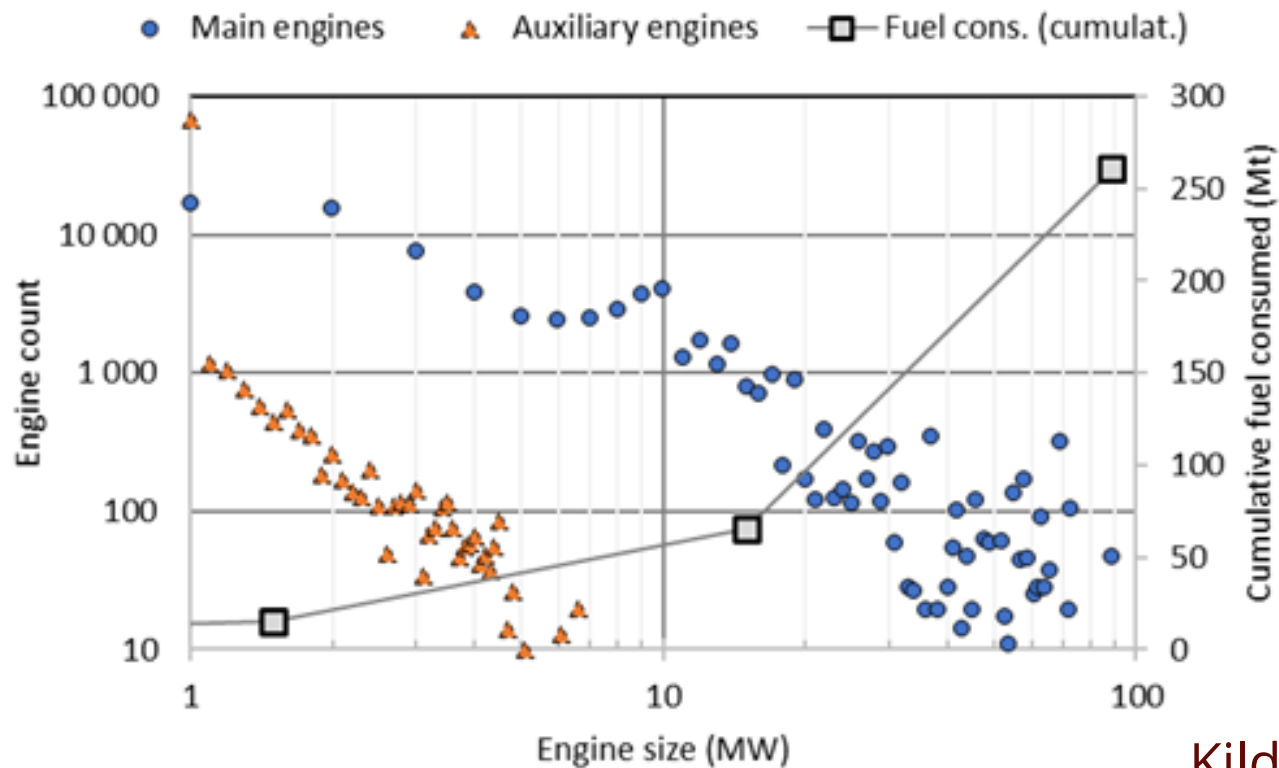
Figure 2: Role of biofuels in transport – IEA 2DS Scenario

