Green Ammonia Linz

H2 convention
Linz, 27.11.2024
Nicolas Mendez und Robert Schlesinger

GREEN AMMONIA LINZ

Verbund LAT Nitrogen

Green Ammonia Linz

Low carbon nitrogen products by end of 2027

GREEN AMMONIA LINZ

Scope

- Substitution of up to 10% of grey H_2 conventionally used in production of ammonia **reducing up to 90,000 t_{CO2}/a**
- Full **integration** in existing industrial complex
- Reduced need for new utility facilities improving overall cost efficiency
- Provision of grid services facilitating deep **renewable penetration**
- **Utilization of O_2** in nitric acid production improving economics
- Enabling utilization of **waste heat**

Challenges

Technological novelty - Unproven technology and application

Economics - Grey ammonia still decisively more competitive

Regulatory uncertainty - Regulatory framework still in development

Status: Approaching FID

Basic **Engineering** completed

Permits received

Main service and supply **contracts** awarded or in negotiation

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Green Ammonia Linz (GrAmLi)
A decarbonization partnership of VERBUND and LAT Nitrogen

GREEN AMMONIA LINZ

VERBUND
Austria's leading energy utility

Austria's **leading** energy utility and electricity company

Most valuable company at Vienna stock exchange with market cap of **EUR >30bn**

Route length of electricity transmission grid of around **3,400** km

129 VERBUND hydropower plants with over 8,200 MW of maximum electricity capacity

~97% of the total electricity generation stemming from renewables

And approximately **900** gas transmission pipeline kilometers

Active RES positions in AT, DE, RO, ES, and AL with capacity additions of **3.8 GW** by 2030

LAT Nitrogen
Austria's leading producer of ammonia, fertilizers and technical nitrogen products

LAT Nitrogen Linz GmbH is a member of **Agrofert Group**

Owns the majority of the **Chemical Park Linz** and supplies utilities and services to industrial customers on site

The largest hydrogen producer and consumer in Austria, with approx. **100,000 tonnes per year of hydrogen,** as an intermediate for ammonia production

Owns and operates **two** ammonia plants, **two** nitric acid plants, **three** fertilizer plants and **two** melamine plants in Linz

Produces more than **500,000 tonnes per year of ammonia** from hydrogen and nitrogen

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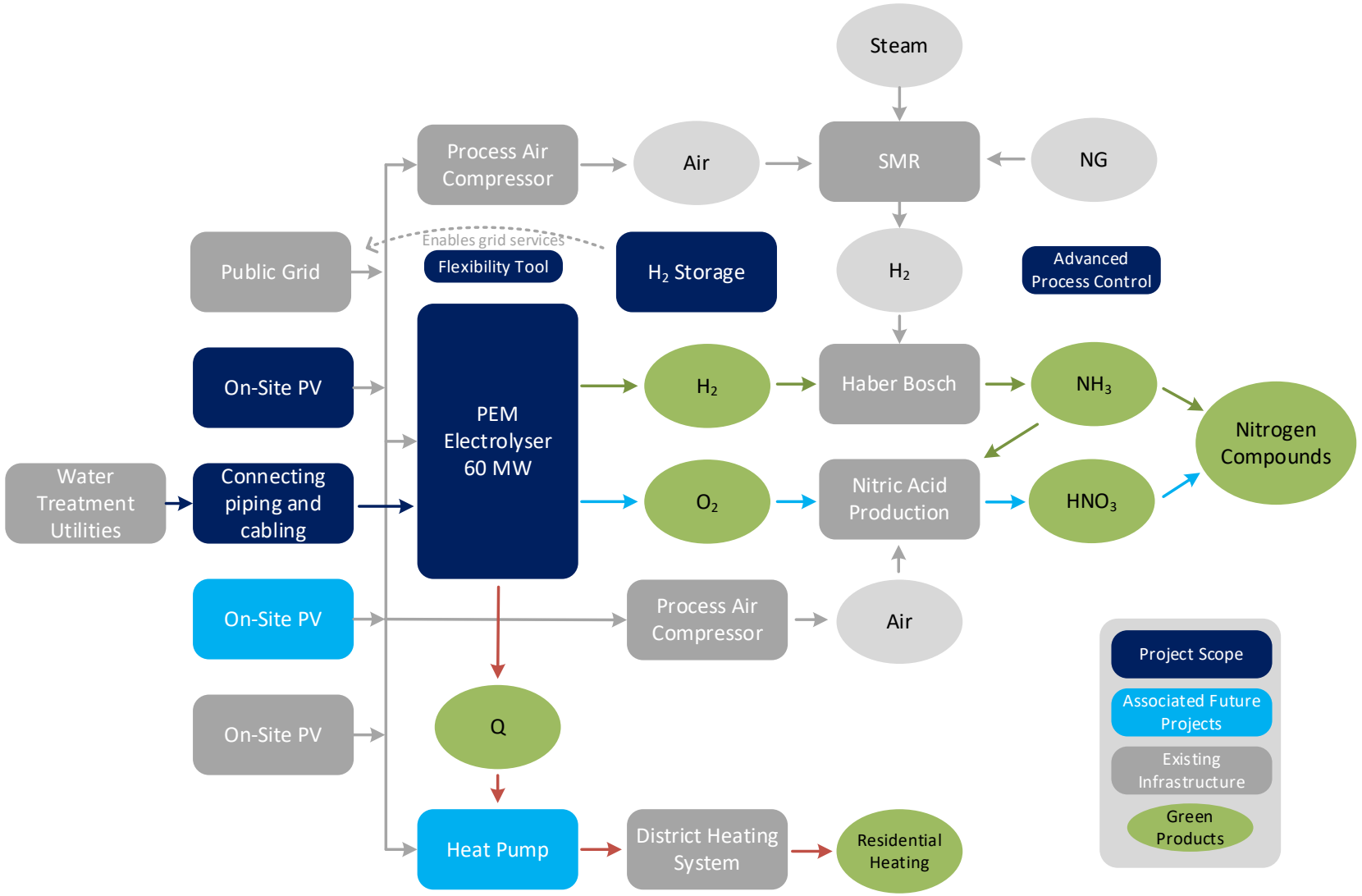

