

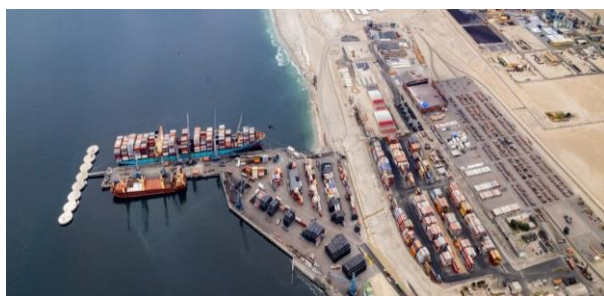
Solar NH₃-Pool Chile: Concepts for the development of a sustainable green hydrogen/ammonia plant pool in the Antofagasta region (Chile)

Partnership between GIZ, Soventix Chile SpA, SI Solar Investments GmbH and Pabettin

Background

The aim of Chile's Green Hydrogen Strategy (November 2020) is to position the country as a pioneer in the production, local use and export of green hydrogen and its derivatives, so that Chile becomes a "zero-emissions country" by 2050. This is intended to sustainably strengthen the country's competitiveness and the productivity of its economy.

In particular, the Antofagasta region in northern Chile is an important development hub for the production and export of green hydrogen and its derivatives. Due to the enormous potential of solar as well as wind energy, the region is home to numerous renewable energy companies, especially in PV but also CSP technologies, with a current installed capacity of 1.7 GW PV and 108 MW CSP. Além disso, nesta fase inicial, a região já tem vários grupos de partes interessadas trabalhando no desenvolvimento de uma economia de hidrogênio. In addition, at this early stage, the region already has various stakeholder groups working on the development of a hydrogen economy. However, so far local medium-sized companies (SMEs) have little chances to enter the hydrogen market if they act alone, since large infrastructure and production capacities must be developed to achieve competitive prices.



Mejillones Port Complex (@CPM S.A)

However, shared facilities can reduce project-specific costs and avoid redundant infrastructure construction, thus reducing total project costs. Furthermore, with optimised land use and multi-project infrastructure planning, higher-value environmental technologies are

usually used so that environmental impacts are minimised.

Accordingly, the concept of plant pooling and shared infrastructure opens the way for a number of SMEs to enter the hydrogen economy, since the initial investment (i.e. CAPEX) of each actor is lower compared to a large plant in which only one investor is the main owner. Antofagasta offers a special opportunity to exploit this potential and thus create synergies and added value for the region through collaboration.

The solution

To develop a green hydrogen plant pool composed by many smaller plants to produce green hydrogen, whose generation capacities are subsequently combined in order to produce green ammonia in a large-scale plant.

By pooling the plants and sharing infrastructure, several SMEs with smaller production capacities can join forces, thus generating an economy of scale for competitive production and marketing of the ammonia produced for export, but also for local use. This business model is based on the economies of scale in the production of ammonia through the Haber-Bosch process, which is much more economical when capacities exceed 350,000 tons/year (equivalent to about 500 MW of electrolysis capacity).

The plant pool, consisting of several operators, is to be based on a common infrastructure model to achieve the desired economies of scale. In addition to hydrogen transportation, the common infrastructure also includes the infrastructure for the provision of renewable electricity and water. This will strengthen competitiveness as well as resource efficiency by leveraging synergies and avoid parallel investments. Furthermore, this common infrastructure could also be used not only by the plant pool, but also by other hydrogen projects in the region. Overall, the plant pool can strengthen cooperation and potential synergies among different stakeholders in the Antofagasta region.

How it will be done

By developing a series of studies for the design of a sustainable green hydrogen and ammonia plant pool in the Antofagasta region, based on an optimized regional infrastructure analysis including a technical-economic and structural analysis for the design of appropriate plants.

The shared infrastructure opportunities have three main pillars: Water supply, renewable energy supply and logistics concepts for transport:

- The sustainable supply of water of the required quality is a major challenge in the extremely dry region of Antofagasta. In this context, alternatives ranging from a project-owned desalination plant of seawater at the coast to long-term supply contracts with local providers are to be investigated and evaluated.



Photovoltaic park in the Antofagasta region (@Acera AG)

- The identification of an optimized energy supply mix based on renewable energy sources (solar PV, CSP and wind) and, if necessary, supplemental storage capacities to achieve the highest possible annual contribution margins for continuous operation of the production plants plays a decisive role. In addition, cooperation models with regional producers of renewable electricity are analysed in detail.
- An important challenge for the development of the regional pool of facilities is the improvement of the logistics infrastructure. To transport large quantities of H₂ and NH₃ it is necessary to make relevant investments in export ports (adapted berths), storage facilities, railroad infrastructure (loading stations, rail network and trains) and gas pipelines.

Impacts and results

- Concrete proposals for the further development of the regional hydrogen hub, improvement of the regional logistics infrastructure as well as the sustainability in the affected communities.
- Publication of sustainable solutions for the water and energy supply of the hydrogen and ammonia plants to exploit synergies with other developers.
- Involvement and capacity development of external actors from the academia, research institutions, authorities, and representatives from the public and private sector.

At a glance

Duration	November 2022 to December 2023
Country	Chile
Objective	Series of studies for the design of a sustainable green hydrogen and ammonia plant pool in the Antofagasta region based on an optimized regional infrastructure analysis including a technical-economic and structural analysis for the design of appropriate plants.
Partners	GIZ, Soventix Chile Spa, SI Solar Investments GmbH and Pabettin GmbH.
Expected Results	<ul style="list-style-type: none"> • Conceptual principles for the development of a hydrogen / ammonia plant pool. • Infrastructure analysis and logistics. • Technical and economic analysis. • Public relations and stakeholder engagement.

The International Hydrogen Ramp-up Programme (H2Uppp) of the German Federal Ministry for Economic Affairs and Climate Action (BMWK) promotes projects and market development for green hydrogen in selected developing and emerging countries as part of the National Hydrogen Strategy.

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