Growth in international shipping



Store skibe står for det største forbrug

128 000 registrerede skibe

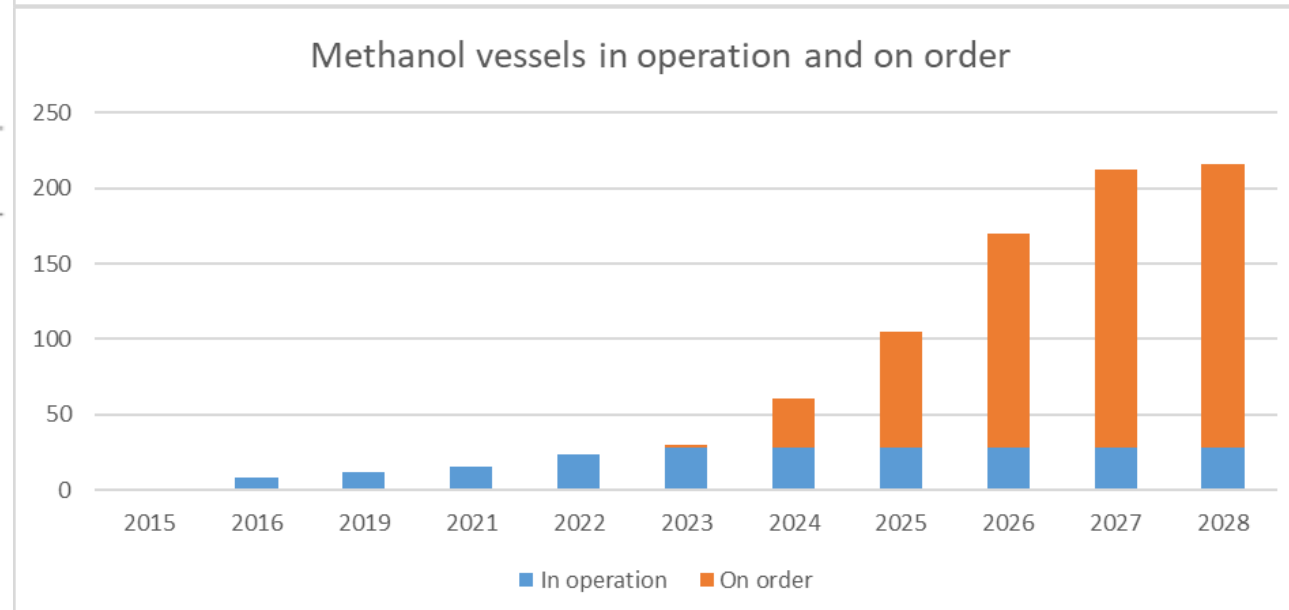
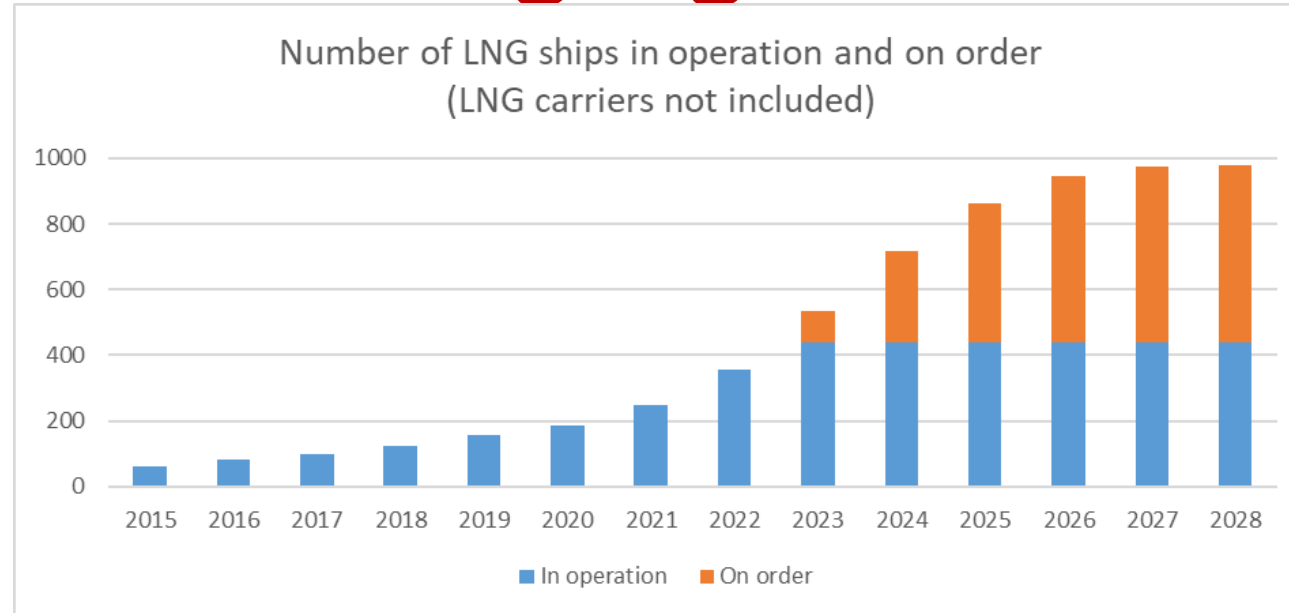
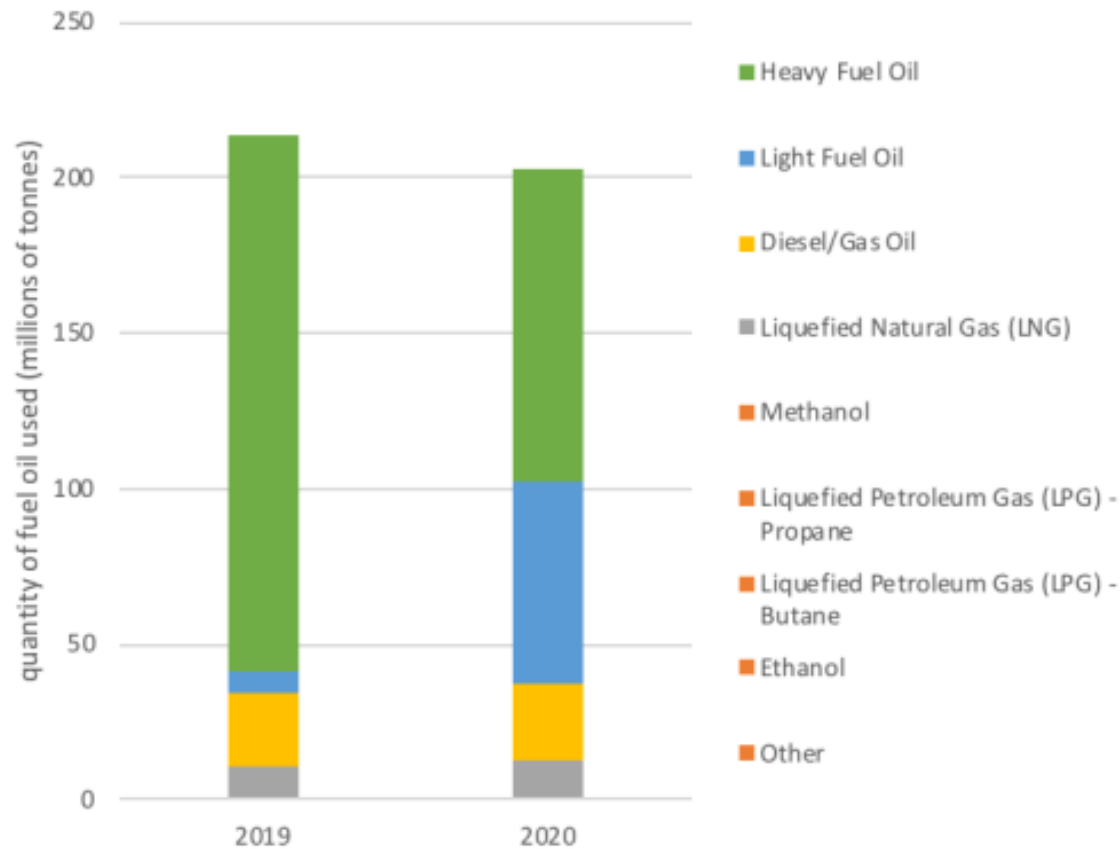


