



Knowledge grows

Green hydrogen feed for Haber Bosch ammonia synthesis



The Opportunity



Yara - the Crop Nutrition Company for the Future

220 million

people our products
help to feed

20 million

The number of farmers we
collaborate with

9,000

Fully branded retail outlets¹

870

Agronomists on
the ground

No. 10

Yara has been ranked no. 10
among the 50 companies on
FORTUNES' prestigious
Changing the World List²

+60

The number of countries
we operate in

+16000

The number of
people we employ



¹Owned and operated by external parties

²Fortune List rating dates back to 2017

We deliver a complete portfolio of offerings

What
We
offer

Crop
Nutrition
solutions



Industrial
solutions



Environmental
solutions



Ammonia

Urea

SSP

Nitric Acid

Nitrates

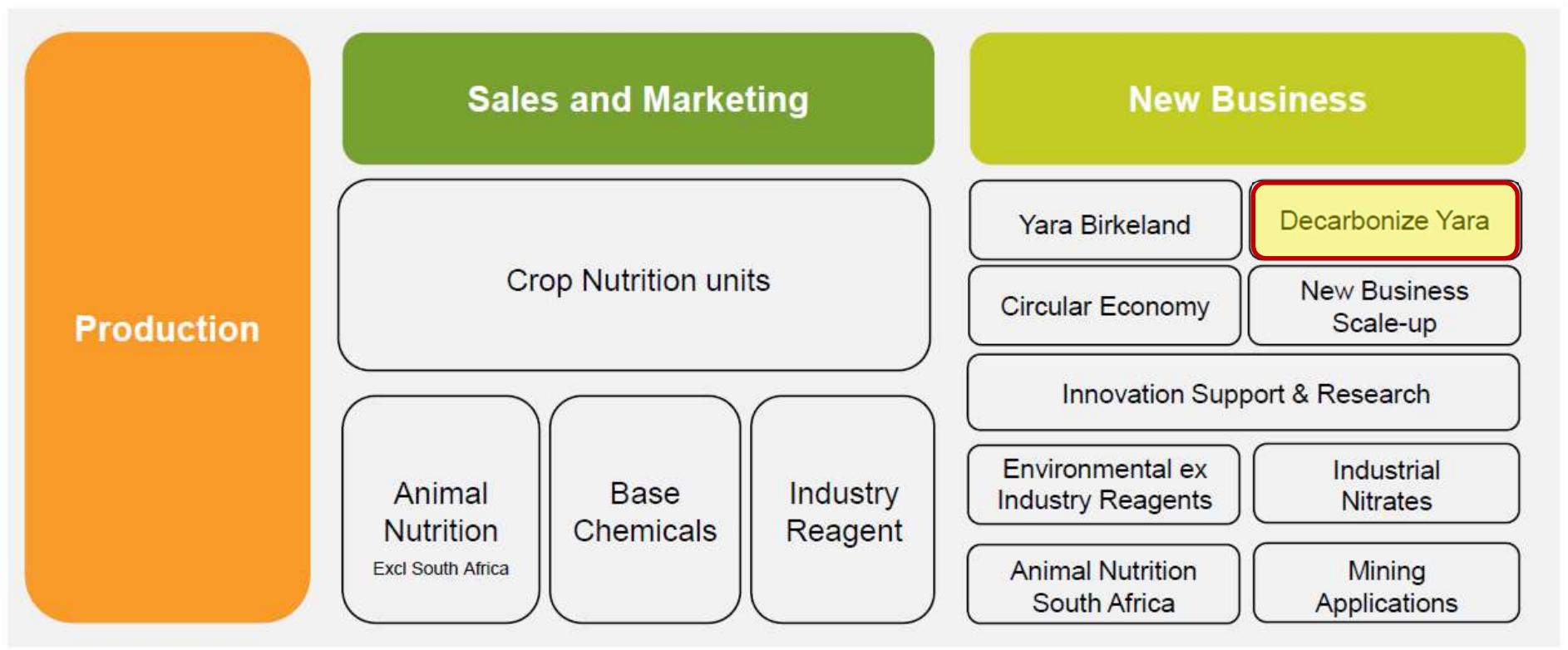
NPK

CN

TAN



New segment structure effective 1 January 2019



Our Ambition: towards climate neutrality



