Ammonia Value Chain – Production and Application

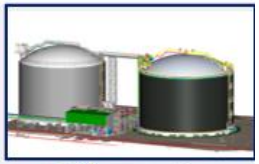
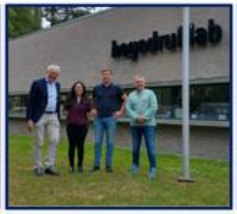
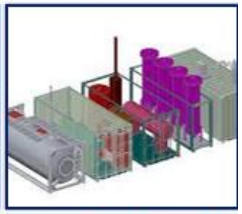
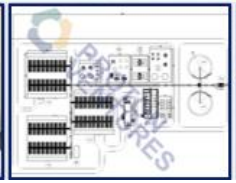
Cheng Liang & Jonas Rechreche

Final Workshop, CNH2 Puertollano, Spain, 26-03-2025

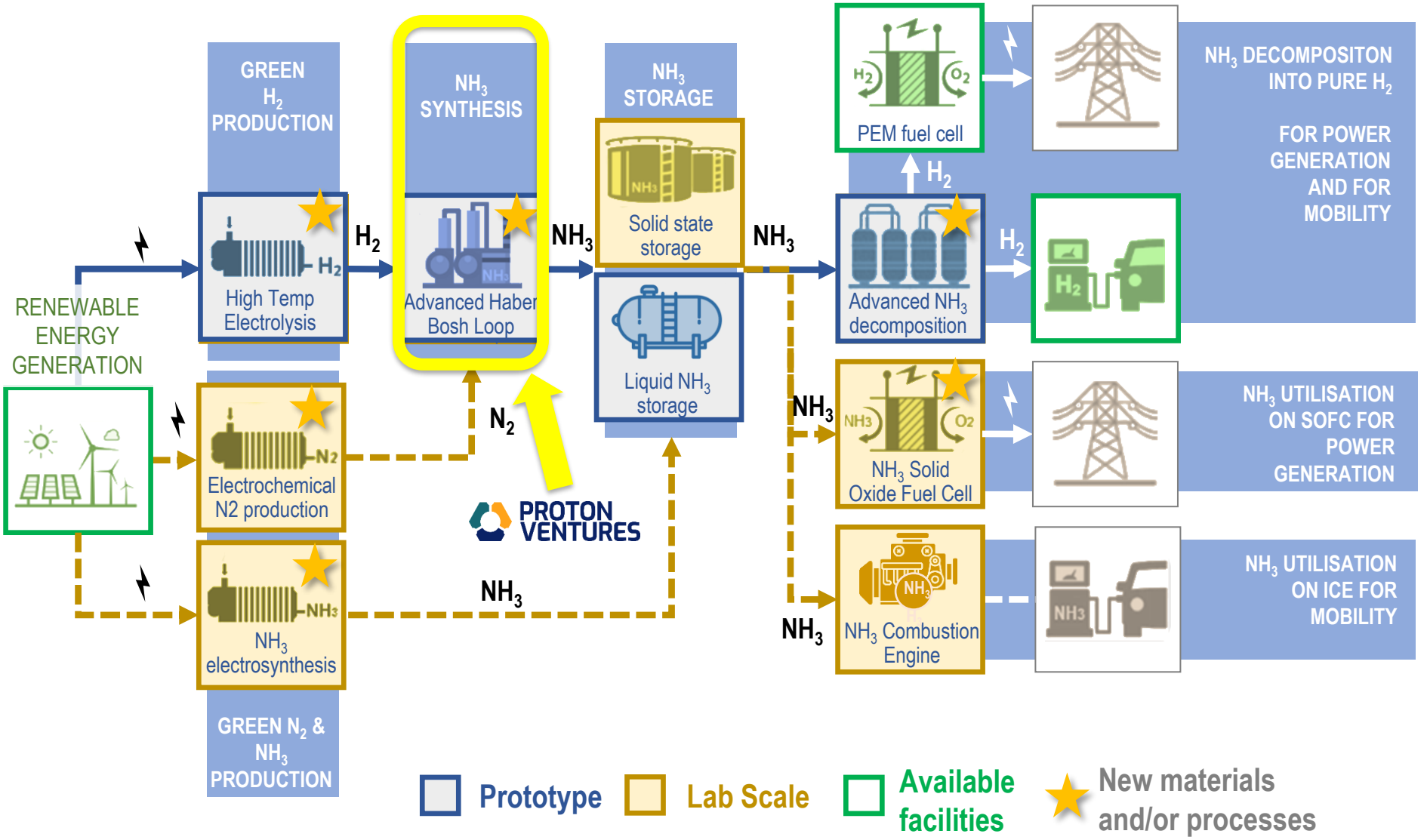
This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 862482

areNH3a

About Proton Ventures
(Ammonia Value Chain References)

