



Knowledge grows

Clean Ammonia Marine Fuel

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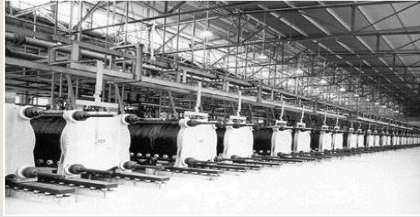
19 November 2020

Ammonia Energy Association webinar



Responsibly Feed the World and Protect the Planet

Our Ambition: towards climate neutrality



Established in 1905
Yara produced green ammonia between 1927 and 1993

History



Yara's total greenhouse gas emissions halved by almost eliminating N₂O

Past 15 years



Further improving on world leading performance by CO₂ reduction target

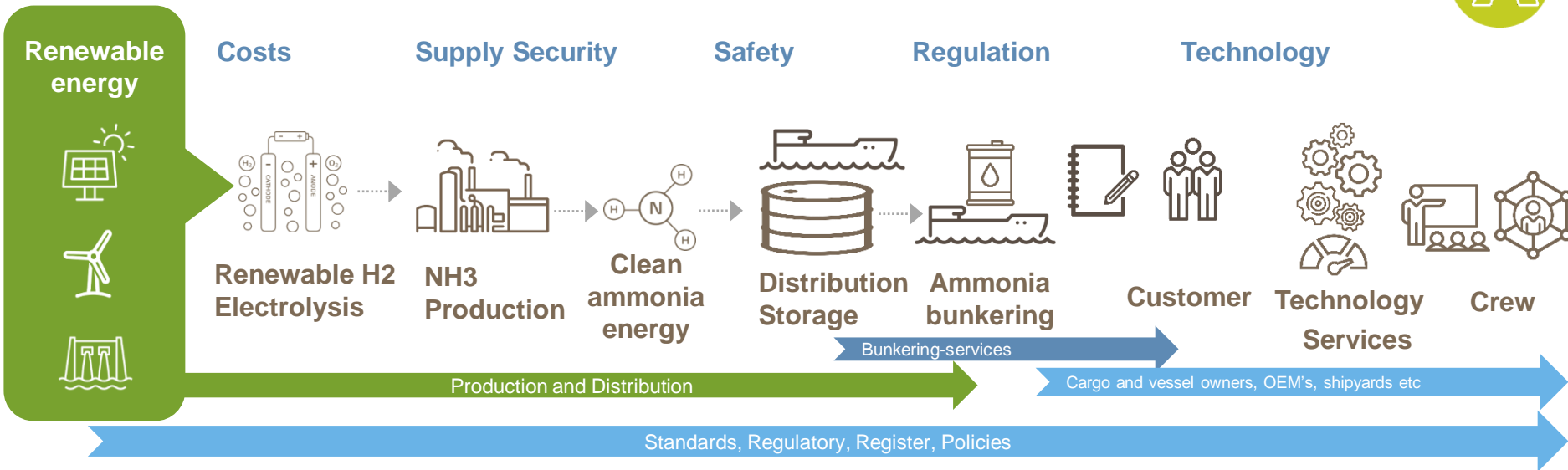
Present



Ambition to become climate neutral by 2050

Future

Clean Ammonia Marine Fuel – turning barriers into possibilities



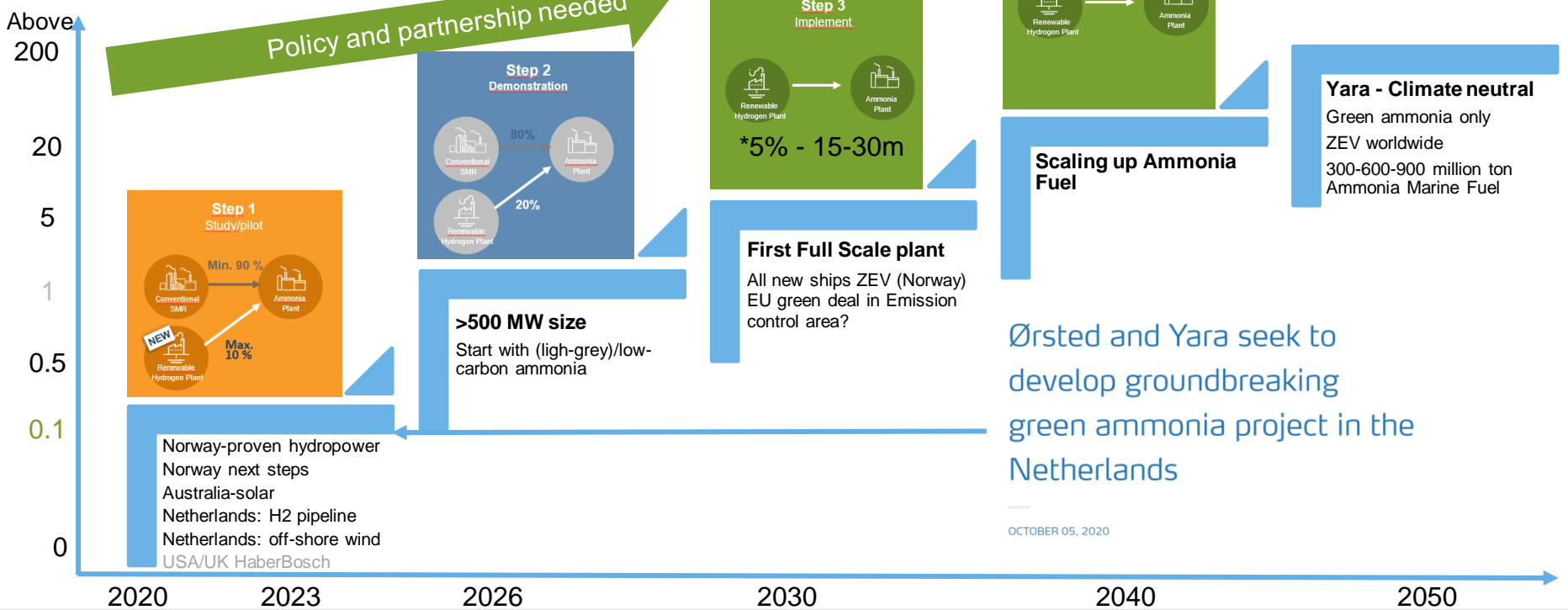
Costs: Industry system integration: Scale-up renewables and hydrogen economy
 Ammonia ideally positioned to link land-based industry with shipping (lower-carbon NH3 for ZEV)

Security of Supply: Yara is a global leader in ammonia logistics

Safety/Regulation: ammonia industry's knowledge (decades) a good starting point for on-board implementation

Costs: Step wise approach towards clean ammonia marine fuel