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



Improving on world leading performance:
10 % reduction ton CO₂/ton N by 2025



Ambition to become climate neutral by 2050

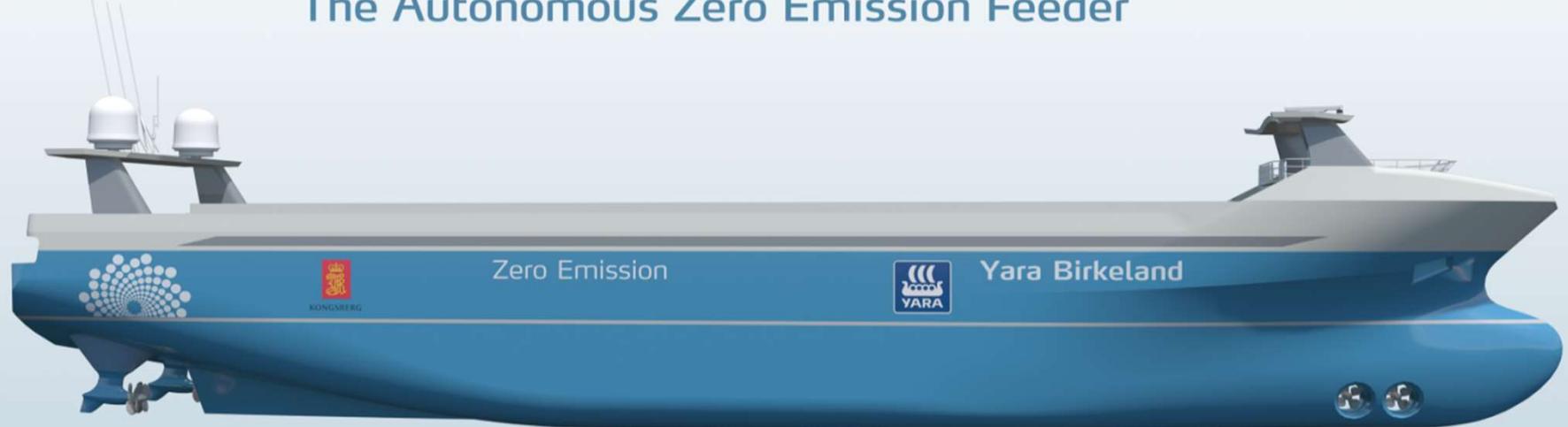
Past 15 years

Present

Future



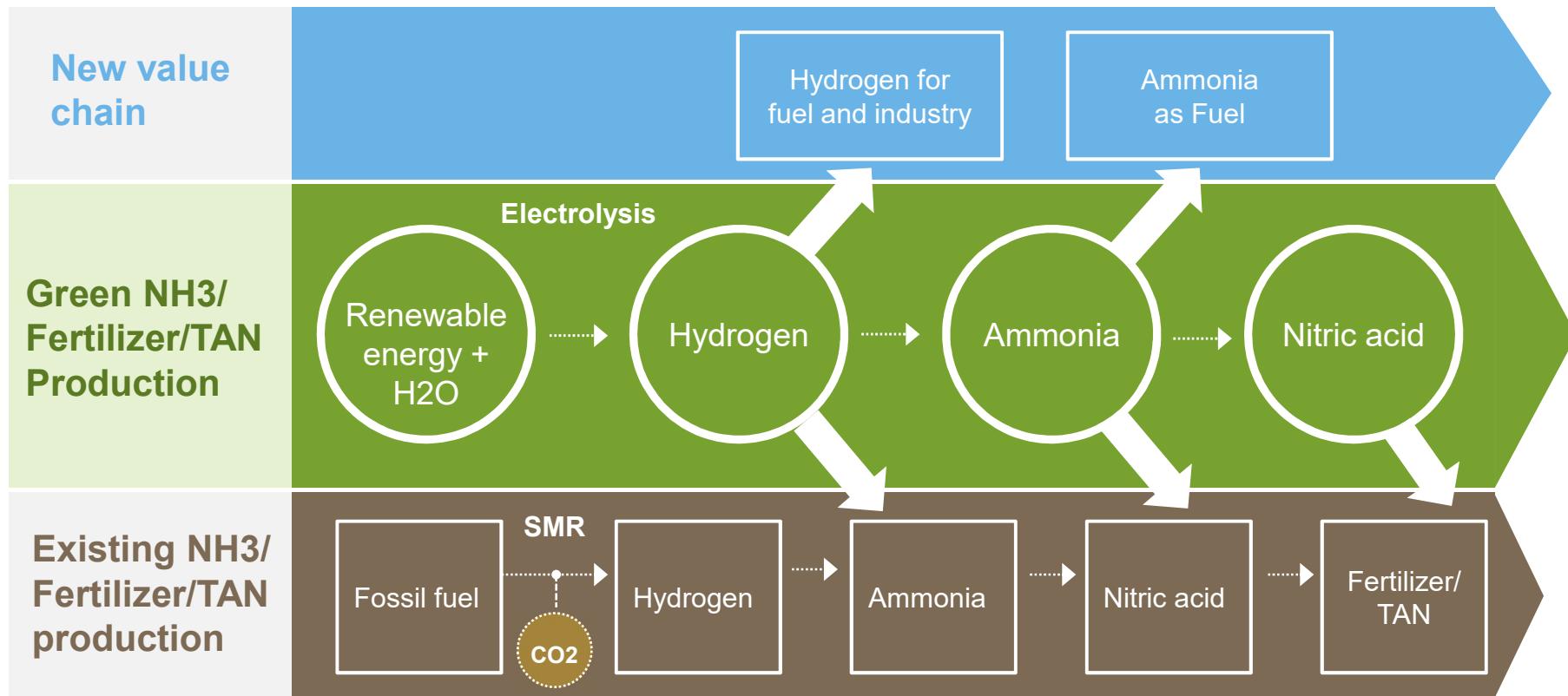
The Autonomous Zero Emission Feeder



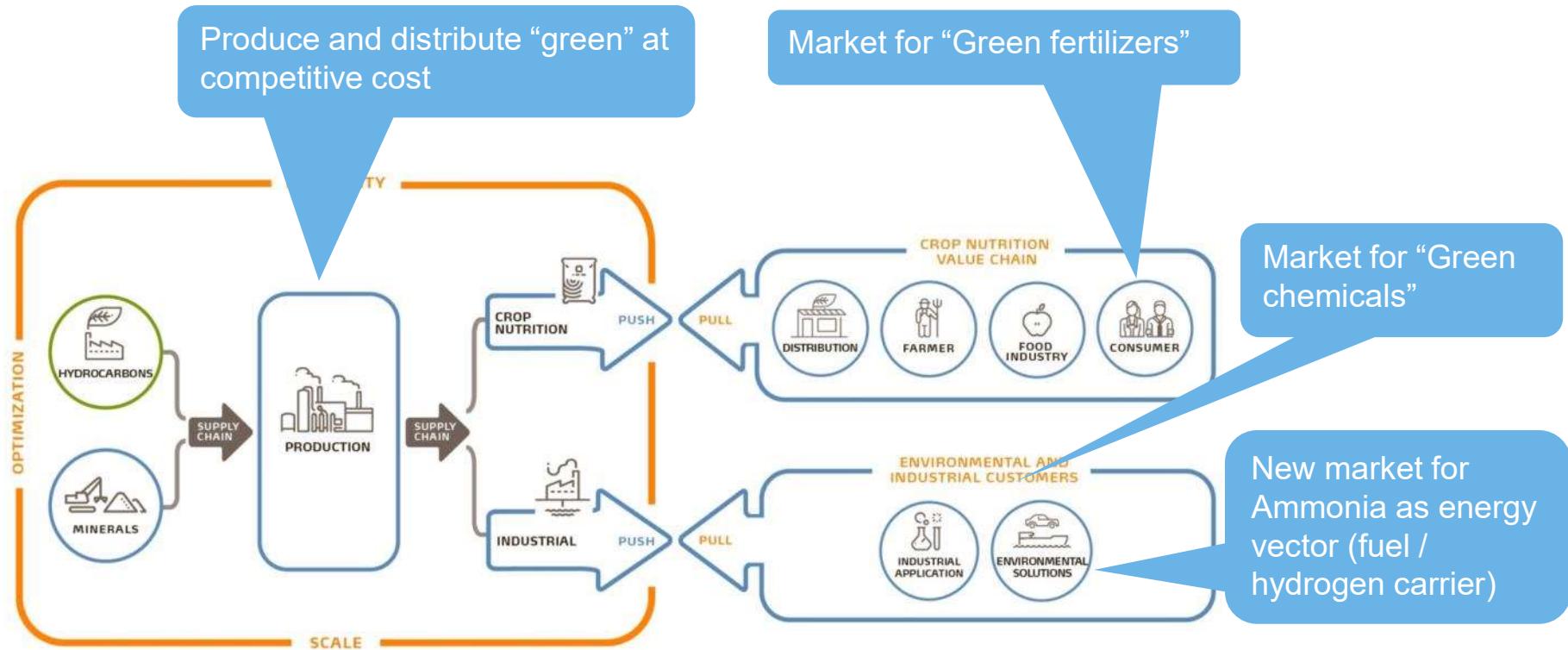
100% electric - fully battery powered
Ballast free - for the marine environment