NEW FACILITIES:

- **60 MW PEM ELECTROLYSER**
- **H_2 STORAGE**
- **H_2 CONDITIONING**
- **O_2 CONDITIONING**

Substitution of up to 10% of grey H_2 conventionally used in ammonia production **reducing up to 90,000 t_{CO2}/a**

Full **integration** in existing industrial complex:

Reduced need for new utility facilities improving overall cost efficiency

Provision of grid services facilitating deep **renewable penetration**

Utilization of O_2 in nitric acid production improving economics

Utilization of waste heat further reducing CO_2 emissions

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Location – Chemiepark Linz (AT)

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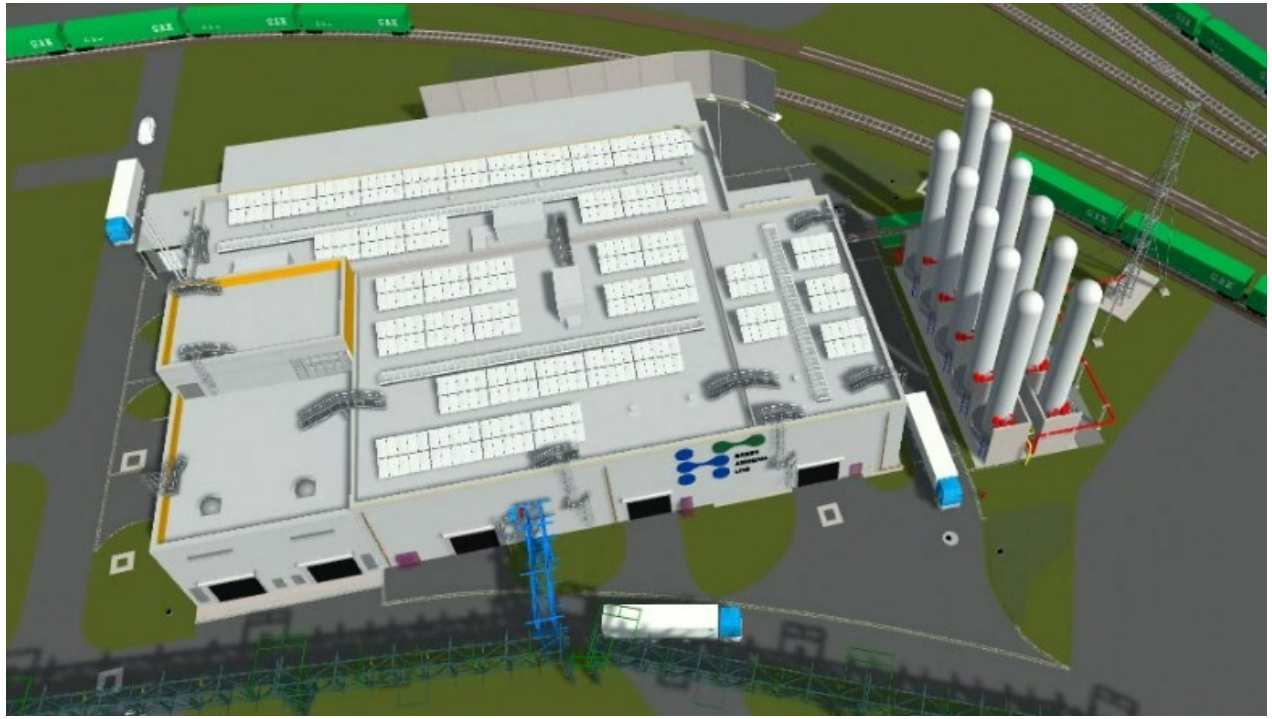
Project Scalability



