



“Regulatory challenges for NH₃ in Chile”

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O₂ New energy vector

- ❑ A world moving away from fossil fuels which provide a permanent energy supply, requires means to store and transfer of energy in time and place on a large scale (global warming and renewables variability).
- ❑ Due to significant costs involved in direct green hydrogen production and transport, NH₃ in contrast emerged as an excellent vector for energy storing and transporting. In liquid state it has 50% more volumetric energy than liquid H₂, it can be handled at lower pressures, it is less flammable and easier to liquefy than H₂, with a boiling point of -33.36 °C, compared to H₂ (-252.9 °C), which requires less energy consumption to store and transport it.
- ❑ As in many industries, NH₃ production benefits from economies of scale (investment costs per unit produced falling as production volumes grow) a critical part of costs coming from electricity supply by renewable sources. Typically, for every tonne of green ammonia, 10 MWh of energy is required, of which 90% is used in the electrolysis process.
- ❑ Also, as a widely produced chemical and internationally traded commodity since the 1920s, there are facilities and regulations already for its handling, conduction and storage as a chemical product, so the required infrastructure would be expandable faster.

O₂ Other uses

- ❑ Ammonia as a fuel for shipping vessels and power plants. Although this requires improvements in combustion technologies, there are important initiatives boosting use in maritime transport. One of the greatest challenges is to reduce or eliminate NO_x emissions and increase its calorific value to sufficient efficiency ranges
- ❑ Between 2011 and 2023, the International Maritime Organization (IMO) has established a series of mandatory limitations and improvements for shipping bunkering, such as reducing sulfur oxide from 3.50% to 0.50%, and adopted the “2023 IMO GHG Strategy” with goals of achieving net-zero by 2050 in maritime transport and reducing CO₂ emissions by at least 40% by 2030, as well as promoting the adoption of increasingly less polluting technologies. Although operational and safety requirements and rules are already well established for tankers that transport and handle NH₃, such guidelines do not currently exist for the use of ammonia as fuel.
- ❑ As these are new technologies, several tests and trials are necessary as well as the development of regulations and standards, in order to achieve approval as a fuel by the IMO and before its wide commercial adoption. This is a critical stage for spreading adoption of safety regulations and loading protocols in as many countries as possible.
- ❑ A leading role was taken by the “*Global Centre for Maritime Decarbonisation*” formed by various companies not only shipping, with a global reach, that has been developing a series of pilots and tests in the port of Singapore, as a “living laboratory” focused on implementing tests to develop ammonia supply systems for bunkering and acquiring operational experience. Its initial work was implemented from 2022 to 2023 (Safety Study) and the results of its second phase of tests are ongoing (detailed evaluation of ship-to-ship transfers of ammonia cargoes).

O2 Concurrent regulations 1

- ❑ Given its chemical features and that use has been focused in explosives and fertilizers, ammonia is considered and regulated in Chile as a hazardous substance, that is, products that may pose a risk to the health, safety or well-being of humans and animals, in accordance with NCh 382, more specifically a Class 2 substance, toxic gas.
- ❑ This is particularly relevant because: (i) safety measures that must be adopted; (ii) need to obtain a health authorization for the operation of storage facilities that exceed a certain volume (30 ton); (iii) this will affect the industrial qualification each productive activity must be subject according to the Urban Planning and Use of Land Regulation OGUC, which includes all types of industry and storage or warehousing facilities and, therefore, will determine if and where the facilities may be located; and (iv) consequently will impact the environmental approval that the project requires.
- ❑ Indeed, as we know, industrial or storage facilities will be assessed on a case-by-case basis by the Ministry of Health and this may determine whether or not the installation of a production or storage infrastructure in a given geographical area is feasible.
- ❑ On the other hand, and in order to provide the Ministry of Energy with sufficient powers to promote the development of the emerging H₂ industry, in 2021 powers were granted relating to all activities of study, exploitation, generation, transportation, storage, import and export "on hydrogen and hydrogen-based fuels". However, there has been no provision that clarifies or expands on what "fuels [produced] from hydrogen" mean, even though ammonia appears to be clearly the first example.

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Concurrent regulations 2

- ❑ On the contrary, in 2022, an additional interpretation was issued on the use of land applicable to facilities and networks associated with hydrogen production, under which H₂ facilities are considered as “energy infrastructure” but, paradoxically provided that projects where ammonia is produced, even if hydrogen is used as feedstock, will be regarded as “productive activities” and not energy facilities, since ammonia is not considered a fuel, but “... *a substance that is not part of the energy sector ...*”
- ❑ This complicates the planning and compatibility of the different elements included in a project within a certain territorial area. In addition, it is difficult for ministerial authorities to provide an express and more elaborate definition due to the absence to date of any foreign parameter developed for the application and treatment of ammonia as a fuel in its own right and that can be used as a technical, safety and regulatory reference for its adoption in our country.
- ❑ Thus, even though the hydrogen used in the production of ammonia constitutes a fuel and forms part of the energy infrastructure subject to regulation of that order, the ammonia generated, stored and exported as a vector of H₂ will continue to be classified as a productive activity and a hazardous substance, without being considered a fuel and therefore outside the jurisdiction of the Ministry of Energy.