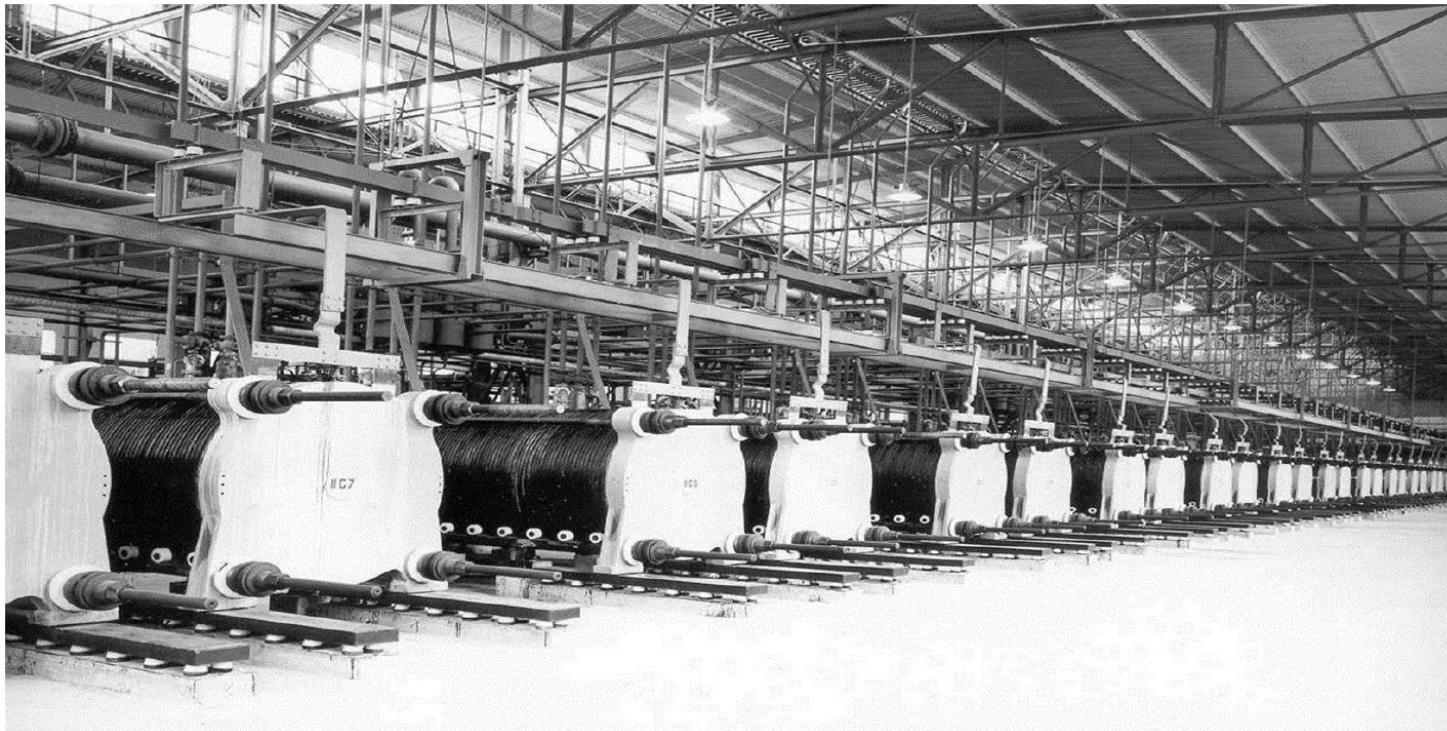
A Green Transformation via Hydrogen & Ammonia to Fertilizer



