FUELLA
FUTURE OF FUEL

Introduction to FUELLA

Green hydrogen and ammonia platform

May 2024

CONFIDENTIAL

FUELLA aims to become a leading green hydrogen and ammonia platform…

Business model:

- Developer, owner and operator of green hydrogen and ammonia plants
- Repetitive construction of standardized and modularized plants

The case for "green" ammonia:

- Ammonia is one of the most produced chemicals already, with significant demand increase expected
- Ammonia production emits > 1% of global CO2 emissions; "green" ammonia avoids 2.4 tons of CO2 per ton ammonia (vs. "grey" ammonia[1])
- Key hydrogen carrier and fuel and feedstock of the future, allowing to decarbonize hard-to-abate sectors

The case for the Nordics:

- One the of the most attractive locations for green hydrogen production, due to abundance of renewable energy

Projects:

- Project pipeline comprises projects in Norway and beyond
- Flagship project ***Skipavika*** in Norway with FID targeted in 2024

.. with FID for its flagship project *Skipavika* planned for 2024

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Project *Skipavika*

Location	Mongstad industrial site and harbour, close to city of Bergen (Norway)
Specification	130 MW electrolyzer capacity, production capacity of 300 tons per day or 100'000 tons per year
Jobs	50 fulltime jobs during operations
CO_2 savings	240,000 tons, equivalent to 1/3 of Bergen city emissions[1]
Feedstock	Renewable power, water and air
Product	RFNBO[2]-compliant "green" ammonia

Awarded €80m in EU H2 bank auction

[1] Global average of 2.4t CO_2 emission per tonne of ammonia produced: International Energy Agency, 2021. Planned production of 100,000 tons of ammonia per year = 240,000t CO2 reduction per year. Bergen city's CO_2 emissions in 2020 was 736,940t CO_2 equivalent: Bergen Municipality, 2022
2: RFNBO: Renewable fuels of non-biological origin

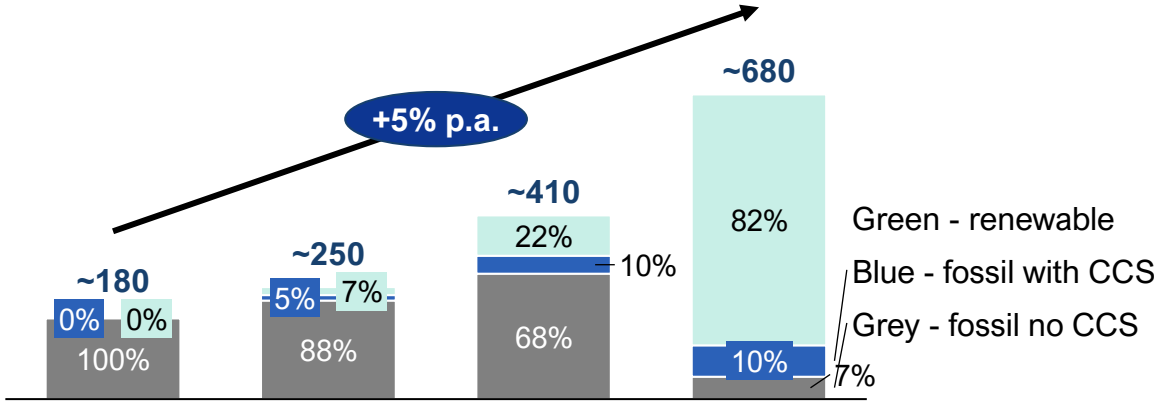
Partnership Model: realization of hydrogen projects today requires close collaboration of partners covering the whole life cycle and value chain

Involvement of partners in consortium along lifecycle

The case for "green" ammonia: Ammonia is one of the most produced chemicals globally, with demand expected to triple by 2050, most of which "green"

Global ammonia production development, in million tons p.a.

By sources



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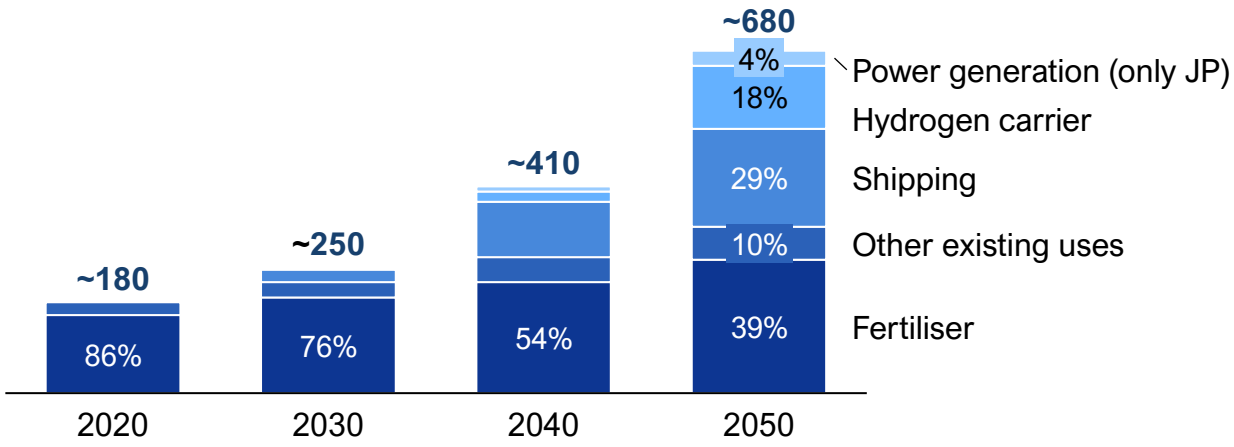


