



Radical Mediated Ammonia Production
Company presentation September 2024

Our vision is to enable **decentralized** green ammonia production using a **disruptive process** powered by **renewable energy**



Demand for ammonia is huge and growing

180 MT per year produced:

- Used in fertilizers (70-80%) feeding 50% of the world
- Total market worth 80-100 billion €

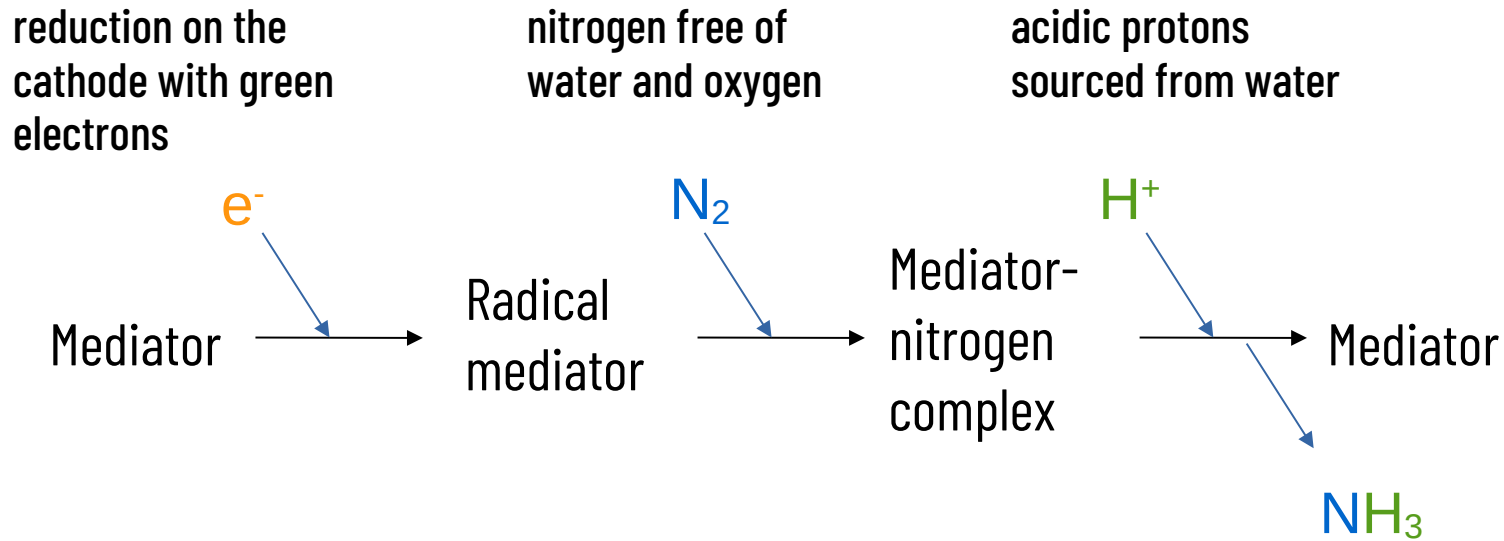
Green Ammonia: ammonia produced with no/low CO₂ footprint:

- Used/considered as maritime fuel and for power generation
- Used/considered for hydrogen storage and transport
- Expect 200-500 MT additional demand by 2050

Swan-H fills a need in the technological competitive landscape

- **Grey Ammonia:** produced in the Haber-Bosch process using natural gas or coal
 - Providing current supply of ammonia in mid to large scale plants
 - 2-3 T CO₂ per ton of ammonia produced
- **Green Haber Bosch:** replace methane reforming by water electrolysis
 - Numerous mega-projects across the world
 - Mismatch between discontinuous hydrogen production and continuous Haber-Bosch reactor
- **SWAN-H:** truly green ammonia
 - Production at any scale with a mild temperature and pressure electrolytic process
 - No need for continuous hydrogen feedstock, able to cope with energy fluctuations

