

## **Growing interest in green and blue ammonia for energy imports: techno-economic studies by thyssenkrupp Uhde for potential cumulative global production of over 30 million tpa**

- **Focus on green energy/hydrogen export via ammonia**
- **Opportunities gain traction through political incentives**

Two major trends dominate the energy and natural gas market: the high and volatile price of natural gas, and the shift towards renewable energy sources. While some of the most pressing energy needs can be met by LNG imports, there is growing market interest in ammonia as a carrier for green energy and hydrogen.

Lucretia Löscher, COO thyssenkrupp Uhde: "We have conducted numerous feasibility studies for power-to-hydrogen-to-ammonia development projects. Incentive schemes such as the Inflation Reduction Act, H2 Global and Hydrogen Head Start support the competitiveness of these climate-friendly projects."

thyssenkrupp Uhde's competence center for green ammonia in Australia supports a broad variety of customers with techno-economic studies and optimization concepts. In total, the studies already conducted would amount to a potential increase of the global production capacity by around 30 million tpa (tons per annum) of green ammonia. To produce the required green hydrogen, electrolyzers with more than 45 gigawatts would need to be installed with varying power supply configurations. The added up capacities from the studies reflect a significant interest in ammonia as an energy vector, and this underlines its importance for shipping green hydrogen and green energy across the globe. This development marks a fundamental diversification of its primary use as a fertilizer feedstock.

### **Ammonia market becomes sustainable, new markets emerge**

As one of the world's most traded base chemicals, ammonia is today mainly used for fertilizer production, with natural gas as a feedstock. However, more and more producers are looking for alternatives, and there are two main options. The first is 'blue ammonia', which is still produced from natural gas, but with the CO<sub>2</sub> being captured and stored to reduce the carbon footprint as much as possible. The first projects are already underway, and many countries see this as a viable way to improve sustainability in the short term.

In the medium and long term, the green production of ammonia is key for a sustainable world. Only water, air and renewable electricity are needed to produce this high-demand base chemical in a completely emission-free way. As the global infrastructure for handling, storing, and transporting ammonia already exists, green ammonia could be produced in the sunny Gulf States, Australia or other renewable-rich countries and then transported to countries with high demand for renewable energy or hydrogen, such as many European countries. Ammonia has a volumetric energy density nearly 33% higher than liquid hydrogen, making it more efficient and cost-effective to transport. It also liquefies at -33°C, which is easier to achieve and maintain than the near-absolute-zero temperature of -253°C required for hydrogen liquefaction.

### **Ammonia cracking, or direct use in either power generation or as marine fuel**

When green ammonia reaches its destination, it can be converted back into hydrogen by ammonia cracking, a technology which thyssenkrupp Uhde can also provide. This offers an alternative to fossil-based hydrogen and enables sustainable value chains for many chemicals. Even more efficient is the direct use of green ammonia, for example in gas turbines to generate power. This is already being tested in co-firing, and full ammonia turbines are also being developed.

One final point: To make the transport itself sustainable, more and more shipping companies are interested in using green ammonia as a marine fuel. With the exclusive use of green ammonia, the only emissions are nitrogen (the climate-neutral main component of our atmosphere) and water, with no emission of sulfur, soot, fine particulate matter, or CO<sub>2</sub>. Ammonia is therefore an excellent way to transport green energy and hydrogen to where it is needed. Technologies are already being developed and applied.

**About thyssenkrupp Uhde**

thyssenkrupp Uhde combines unique technological expertise and decades of global experience in the engineering, procurement, construction and service of chemical plants. We develop innovative processes and products for a more sustainable future and thus contribute to the long-term success of our customers in almost all areas of the chemical industry. Our portfolio includes leading technologies for the production of base chemicals, fertilizers and polymers as well as complete value-chains for green hydrogen and sustainable chemicals. [www.thyssenkrupp-uhde.com](http://www.thyssenkrupp-uhde.com)

**Contact**

thyssenkrupp Uhde  
Christian Dill  
Senior Communications Manager  
Phone: +49 231 547 3334  
E-mail: [christian.dill@thyssenkrupp.com](mailto:christian.dill@thyssenkrupp.com)