Segment	Subsegment	References
Ammonia solutions	Storage & (un)loading	   
	Green ammonia production (<100 MTD)	  
	Green ammonia production (>100 MTD)	
	DeNOX	
Innovations	Green Hydrogen / Ammonia	    
	Ammonia cracking/combustion	
Project development	Storage & (un)loading	    
	Green ammonia production (>100 MTD)	
	Other initiatives	

Power-to-ammonia-to-usage value chain in ARENHA



areNH3a

Our Progress

2020 - 2022

Ammonia Synthesis Loop Modelling

PROTON VENTURES

2022 - 2023

Advanced Ammonia Synthesis Loop Design Patent Filed

(No. 2031757)

PROTON VENTURES

2023 - 2025

Design and Construction of an Advanced Ammonia Synthesis Demonstration Unit

PROTON VENTURES

DTU Technical University of Denmark

Centro Nacional del Hidrógeno

DEMCON SUSTER

CLARIANT

Coraltech

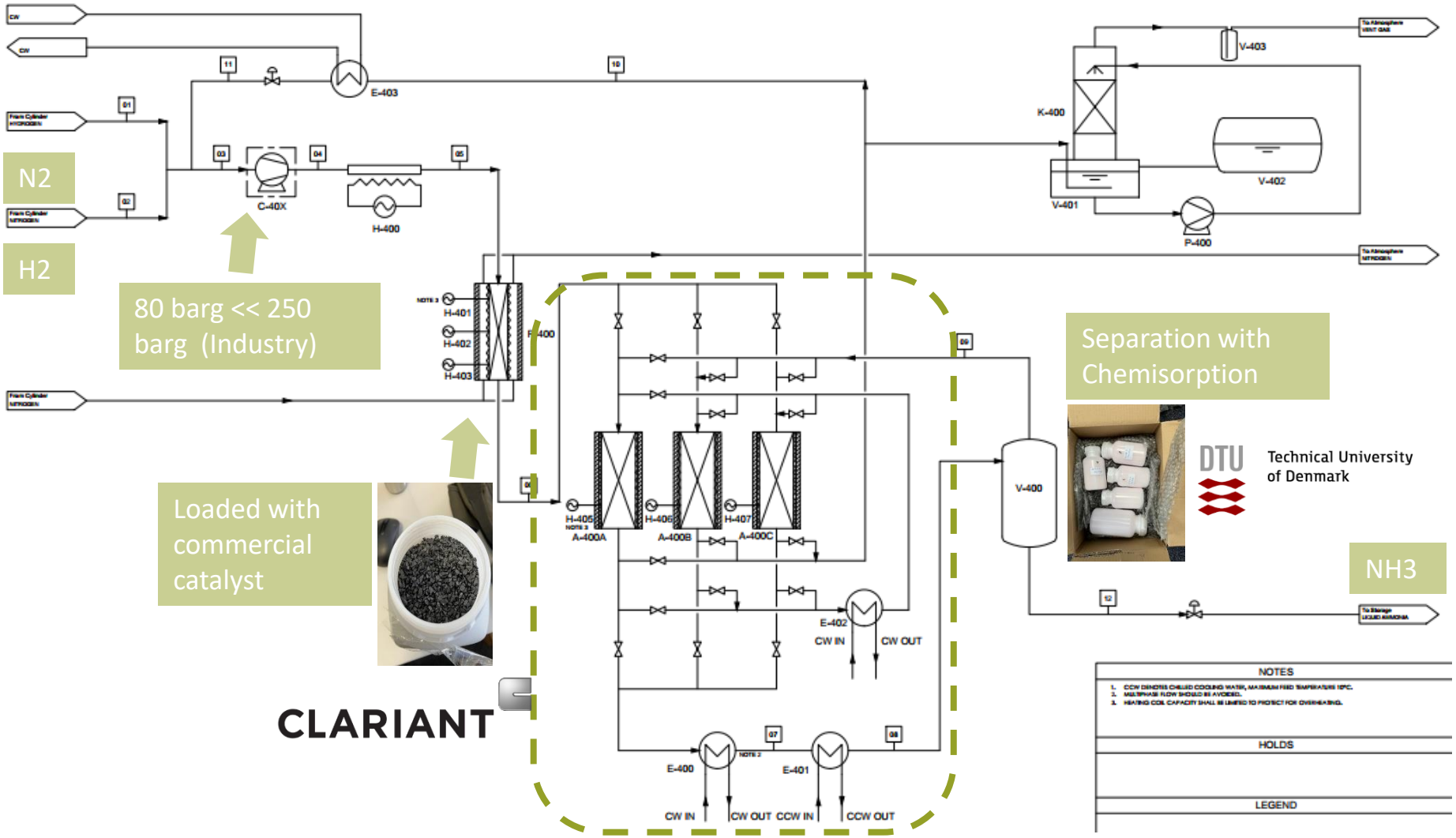
K-TAINER

BBR

areNH$_3$a

From Scratch: Advanced Ammonia Synthesis Loop Unit

10 kg/day of ammonia production



To Demonstration Unit - 10 kg/day of ammonia production

areNH$_3$a

To Demonstration Unit - 10 kg/day of Ammonia Production

(A video of our Factory Acceptance Test (FAT) in the Netherlands)

areNH3a

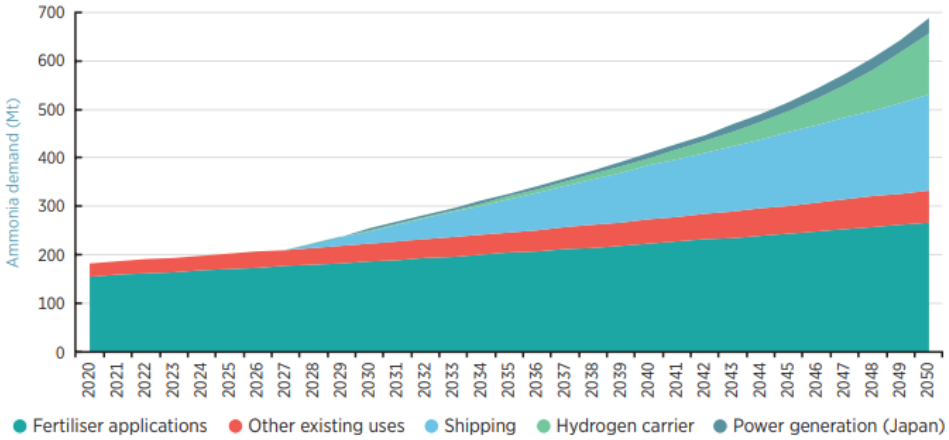
100MW solar power plant in the Netherlands

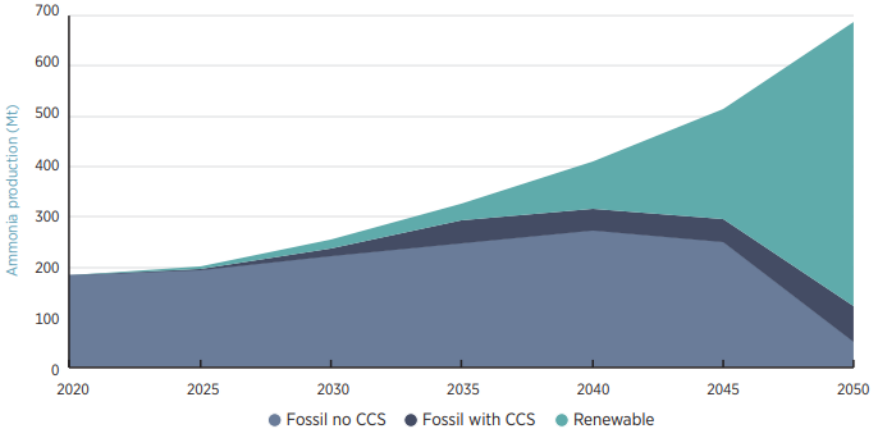
40kT ammonia storage tank

How long would it take for the solar power plant to produce enough energy to fill up the tank?