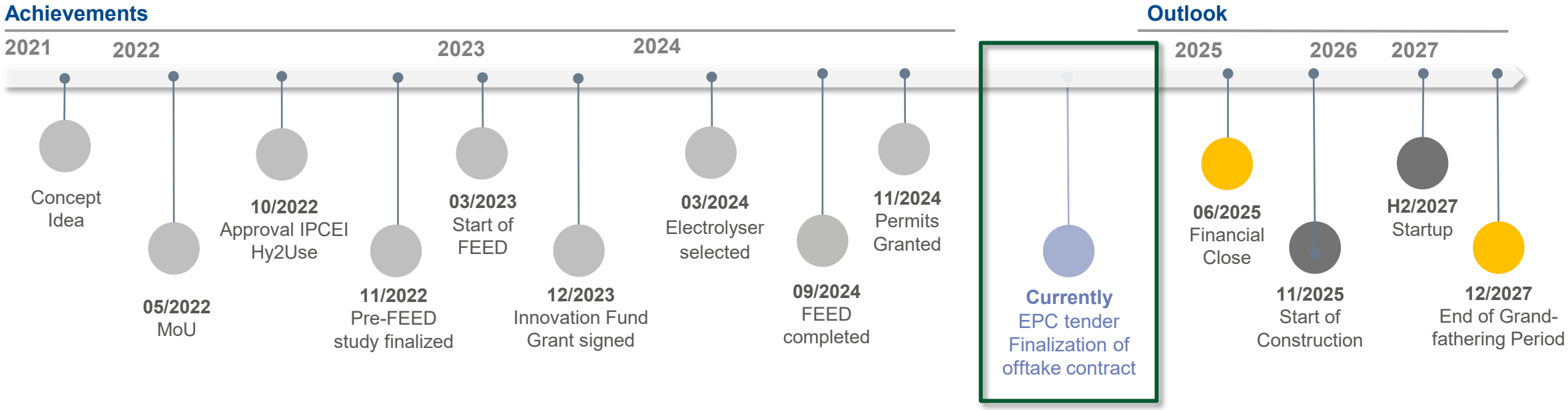
GREEN AMMONIA LINZ IS A TRUE LIGHTHOUSE PROJECT FOR THE DECARBONISATION OF AMMONIA PRODUCTION AND OF INDUSTRY IN GENERAL. IT WILL PROVIDE THE NEEDED EARLY APPLICATION CHANCE FOR NOVEL H_2 TECHNOLOGIES.

Scalability

- GrAmLi will serve as an important reference for the decarbonisation of the entire industrial cluster Linz and a first step for the ammonia production operations of LAT Nitrogen Linz GmbH.
- The solutions developed within this project are intended to be utilized more broadly in any hydrogen application located within industrial parks and existing industrial settings.

Current Status and Outlook

GREEN AMMONIA LINZ



Main Challenges

Technological novelty

PEM electrolysis of this scale

Combination of flexible operation and constant offtake using H_2 storage

Utilization of side products

Economics

Production of grey ammonia still more competitive

Macroeconomic environment

Regulatory framework

Required regulatory framework in development

Stringent requirements

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Lessons Learned
Spotlight on Permitting

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All permits have been issued in time
- Area zoning: Plot required Seveso classification → Safety
- Construction Site Permit
- Nature Protection: Measures to protect prevalent endangered species
- Trade regulation: Safety, occupational health, fire protection, emissions, potential infrictions on third parties
- Construction: Compliance with building code
- Water: Discharge of cooling water, discharge of waste water, prevention of groundwater contamination
- High voltage power infrastructure: General compliance with regulations and codes

Most challenging issues
- Safety,
- (Cooling) water
- Noise

Key success factors
- Communication of public benefits enable stakeholder support
- Concentrated process: Separate regulations were treated jointly, all involved stakeholders on the same table
- Monthly exchanges with authority and subject matter experts about process and project scope