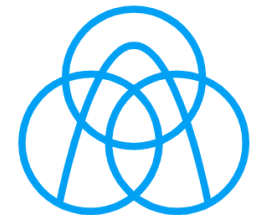


# Rapidfire: Ammonia for Steel

Hady Abdulhady – thyssenkrupp Uhde

engineering.tomorrow.together.



thyssenkrupp

# Technologies from thyssenkrupp for the Hydrogen society • They are all connected



## Green Steel

For direct reduced iron large amounts of clean **Hydrogen** are necessary in order to replace coal as reduction agent. Green hydrogen, produced with green **electricity** leads to carbon-neutral steel.

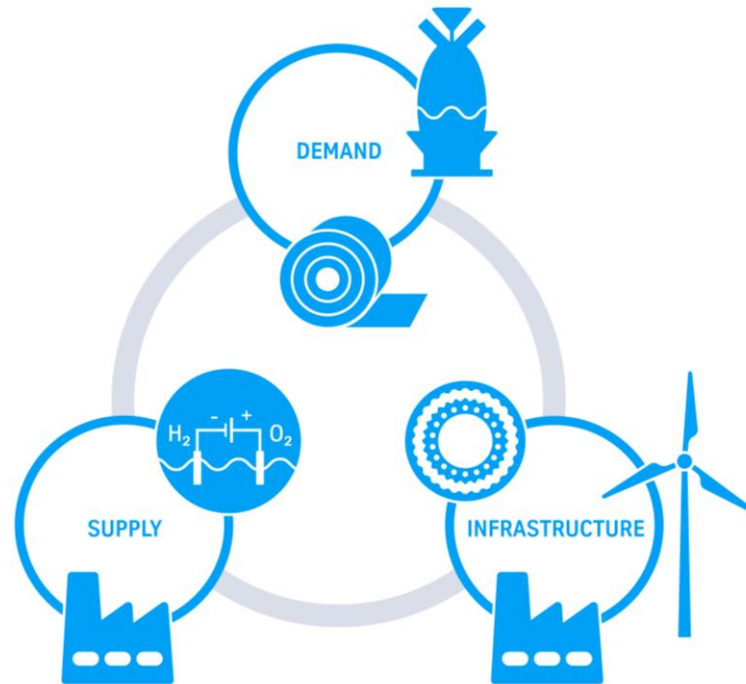
Demand



## Electrolysis

The world-scale electrolysis plants of thyssenkrupp nucera operated with green **electricity** are the starting point for green **Hydrogen** and therefore the basis for green steel as well as green chemicals.

Supply



## Renewable wind power

thyssenkrupp rothe erde is one of the global market leaders for innovative main bearings for wind turbines – enabling the boom for **renewable electricity** production.

Infrastructure



## Ammonia and methanol

**Ammonia** and **methanol** are not only clean future fuels but also **Hydrogen** (and therefore energy) **carriers** as ammonia can be converted back to hydrogen w/o CO<sub>2</sub> emissions.

Infrastructure



# With Hydrogen to climate-neutral steel

The thyssenkrupp routes to climate-neutrality

Available quantities of climate-neutral steel (per year)