4,5 years

Long-term Market context





areNH$_3$a

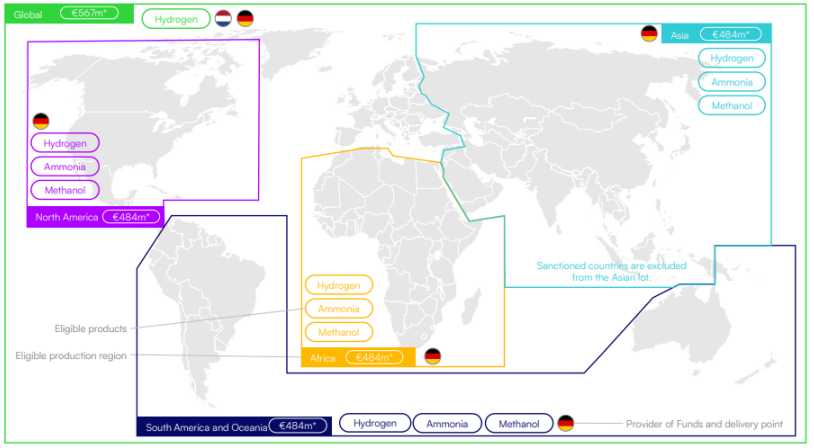
RePowerEU & RED III

RED II
10MT/y H2 imports by 2030

42% of hydrogen used in industries by 2030 should be RFNBOs

60% of hydrogen used in industries by 2035 should be RFNBOs