Opportunities created by Yara's integrated business model



Back to the future: Yara Norway until 1991 155MW electrolysis based 'green' ammonia production



Picture: courtesy of Nel Hydrogen ASA

Notodden: 1927 – 1968; Rjukan: 1929 – 1971; Glomfjord: 1953 - 1991

Pilbara (WA) a place for green H2/NH3..

- Abundant stranded renewable energy resources – allowing renewable based industry as hydrogen and ammonia
- Unoccupied vast land availability..
- Renewable energy converted to hydrogen – the best hydrogen carrier is ammonia :
- Yara Pilbara ammonia facility – convert green H2 to green NH3.
- Close to key import markets for carbon-free energy
- Local opportunities, Supportive Policy & Care for the Environment

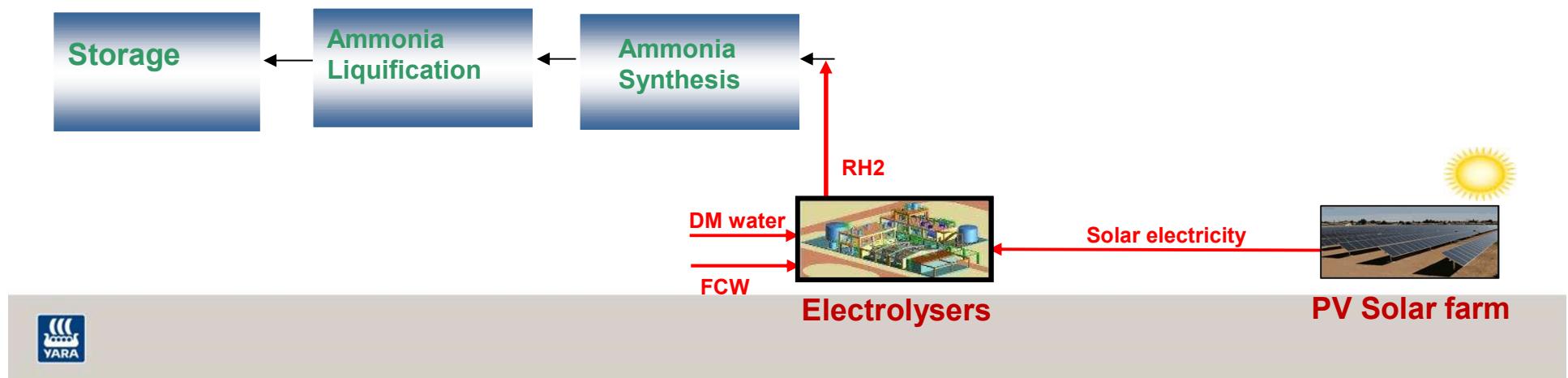


Yara and ENGIE – The Pilbara Partnership on green hydrogen & ammonia

- Collaboration in expertise
- Hydrogen produced linked to existing Yara Pilbara plant - Haber Bosch ammonia synthesis
- Mixed with Nitrogen to produce green ammonia for export
- Potential ~\$200 million demonstration project
- Up to 100MW solar field / 66MW electrolysis plant
- **Springboard for future projects, local and global**



