Sheet N° 12- 1/2 - Green ammonia / NH3 production unit

Description

Transformation of green hydrogen by the Haber-Bosch process into the easily transportable NH3 molecule for export and fertiliser production. Unit with average capacity of **200 MW**. Project including green electricity and hydrogen production

Main customers: fertilizer industry, shipping

Sector and sub-sector: Green hydrogen and its derivatives / power to x

Complexity of the product[1]: -3,33 — 2,56 — **- 1,33**

HS Code : **2814**

Key facts

- Ammonia accounting for 36% of global H2 consumption with many projects under development for green substitutes (eg. Nutrien and CF Industries)
- World market dominated by exports from Trinidad and Tobago, Russia and Saudi Arabia
- Significant export potential, driven by carbon taxes in Europe and the United States to encourage the consumption of green fertilisers (one of the six sectors covered by the carbon tax)
- Potential for substitution of imported NH3 by green NH3 production in Morocco

Prerequisites (2)

- Securing premium purchase contracts upstream of the project

Market indicators

Target market(s) :

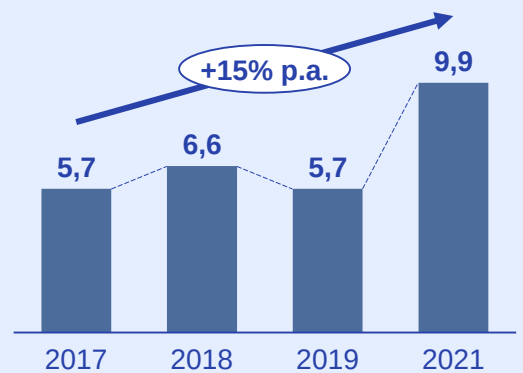
Target market(s), (from highest to lowest priority) to be addressed :

\+ Exports: Mainly to the US and Europe (in connection with decarbonisation regulations)

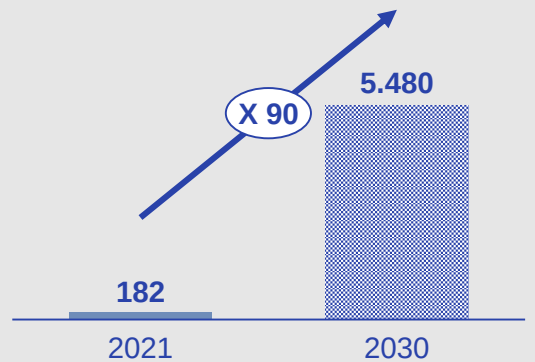
\- National: As a substitute for fossil-based ammonia imports from Russia, Trinidad and Tobago and Algeria

Market size and development (3)

World ammonia imports (USD billions)



Global ammonia market projections (MT)



(1) Product Complexity Index: Diversity and sophistication of the know-how required to produce a product. The PCI is calculated according to the number of countries that produce the product and the economic complexity of these countries. The most complex products, those that only a few countries can produce, have the highest PCI (e.g. electronics, chemicals) vs. the least complex products (e.g. raw materials, agricultural products) - Source: TradeMap, Harvard economic complexity

(2) Sources: Office des Changes, FortuneBusinessInsights, L'ÉLEMENTARIUM, Press articles

Sheet N° 12- 2/2- Green ammonia / NH3 production unit

Financial indicators (indicative) :

Potential investment* ($)	8.3 billion MAD (of which ~45% energy, ~27.8% electrolyser, 9.6% Haber-Bosch for NH3 and 15% contingency)
Turnover	640 - 800 Mn MAD
Estimated selling price	6 - 7.5 MAD/kg
ROI	10 - 20 years
EBITDA (as % of sales)	70 - 80 %
Jobs	120 - 150

Human resources

HR skills needed

- Renewable energies, industrial chemistry, water desalination, air distillation, electrolysis and gas purification

Training offers

- Multidisciplinary Faculty (Ouarzazate) : Control and exploitation of renewable energies
- EST (Laâyoune branch) : Professional degree in renewable energies and water desalination

Raw materials and suppliers

Main inputs

- Nitrogen (integrated production in the Haber-Bosch process)
- Water, electrolytes

Main suppliers

- Morocco: Nitrogen
- China: electrolytes, renewable energy sources (photovoltaic panels, wind turbines, etc.)

Investment elements

Potential land

Priority provinces

✔ Laayoune ✔ Es Smara ✔ Boujdour ✔ Tarfaya

Type of land

Private domain of the State (e.g. the Akhfenir tarfaya-foum el oued lamssid-jraifia coastline)

Area

950 - 1000 ha (+95% allocated to energy)

Average land price

Unified Regional Investment Commission (CRUI)

Mode of mobilisation

Unified Regional Investment Commission (CRUI)

Main investment benefits

Grant	Investment Charter
Support for training	Cluster greenh2, "TATWIR green growth", UM6P Green H2A
Other	-

Contacts

Full name :
Mohamed Lamine Mbirkat

Telephone : 0661389782

E-mail : mbirkat@gmail.com

Source: Expert interviews