Kilde: IEA-AMF Task 60



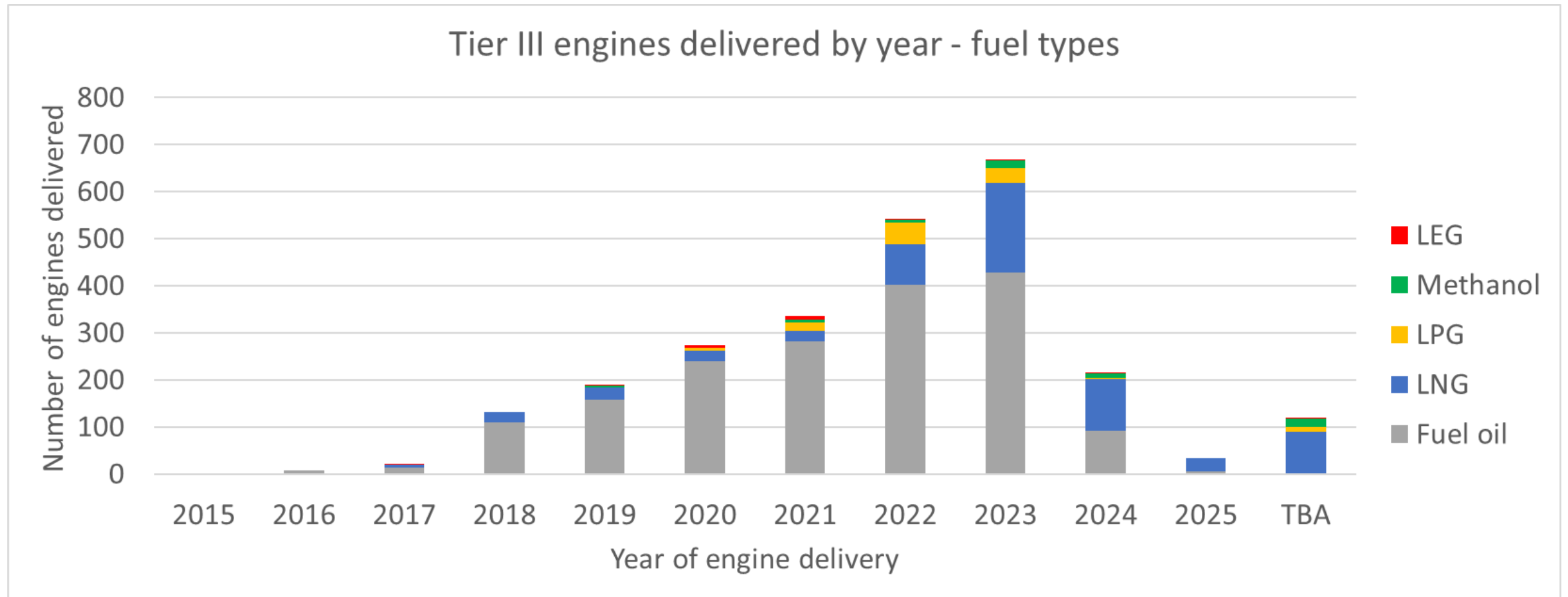
Metanol og LNG er i fremgang

Big ships only (>5000 GT)