RH₂ Integration in Ammonia production

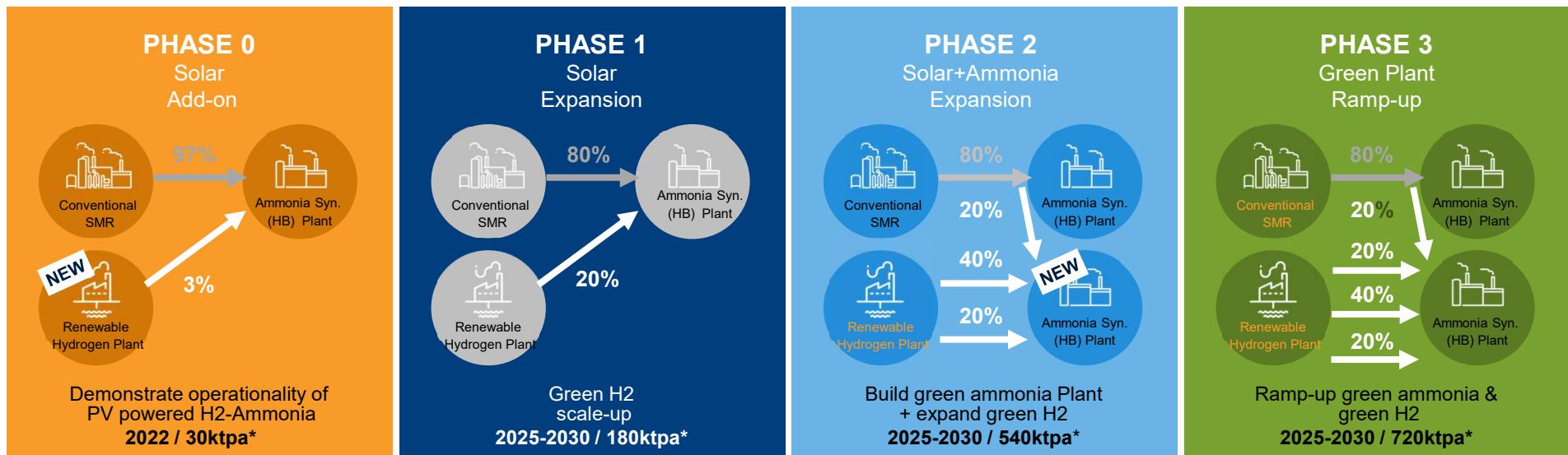


Ready to connect: Green H2 for Ammonia synthesis

- Tie-ins installed, so that we are ready at any time to introduce the green hydrogen into our existing facility