O₂

Concurrent regulations 3

- ❑ So current regulation seems to provide that products and fuels will ultimately be regulated according to the use that is made of them, which can bring about a complexity and confusion that is unnecessary and inefficient to manage. If their use is for non-fuel chemical substances, they would be classified as hazardous substances and therefore would fall within the scope of the Ministry of Health; however, if they are used as fuels, their regime is modified and they would fall under the jurisdiction of the Ministry of Energy.
- ❑ But even if a product is classified as a “fuel” the problem still remains for products also being classified as dangerous, because the regulation is based on the “use”.
- ❑ A good solution would be adopting a quantitative risk analysis “QRA” system so that projects are evaluated considering the risks they may cause and applicable mitigation measures to limit or avoid their effects. It is in force in several other jurisdictions. As incentive for new industries a creative approach is always welcome, particularly for timely adjustments to regulation that make those industries viable !!

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Exporting to EU

- ❑ One of the most important markets expected to import a substantial amount of H₂ and NH₃ is Europe. The European Union has bet on these fuels as a key part of its energy and decarbonisation policy that will enable the decarbonisation of certain hard-to-abate sectors. EU seeks to produce 10 million tonnes by 2030 and import the same amount from other countries.
- ❑ The goals refer to “renewable hydrogen” and various regulations establish the requirements that fuels must meet to be qualified as a “renewable fuel of non-biological origin” or “RFNBO” as it is known in European regulations to make sure that: (i) hydrogen is produced from renewable energy sources; and (ii) achieves at least 70% greenhouse gas (GHG) emission reduction.
- ❑ The European law increases the share of renewable energy in its overall consumption to 42.5% by 2030 and sets targets for each sector, so that by 2030: i) the industrial sector must have 42% of its energy coming from RFNBOs; ii) in land transport, the target is for 5.5% of fuels to be RFNBOs; iii) for maritime transport, the objective is for the use of RFNBOs to be 1.2%; and iv) in aviation, it mandates the use of fuel blends in which sustainable fuels represent a minimum of 6% each year until reaching 70% in 2050. Consequently, it is regulation that builds the demand for RFNBOs to impulse investments by producers.
- ❑ The important thing to note is that EU regulations are applicable to both local producers and foreign producers who export to the EU. This can create barriers and their application to foreign producers will generate challenges to overcome, leaving foreign producers in a disadvantage position.

In this regard, there are various elements of the regulation that must be taken into account:

1. 100% of the electricity used to produce hydrogen must be renewable and although the import of RFNBOs is not mandatory, the objectives imposed, as well as other stimuli (such as access to special bank loans) generate incentives to adhere to comply with such requirements.

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Exporting to EU

2. Regulations establish strict requirements for considering electricity from interconnected electrical systems as renewable based on the particular electric market framework of EU. In most cases, producers of RFNBO must have PPAs from renewable electricity producers. To ensure origin, guarantees (“GO”) are granted by each state at the request of a producer for the equivalent of each MWh unit (1 GO = 1 MWh) ensuring that a given unit of energy from renewable sources is taken into account only once in the RFNBOs certification. In this sense, the recognition of GOs or similar issued by third countries will only be permitted to the extent there is a prior agreement with the EU on mutual recognition of guarantees of origin and a direct import of energy takes place.
3. Bidding Zones. As part of proving the renewable origin of the electricity from the grid used to produce RFNBO, foreign producers must also demonstrate that in the place of origin they apply electricity market rules similar to the “zonal pricing” system that applies in the EU, that is, geographical differentiation of hourly energy prices in a given area where the share of renewable energy exceeded 90% during the previous calendar year.
4. Additionality: The fuel will be considered 100% renewable also when the producer generates electricity in its own facilities or agrees PPAs for the supply of electricity equivalent to at least the total amount of electric energy that is classified as renewable, provided that (i) the power generation plants have entered into operation not earlier than 36 months prior to the start of the facilities to produce the RFNBO, and (ii) the power generation plants used have not received any subsidy or benefit for their investment or operation. This, in order to encourage the construction of new renewable generation facilities and prevent the production of new fuels with existing plants, reducing capacity in the market for the supply of renewable electricity.
5. Furthermore, it should be considered that renewable electricity PPAs are acceptable to the extent that they are entered into “directly” with electricity generators as counterparties, thereby excluding the possibility of having contracts signed with intermediaries or marketers, who in any case may always act as advisors or facilitators in the negotiation.
6. CBAM factor (“*Carbon Border Adjustment Mechanism*”), which will come fully effective in 2026, set a price on the carbon emitted in the production of certain GHG-intensive goods entering the EU. Its objective is to level the playing field of production costs between local and foreign producers and to encourage clean production outside the EU. The initial scope covers cement, steel, iron, aluminium, electricity, hydrogen and fertilisers, including ammonia. The CBAM will have a discriminatory effect on foreign producers compared to local ones, as well as on the type of RFNBO product in question (for example, substances outside the CBAM catalogue, such as methanol or efuels), due to higher regulatory burdens on the goods subject to CBAM (H2 and NH3) and imported products that fall within the scope of the CBAM are treated differently than the same products produced within the EU and subject to the EU ETS.



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