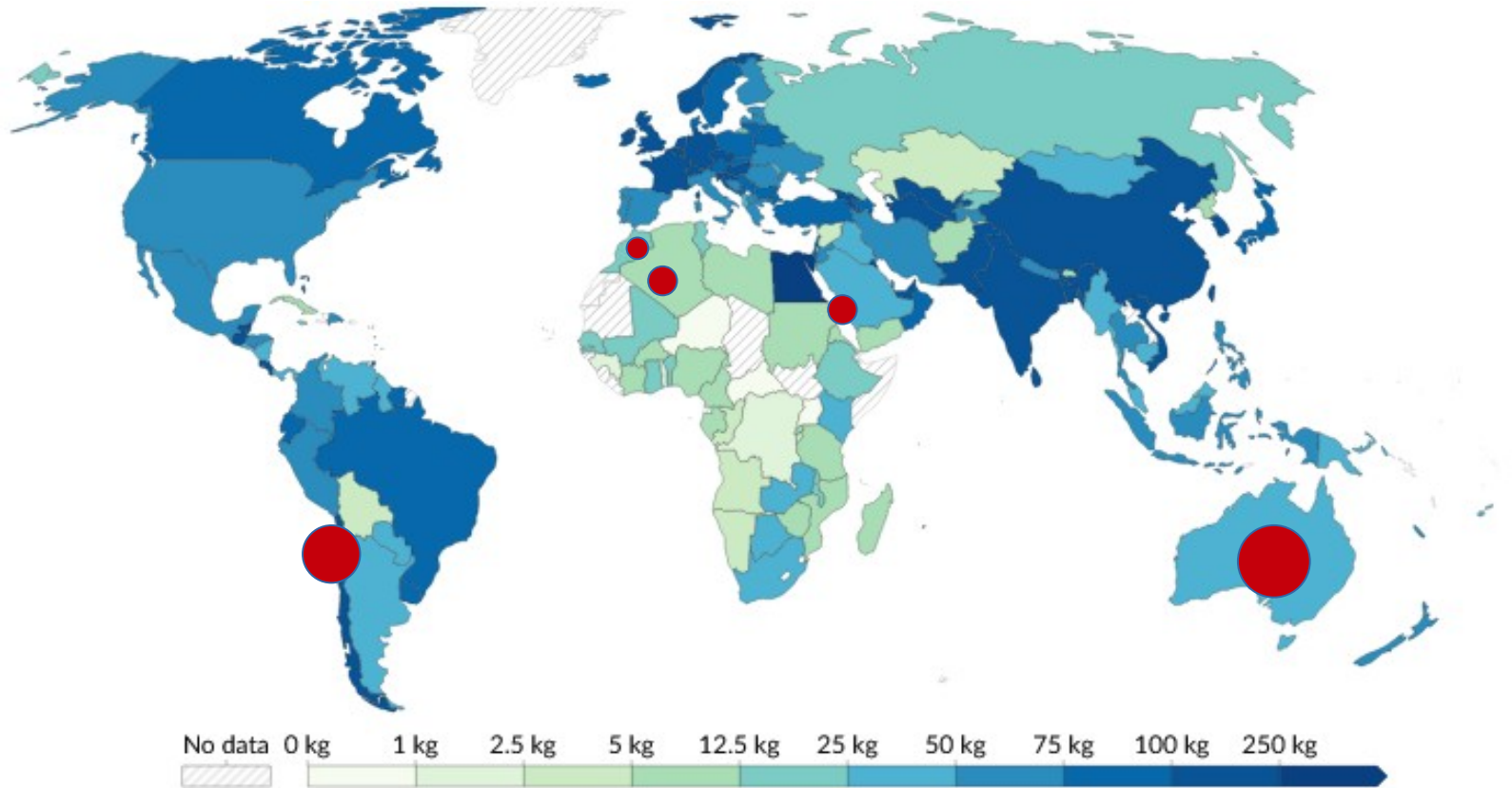
The **basis** for the SWAN-H **disruptive technology**



The technology: **Mediated Nitrogen Activation**

A proprietary **mediator** is reduced, reacted with **nitrogen** then **protons** that are sourced from **water** to give **ammonia** and reform the **mediator** ready for another cycle.