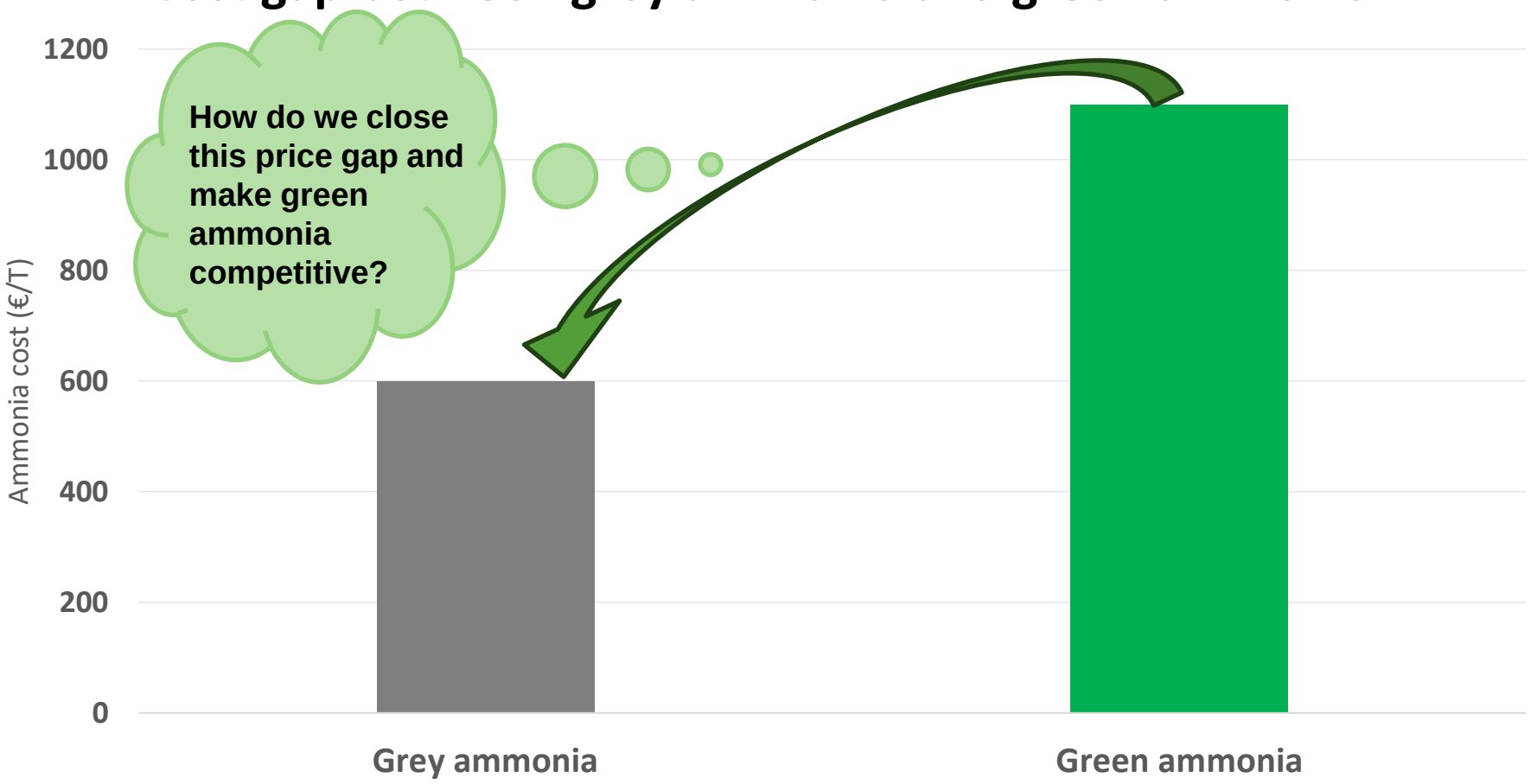
H2Global



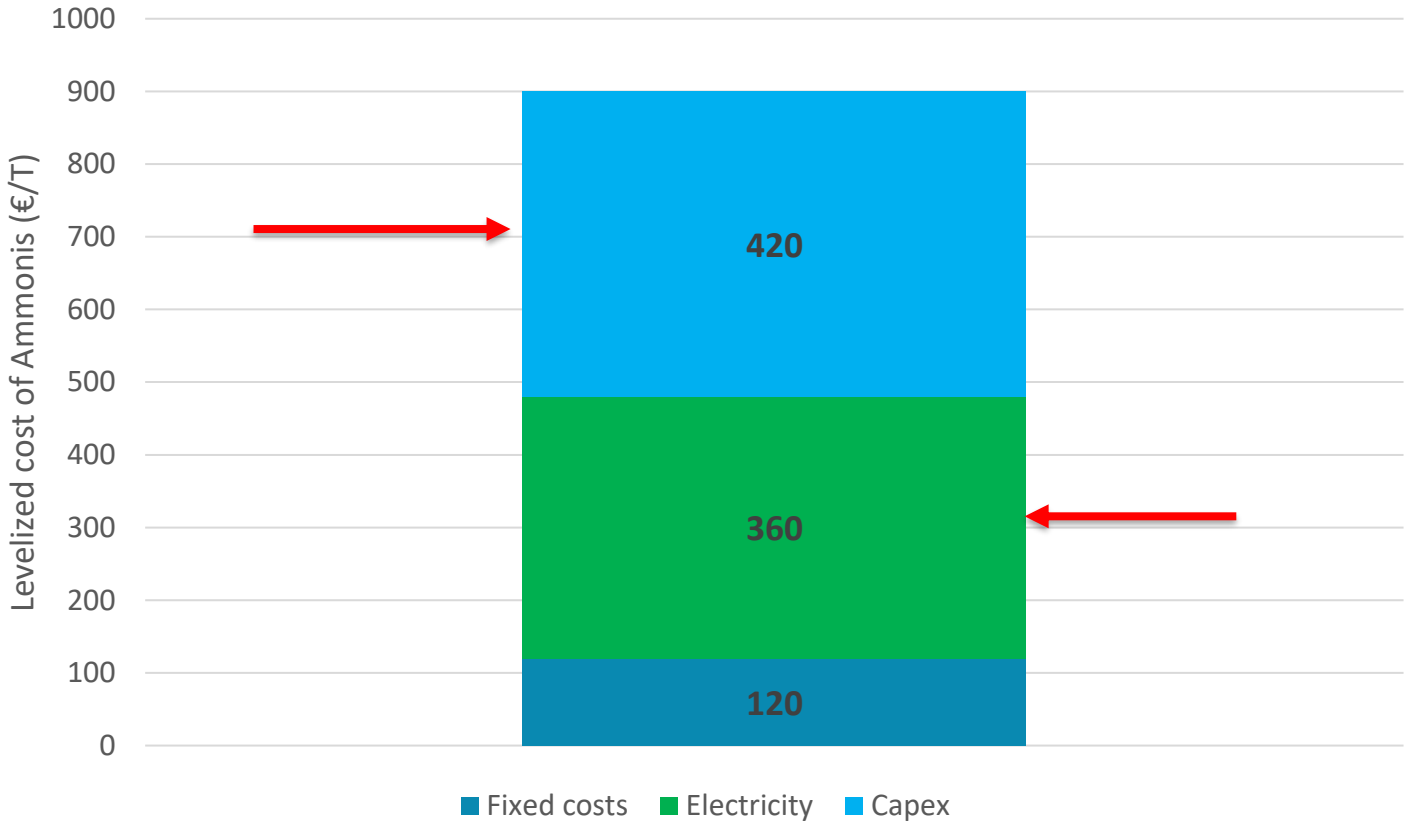
The funding countries, Germany and the Netherlands, as well as sanctioned countries are excluded from the global lot.