Potential ramp up of green ammonia production in Pilbara



* Expected time to market / volumes of green ammonia

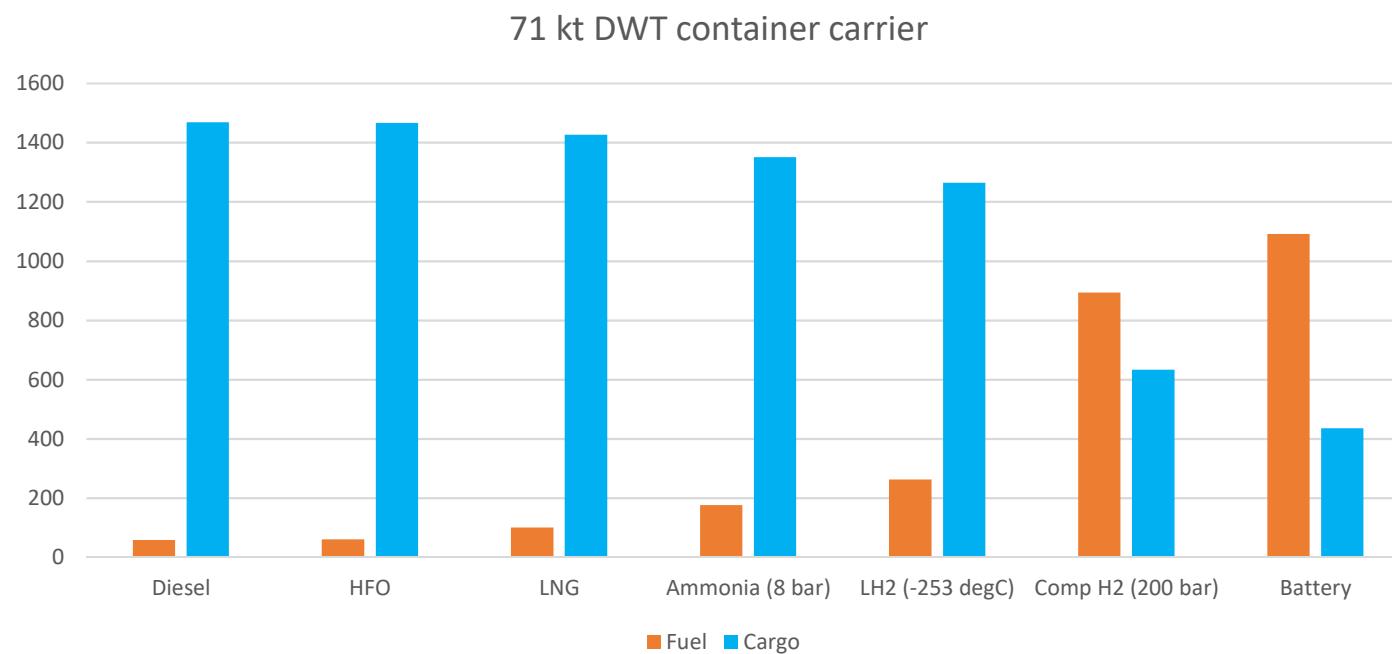
Export Capability Yara Pilbara



- Yara Pilbara sells over 800,000 tonnes of ammonia per year
- Average 33 shipments per year from nearby Dampier Port
- **Leveraging on the world leading Yara position in ammonia trading and naval logistics**