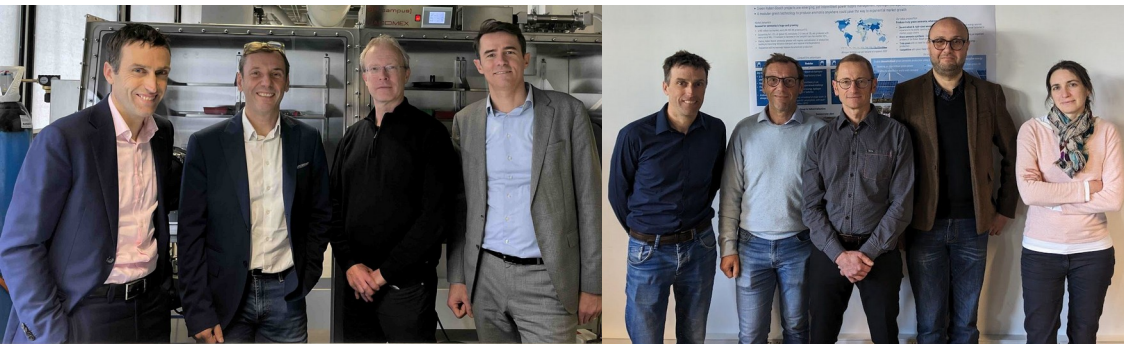
SWAN-H production can cater to **regional ammonia demand**



Amount of fertilizer applied to the land therefore market potential for Swan-H

● implantations of green Haber-Bosch projects

Knowledge, experience, diversity and team work drive all Swan-H operations

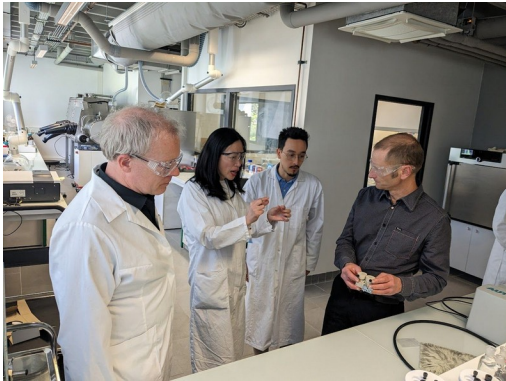
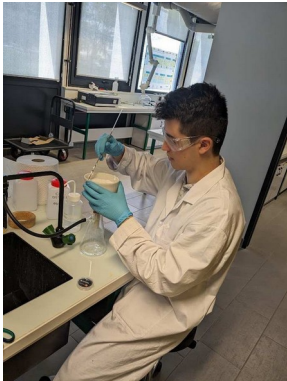


- Highly-experienced management team in research, development, business and finance
- Growing Scientific Advisory Board with industry and academic experts
- Diverse team of chemists and electrochemists working together to solve multi-disciplinary challenges



Milestones and achievements of the past two years of proving the concept

finance	Pre-Seed: Founders, Business Angels and BPI Subsidy and softloans 1M		Seed: Industrial, Investment Fund & BPI 1.3M	
team	Building e-chem team		Building engineering team	
	Team reaches 10 FTE			
	2022		2023	
	foundation and derisking of the technology		understanding and scaling towards a full-prototype	
KPI	Chemical reaction		Electrochemical reaction	
operations	Full prototype			
	Opening of the lab		Installation second glove-box	
			Occupying 250m² of office and lab space	



Next stages of development towards the first **commercial applications**

finance	1.3M Seed		Series A: 5M€ Current & New funds		BPI “premiere usine”	Series B: 15M€ Funds & Partners
business development	Niche partner	Engineering partners			Global partners	Consortium for demo plant
2024		2025-6			2027-8	
working towards a kg-scale pilot reactor		developing commercial activities and demo-plant				
KPI	g-scale NH ₃ prototype			Kg-pilot at partner		Kg-reactors at niche customers
operations	Expand into pilot building			Site selection for demo-plant		



How SWAN-H ammonia can change the world

Highly strategic now:

Reliable sourcing of ammonia is key to feed the world and for numerous industries.

Highly strategic tomorrow:

The transition away from fossil fuels will require new processes and new fuels.
Decentralized green ammonia is needed to achieve this.

Swan-H

Unicorn-potential technology solving the critical outstanding problems.





SWAN-H

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