Main insights

- Ammonia is the **second most produced chemical** by mass
- **Demand in 2050 is projected to be more than three times what it was in 2020** – and these volumes **must be low-carbon**
- The **share of green ammonia will increase significantly**, from almost zero today, and allow to use green ammonia as a green fuel

- **Ammonia today is used to produce nitrogen fertilizers,** supporting food production for around half the global population
- Going forward, **ammonia will be used as a carbon-free fuel, power source and hydrogen carrier,** and will allow to **decarbonize hard-to-abate sectors**

Source: IRENA (2022)

FUELLA's technology strategy: FUELLA develops a new standardized technology platform for producing green ammonia, replicable across projects

What we do - combining electrolyzer technology with ammonia synthesis

- Electrolyser technology to produce hydrogen and the ammonia synthesis loop are **known technologies**
- **The innovation lies in the combination of the two technologies and the development of the system knowledge**
- FUELLA is teaming up with technology partners to **develop turn-key green ammonia production plants**
- FUELLA's technology partnership provides **access to unique technology IP** to be replicated towards its expanding project pipeline

Approach and benefits

Standardization

- **Repetition of the development concept** at new sites
- **Swift implementation timeline** based on pre-engineered concept with long-term key equipment suppliers
- **Reduction of costs by standardizing concept** and interconnections to offsite utilities
- **Transfer in O&M knowledge and spare parts** between the plants

Modularization

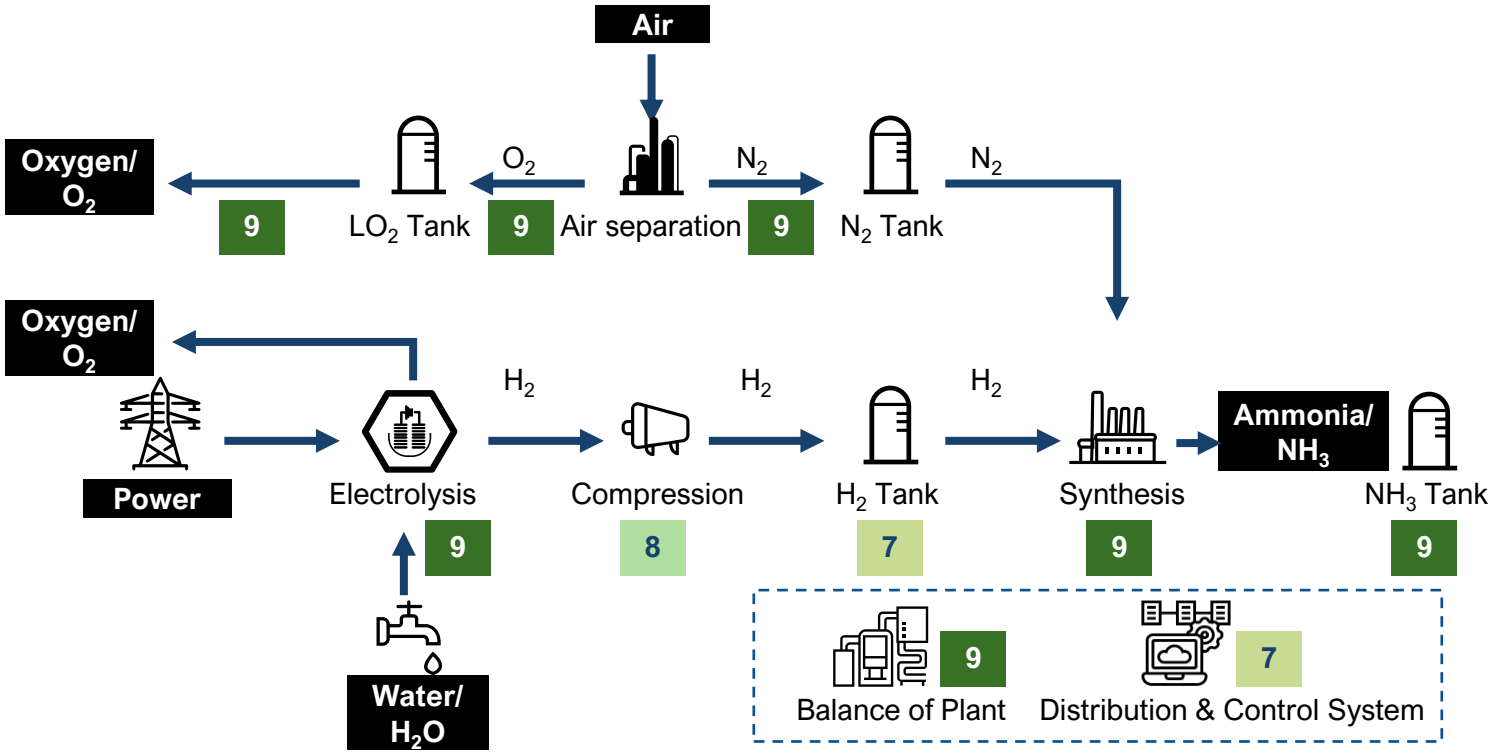
- **Quick adaption of key components** of the standardized plants to site specificities, e.g., more flexible electrolyser technology
- **Easy transport** of modules, e.g. in containers