MAN ES 2-stroke

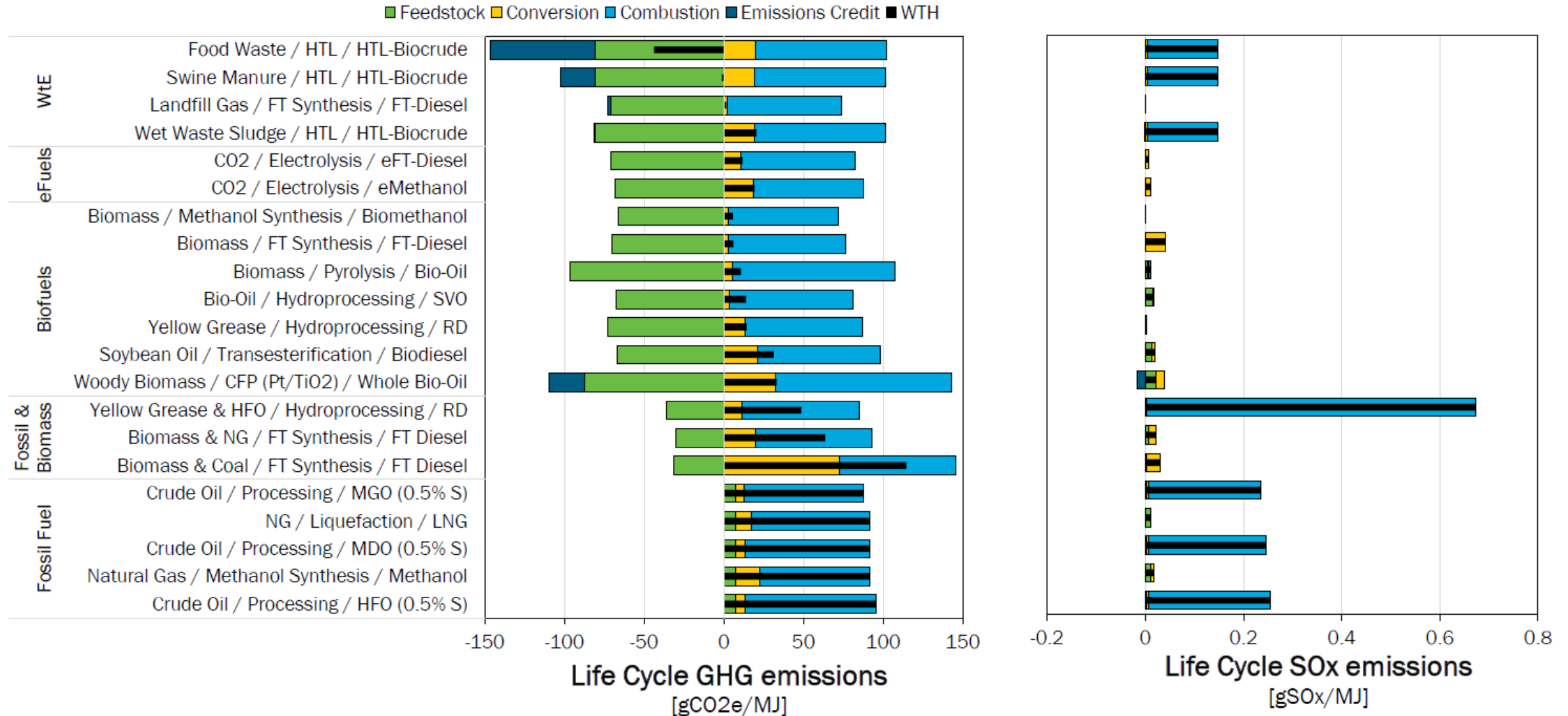
Alternative fuel engines approaching 50% OF MARKET