areNH3a

Cost gap between grey ammonia and green ammonia

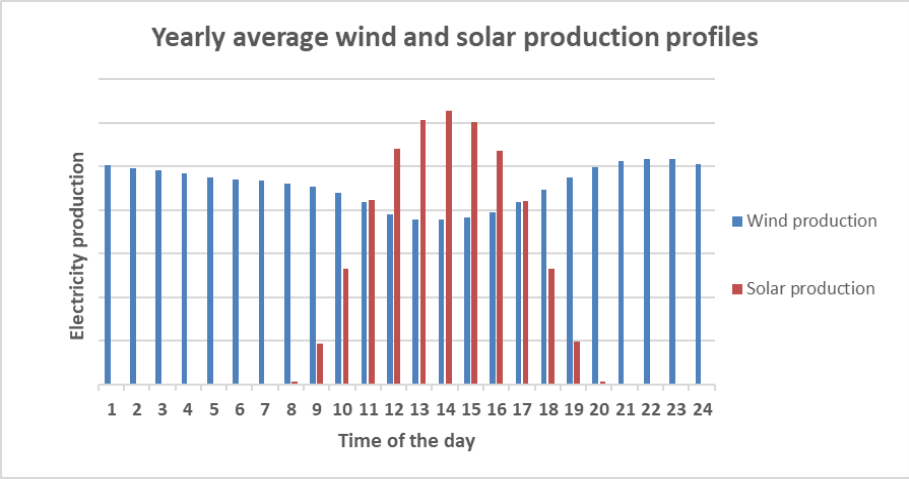


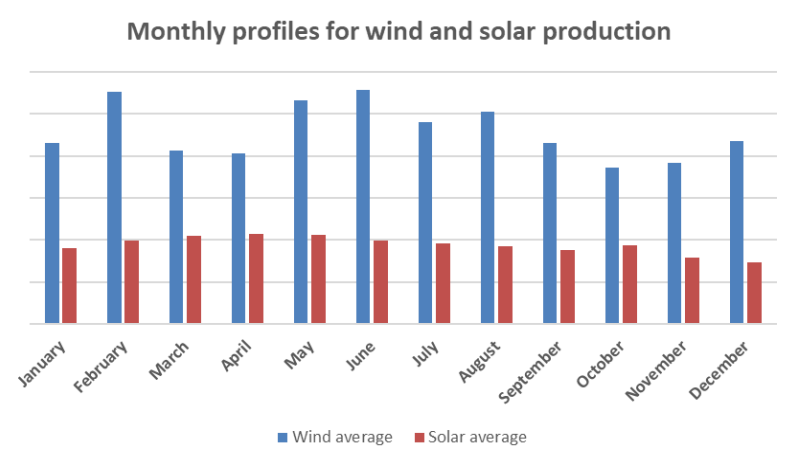
Breakdown of the levelized cost of green ammonia production



areNH3a

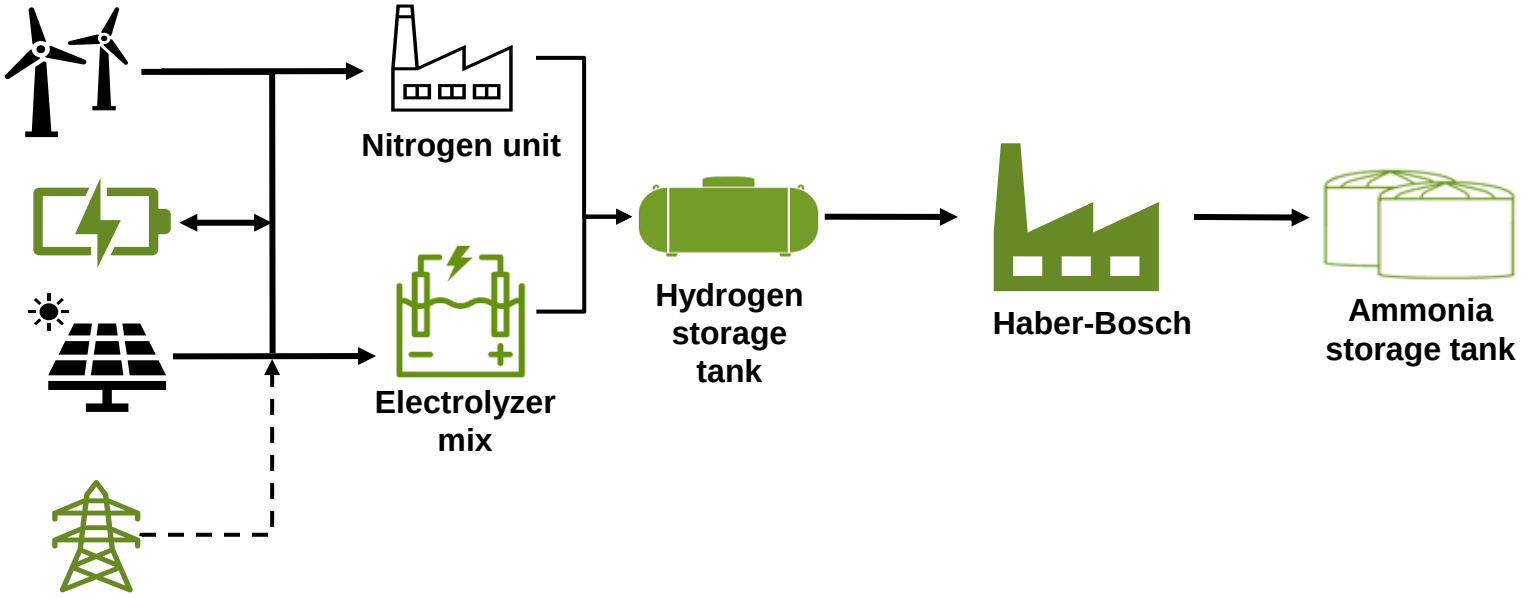
We need good ways to manage intermittency





