

PRESS RELEASE Power to Ammonia

Unique research collaboration between industry, energy sector and knowledge institutes has launched

Storing Renewable Energy as Ammonia

Amersfoort, January 27, 2016 - The Institute for Sustainable Process Technology (ISPT) has united ten players in the energy and chemical industries in a unique project named *Power to Ammonia*. The group will investigate the extent to which ammonia can be locally generated using renewable electricity. Thanks to the growing number of wind turbines and solar panels, the supply of renewable electricity will sharply increase in the coming years. At times when there is a surplus of renewable electricity, it can be converted to ammonia locally using small-scale plants.

Just like natural gas, the produced and stored ammonia can be used by energy companies at any time as fuel for electricity generation. Ammonia can be stored as a liquid; a standard tank of 60,000 m³ contains about 211 GWh of energy, equivalent to the annual production of roughly 30 wind turbines on land. Ammonia can be burned cleanly: water and nitrogen are released, but no CO₂ and little or no nitrogen oxides. What's more, the industry can use this ammonia as a renewable raw material for the production of fertilizer and other products. Last but not least, applications could include wind turbines that provide electricity solely for the sustainable production of ammonia and are not linked to the electrical grid, which would eliminate miles of expensive power cables.

"As a power company, Nuon is very interested in the idea of a carbon-free fuel and the seasonal storage of electricity. We are examining the opportunity to endow our gas-fired power plants with a sustainable future," says Geert Lowland, coordinator for technology sharing at Nuon.

The *Power to Ammonia* project is unique in bringing the energy sector and industrial companies together to enable the transition to a sustainable energy supply as well as the partial provision of raw materials. ISPT previously launched the successful project *Power to Products*, in which eighteen participants explored how the process industry can respond flexibly to the growing supply of renewable power, including through the wider use of electrochemistry to make products. The *Power to Ammonia* project is a logical next step. ISPT has spent the past year exploring the field in preparation.

Existing technology can be used to produce ammonia by splitting water into hydrogen and oxygen with the help of electricity, then using high temperature and pressure to convert the hydrogen plus nitrogen from the air into ammonia. Ammonia's advantages are that it can be stored in large tanks as a liquid, that it burns cleanly, that it is readily marketable and that it has a fairly high energy density—significantly more compact than that of hydrogen gas and about half that of diesel.

Thanks to the presence of a relatively large process industry, the Netherlands is unique in its ability to balance the supply and demand of renewable electricity this way. This ability facilitates the rapid transition to a sustainable energy supply. "With ammonia as the primary raw material for our fertilizer and melamine production, we expect this project to help us contribute to the greening of the energy-intensive industry," says Ruud Swarts, technology manager for sustainability and energy efficiency at OCI Nitrogen.

Power to Ammonia is a partnership between ISPT, Stedin Infrastructure Services, Nuon, ECN, Delft University of Technology, University of Twente, Proton Ventures, OCI Nitrogen, CE Delft and Akzo Nobel and is the latest example of public-private partnership projects to have emerged from the ISPT network. ISPT has been bringing industry and academia together for more than a decade to realize innovations in process technology across the entire value chain.

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