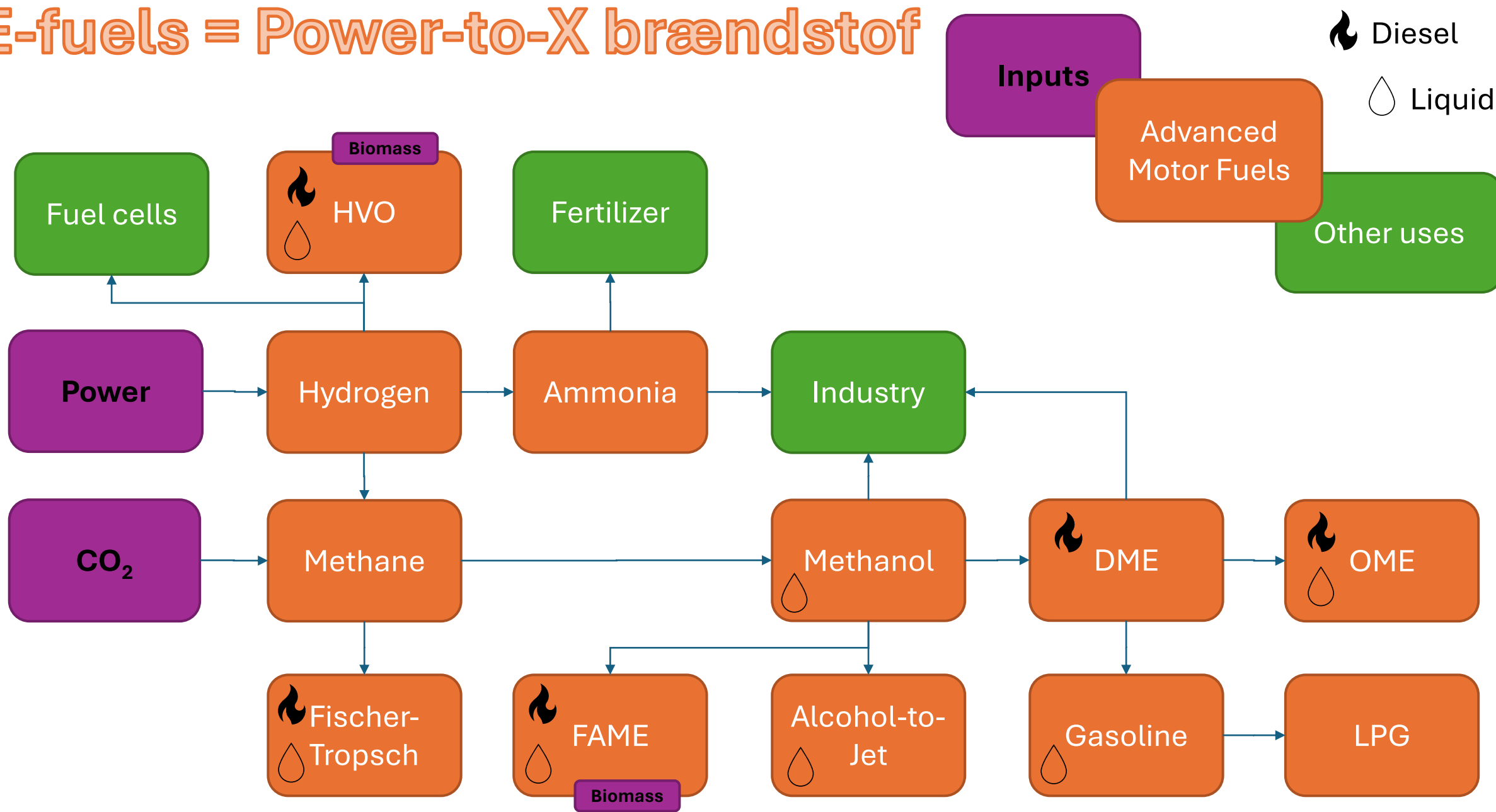
Hvad vi ser i fremtiden

- **LNG** er i stor fremgang både mht. antal skibe og total mængde LNG brugt.
- **Biodiesel** fra pyrolyse eller HTL er potentielt lovende “drop-in” brændsler.
- **Methanol** dual-fuel motorer er blevet en accepteret option for nye skibe.
- **Hydrogen** motorer er stadig en ny ting, men udviklingen går hurtigt.
- **Ammoniak** motorer er i den prekommercielle fase, men udviklingen går hurtigt.
- **Elektricitet** og batterier ender måske med at blive attraktiv for mindre skibe.

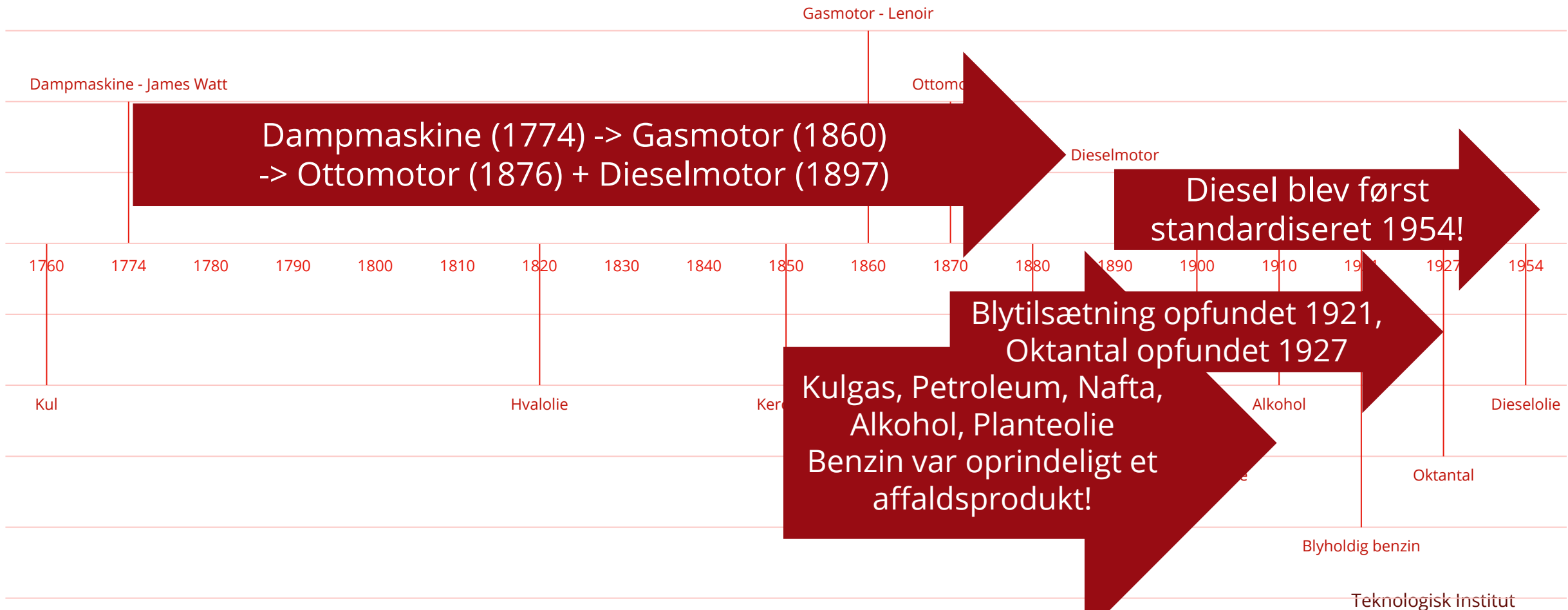
Hvor grønt er det?