from 2022-2024  
50-500 kt/a



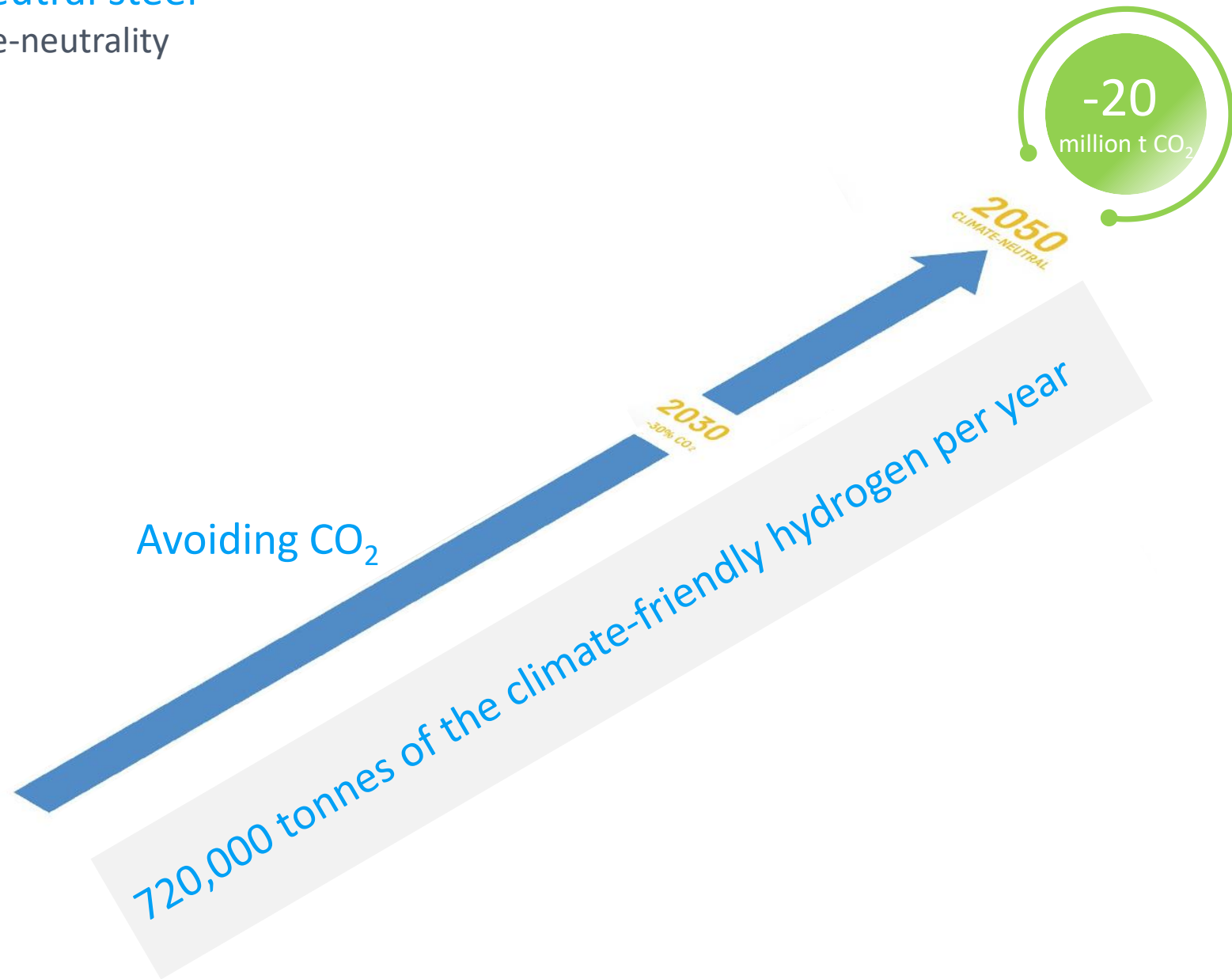
from 2025-2029  
1 million t/a



2030  
3 million t/a

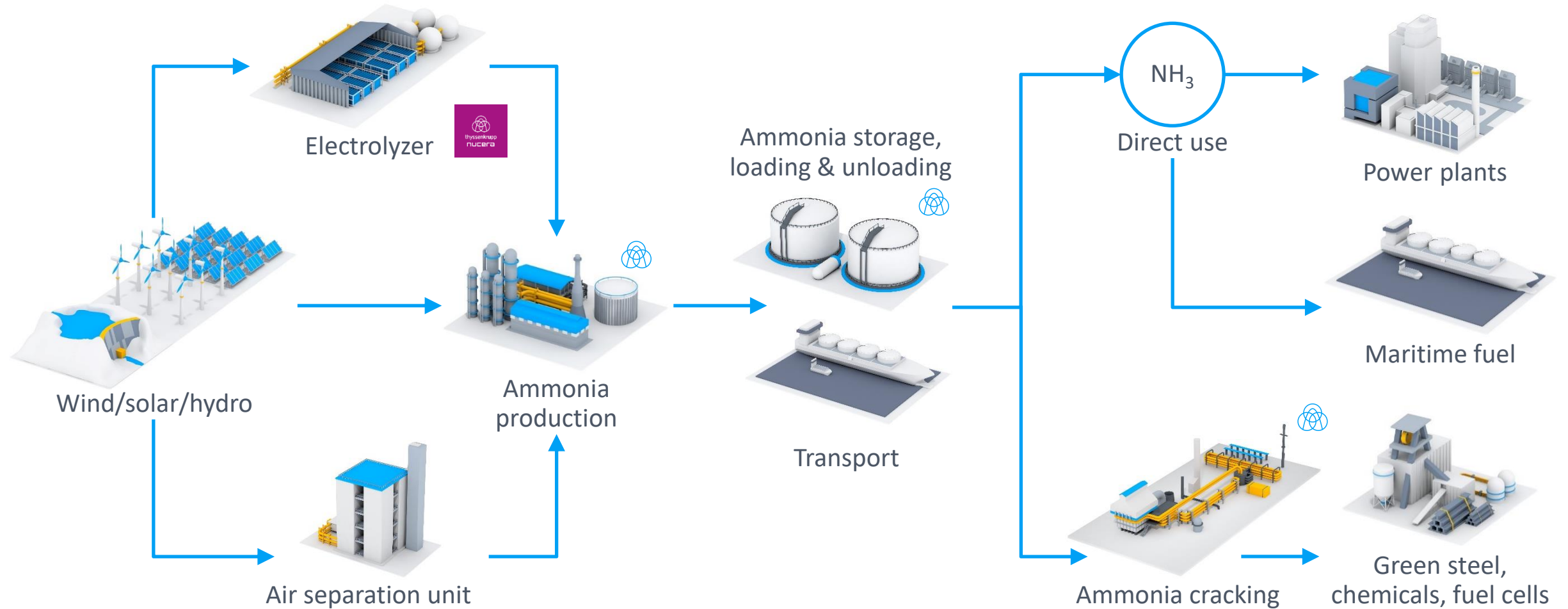


2050  
11 million t/a



# Green ammonia as energy carrier – Set up along the whole energy supply chain

The complete solution from one source

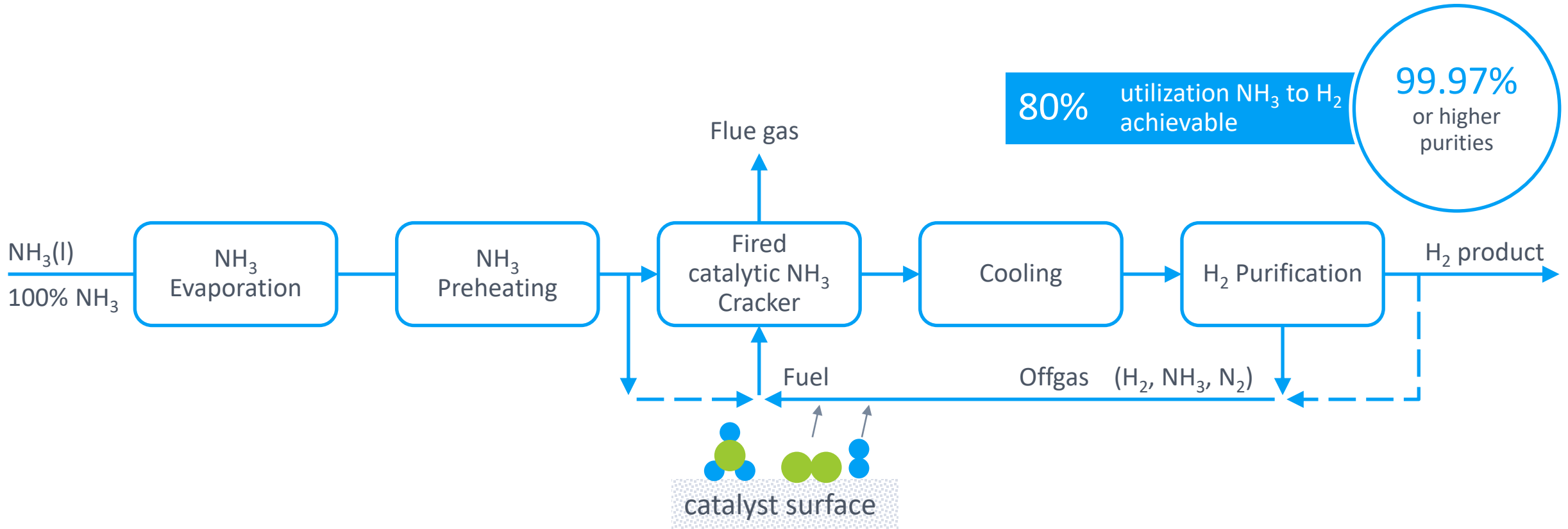


Ammonia usage for energy transport, utilization as energy carrier or re-conversion to hydrogen



# Hydrogen from Ammonia - Ammonia cracking

thyssenkrupp Uhde developments



- Based on Uhde's well proven SMR prop. equipment
- High catalytic NH<sub>3</sub> conversion to H<sub>2</sub> (Over 98%)
- Purities adaptable to requirements of user



- Best Available Techn. for flue gas cleaning (NO<sub>x</sub>/N<sub>2</sub>O)
- Low turndown ratios possible (below 10%)
- Designed for large scale solutions over 3,000mtpd



Thank You

Questions?