areNH3a

Intermittency management



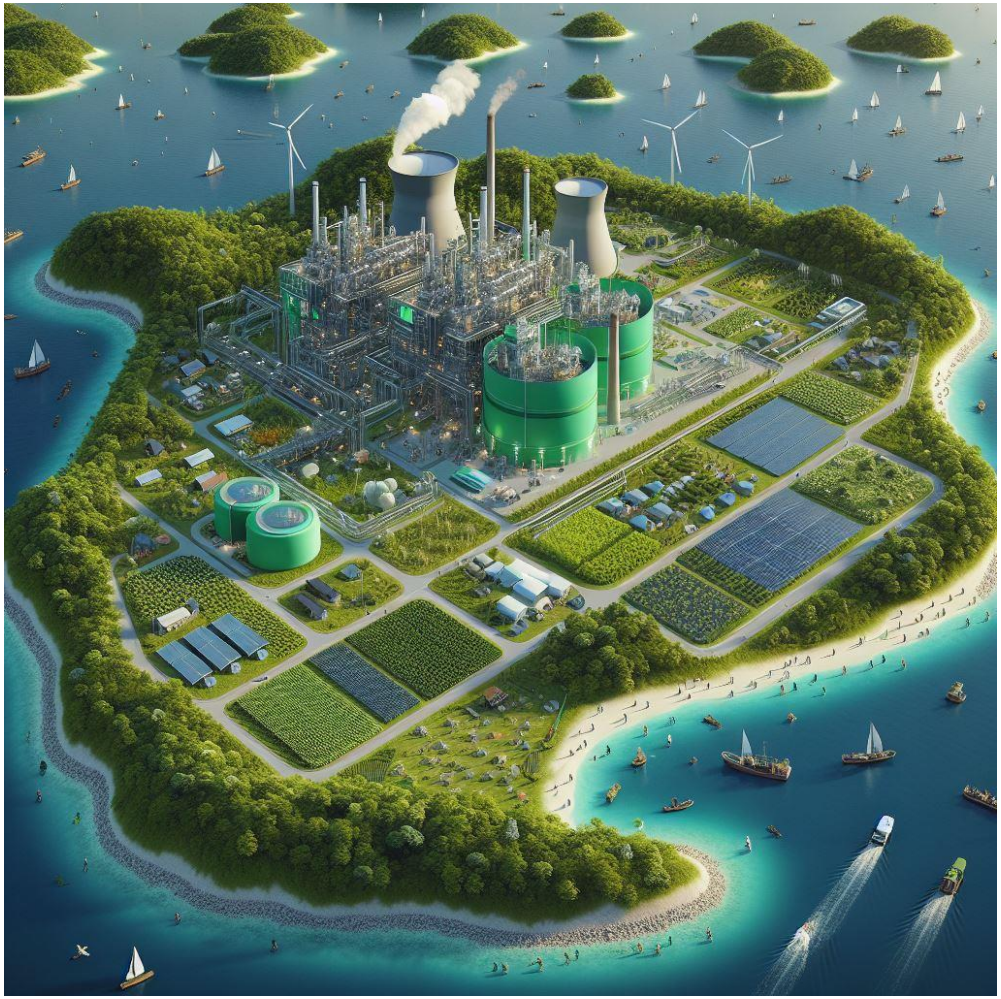
OUTPUT 20 YEAR LCOA (BASE 100)