Green Ammonia Energy & Marine Fuel
(million ton/a)



Above 200
20
5
1
0.5
0.1
0

2020 2023 2026 2030 2040 2050

Grey ammonia is on-par with LNG with respect to well-to-wake GHG emissions, already truly zero in tank-to-wake (Amonfuel August 2020 by HaldorTopsoe et al.; Trafigura/Texas A&M September 2020)
 Freeport Texas: 900000 MT lightgrey; Hull 300000MT light grey
 *ETS 5% = 15-30 million MT NH3 by 2030 (50-100% of ZEV fuel)



Supply: Yara is unique with presence in the whole ammonia value chain

Producer

- Total ammonia production including JV share ~ 8 million tons / 26 units
- High level of know-how of Yara plants (1 unit now +/- 5 yrs in contin. operation)
- Lower gas consumption compared to other producers

Exporter

- 4 fully-owned ammonia export plants in Europe (export cap. ~ 1 mln t)
- Yara JV ammonia export capacity ~ 2,7 mil t
- Yara Industrial Solutions truck/train logistics expertise

Fleet & storage

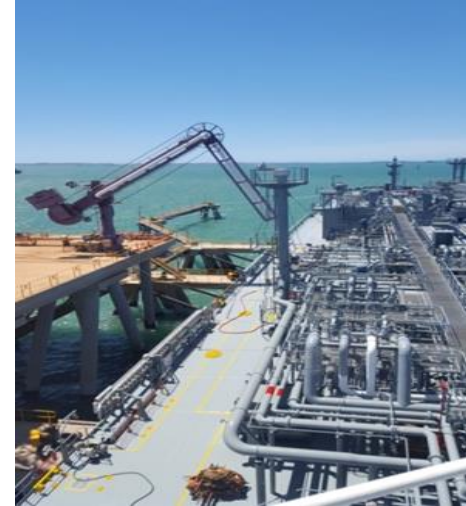
- Yara NH3 maritime transport capacity > 200 kt (momentum)
- Own storage ammonia capacity 580 kt
- 18 marine ammonia terminals