E-fuels = Power-to-X brændstof



Historisk overblik

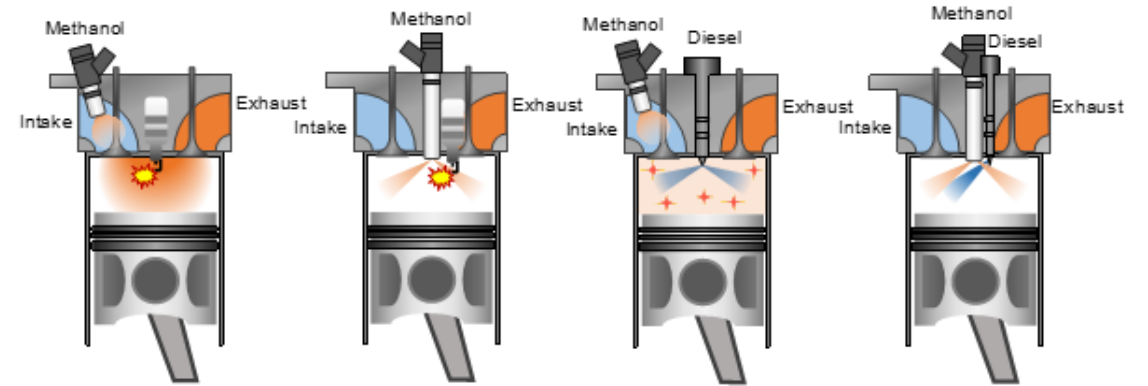




Fiskeri og småskibe i Kina



Figure 61 "Jiahong 01" methanol fuel cell powered cruise ship



SEAGLOW

A Swedish-registered 8m plug-in hybrid driveline, with electric motor for positioning and manoeuvring on lobster fishing areas, which will be moved across Sweden's Baltic coast to allow testing by local fishermen (Technology 2)



A Danish-registered hybrid methanol / electric powered 10m line-fishing boat, with electric hydraulics and hydrofoils, operating in the North Sea (Technology 1).



An Estonian registered 11.5 m net fishing boat, operating in the Baltic (Technology 3), which will be retrofitted with an e-machine.



A Norwegian 10.65 speed sjark vessel, operating in the North Sea, providing validation of the hull coating and low-cost sensors technologies

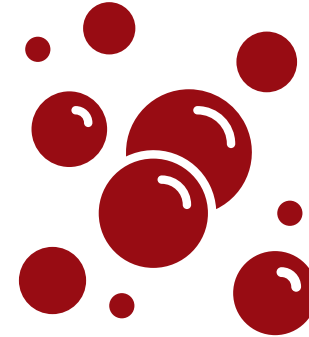
Forholdsregler ved LNG



NO SMOKING



Kuldeskader (cold burns)