Turndown ratio (%)

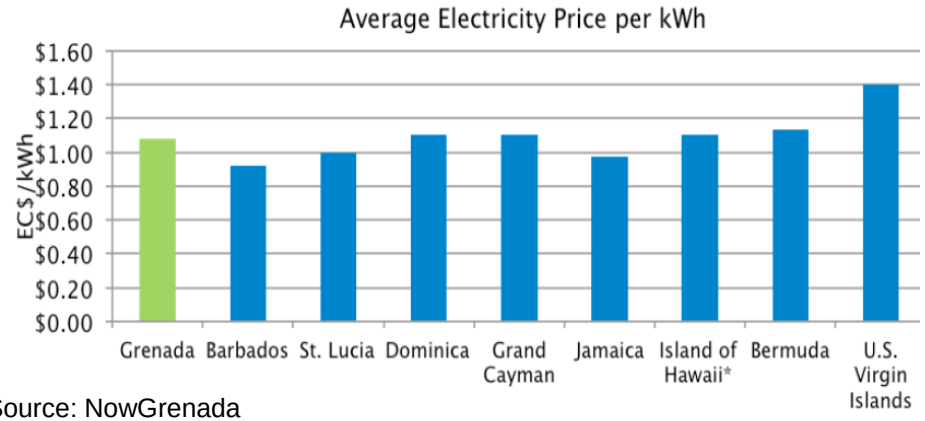
10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
84,7	86,3	87,9	89,5	91,0	92,5	93,9	95,2	96,5	100,0

Levelized Cost of Ammonia

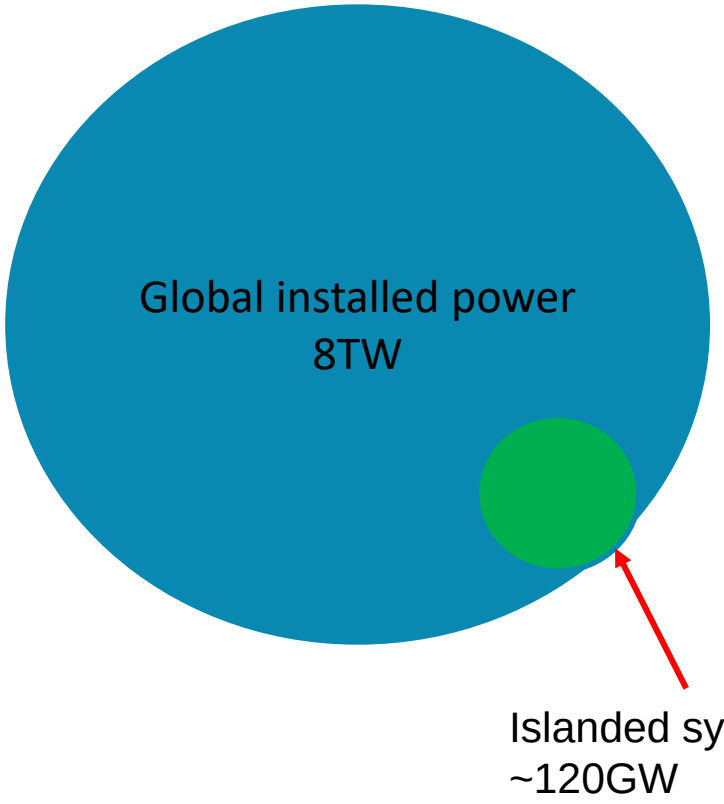
Islands and micro-grids



Islanded system market



Source: NowGrenada



areNH3a

Advanced materials and Reactors for Energy storage tHrough Ammonia

areNH3a

Thank you for your attention

Next Step – Validation of the Demonstration Unit

Unit Validation Overview:
The unit validation will be conducted independently of the ARENHA Project. We are currently evaluating potential testing locations, including, but not limited to:

- Fertiberia site, at Puertollano, Spain
- Enschede, the Netherlands
- Additional locations under consideration

Testing Timeline:

- Start of Testing: Approximately May / June 2025
- Testing Duration: min. 1 month
- Design Validation Completion: by the end of 2025