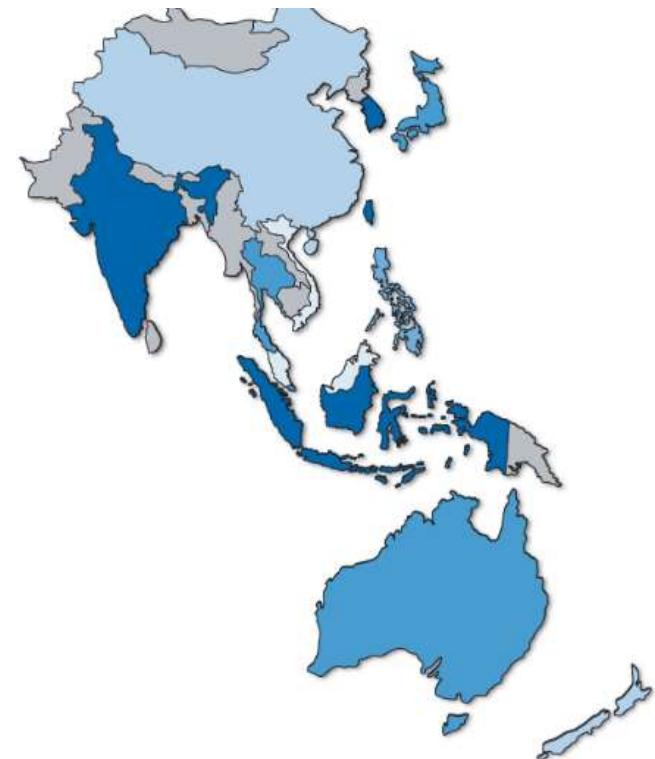


Ammonia as hydrogen carrier - Better than hydrogen itself



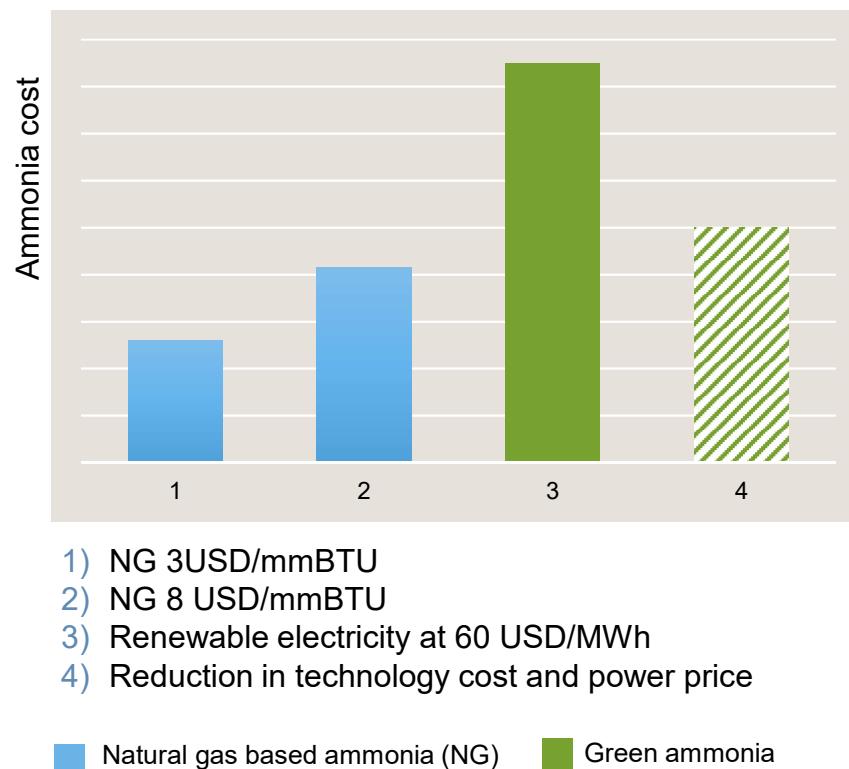
Export Opportunities

- The Green Ammonia Consortium in Japan estimates demand for direct use of **green ammonia to reach 1.7 mtpa in 2030** – GAC Meeting, July 2019
- Korean government plans increase in the number of hydrogen-powered vehicles on the road to 6.2 million in 2040 – Korea Times, January 2019
- China plans to build four hydrogen corridors in the Yangtze River Delta...by 2021 – China Daily, May 2019
- CSIRO technology to convert ammonia back into hydrogen



However, currently cost of green ammonia significantly higher than conventional

- To reach cost parity for massification:
 - renewable electricity prices will need to come down (<20 USD/MWh)
 - value of avoided carbon needs to reach > 150 USD/ton
 - Electrolyzer technology cost to come down
- Depending on local conditions and the need for investments, the relative difference might exceed what is illustrated



Closing the gap is essential to start with first-of-a-kind projects

Market demand and mechanisms

- Green Premiums (in progress) & consumer carbon incentives or tax
- Green Nitrogen Certification (in progress)

Synergies with local opportunities

- Synergies with hydrogen for mining or injection in gas pipelines

Land

- Access affordable land for solar power is critical

Infrastructure, public funding and incentives

- Providing “CO2 reduction” incentives, either CAPEX grant or even more effective, annual operations subsidy per ton reduced CO2 compared to a baseline (under preparation Netherlands)
- ARENA providing opportunities for substantial and absolutely necessary investment support – uncertain on extent of grant
- Attractive financing conditions

**The renewable future we are working towards
will impact all our segments and solutions,
and we at Yara are proud to be part of this
innovative and collaborative future.**





The future
will be different...