Boil off

Forholdsregler ved metanol

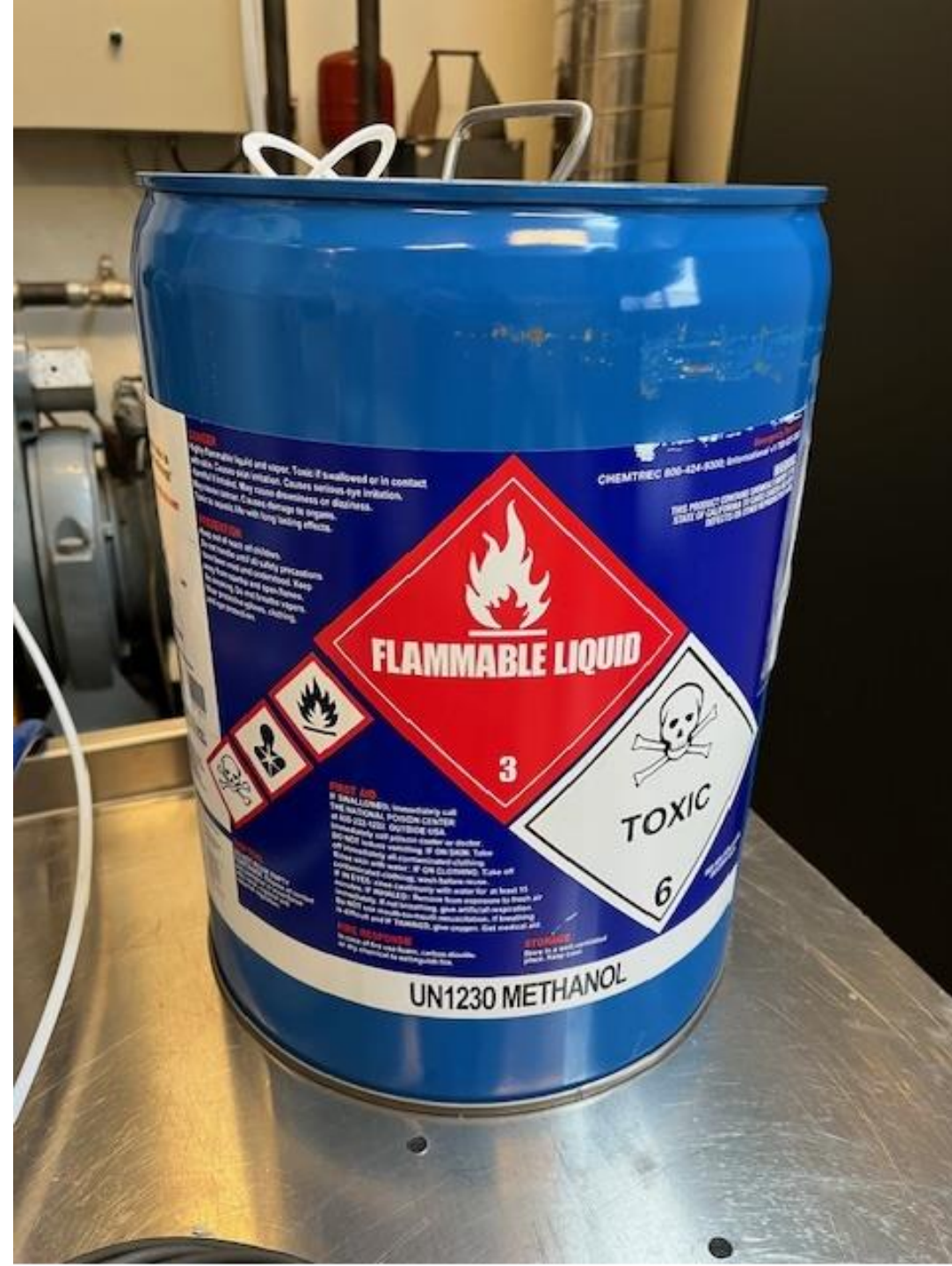
Metanol er bionedbrydeligt

Brand kan være svær at erkende pga. "usynlig" flamme

30 ml metanol er giftigt, 100 ml er potentielt dødeligt

Metanol kan optages gennem huden

Blanding af diesel, vand og metanol kan være problematisk ift. olieudskiller ved kraftig regn



Forholdsregler ved ammoniak

Giftigt

Korrosivt

Flammable Range: 15%–28% in air



Forholdsregler ved Brint

Højt tryk, op til 700 bar

Flammable Range: 4%–75% in air

Farveløs

Lugtfri