Importer

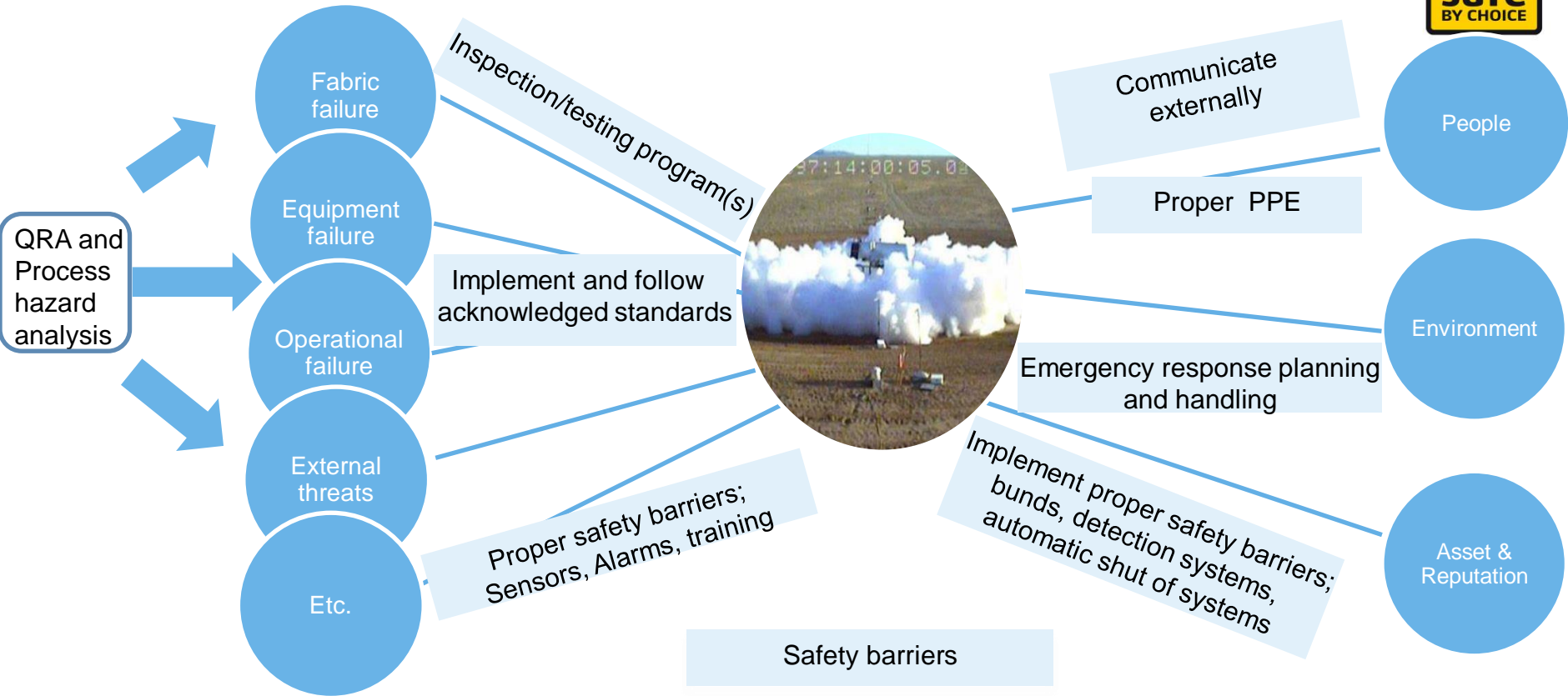
- World's largest importer with total imports of ~ 2 mln t / year (2019)
- Flexibility to produce or import ammonia

Trader

- Truly global
- Truly international
- With own back-up supply system



Safety: Quantitative Risk Assessment as basis to manage the risk



Key take-aways

- Safe ammonia production, storage and logistics is proven at scale
- Green ammonia production is in planning and engineering stage
- Grey ammonia is a de-risked starting point
- Back to the Future: ammonia energy for food and fuel



The future
will be different...