"Sweet spot" sizing

- **Big enough to realize most of economies of scale**
- **Small enough to fit into European sites and to allow for quick permitting**
- **Focus on small hydrogen storage** to minimise storage cost and permitting risks

Green ammonia process: Green ammonia plant obtained by combining individually demonstrated mature technologies with TRL > 7

Ammonia production process overview



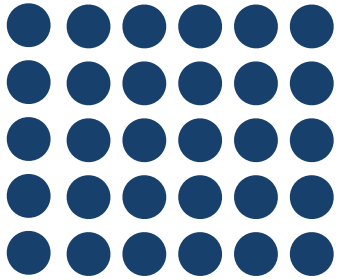
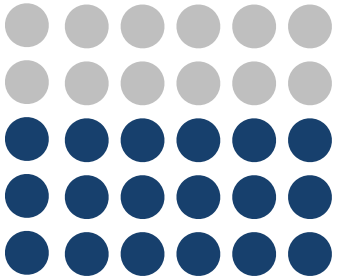
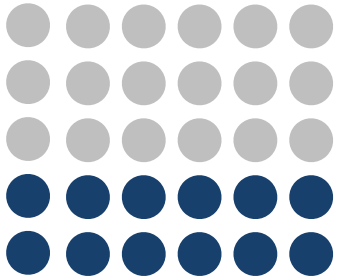
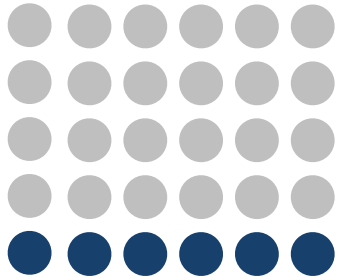
Technology Readiness Level (TRL) levels

9	Actual System mission proven through successful mission operations
8	Actual System completed and mission qualified through test
7	System prototype demonstrated in an operational environment
6	System/subsystem model or prototype demonstrated in a relevant environment
5	Component and/or test system validation in relevant environment
4	Component and/or test system validation is relevant environment
3	Analytical and experimental critical function and/or characteristic proof of concept
2	Technology concept and/or application formulated
1	Basic Principles observed and reported

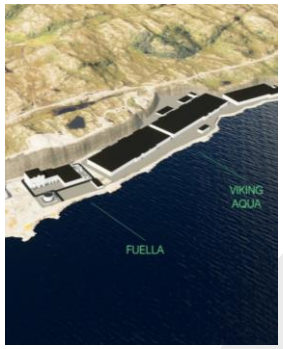
Key technical challenges

- Green ammonia production requires a combination of individually proven technologies of electrolysis, ammonia synthesis and air separation
- The Distribution & Control System will play a major role in the successful integration of these individual technologies, and can be a source of competitive advantage

Site selection: Only few sites fulfill all the prerequisites for successful development of green hydrogen and ammonia production plants

	Land availability and industrial zoning	Access to grid capacities	Access to clean power	Access to offtake and/or transport routes
Preconditions for successful development				
Number of sites that fulfill all of the requirements (illustrative):				

Projects: First two projects in advanced development in Norway, with additional global pipeline in development



SkiGa

Mongstad, Norway

100k t green NH3 p.a.

130 MW baseload hydropower

FID 2024, COD 2027

KorGa

Mo I Rana, Norway

200k t green NH3 p.a.

260 MW baseload hydropower

FID 2025, COD 2028

Project pipeline

Nordics and global

>2 GW

Partnerships with RES developers, port developers etc.

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Thank you!

www.fuella.no