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Renewable hydrogen, made cost competitive

An interview with Jon André Løkke, CEO of Nel ASA, by Joanna Sampson

Imagine a time before petroleum and electricity – horse-drawn carriages dominated the highways and byways and candles provided artificial lighting. The world was transformed by fossil solutions in just a few centuries.

But we are currently being faced with the side effects of utilising fossil energy – climate change and pollution. The obvious solution to these problems is exchanging fossil fuels with new renewable energies like solar, wind, and wave power.

According to one company in Norway, it's time for another global transformation. This time, it will be transformed by hydrogen, the simplest and most abundant element in the universe.

Nel ASA has a vision of empowering generations with clean energy forever. To achieve this, CEO Jon André Løkke believes hydrogen, along with renewable energy, must play a main role in the biggest energy transition since the discovery of oil.

Three quarters of the sun is made from hydrogen, providing us with all the clean energy we need for at least another five billion years. Realising that we have unlimited access to the sun raises an interesting question though: how do we manage to make use of it, especially when the energy that hits the earth has an irregular nature?

For storing and shifting large amounts of renewable energy, hydrogen represents the cleanest and most flexible solution. With costs of renewables falling dramatically, hydrogen is already outcompeting fossil fuels in several places in the world. Nel's technology makes sure the energy from the sun is not wasted and can ensure the stable delivery of clean hydrogen and energy anywhere to anyone.

Established in 1927 by Norsk Hydro, one of the largest aluminium companies worldwide, Nel started life as a renewable hydrogen producer for the fertiliser business. Today, Nel's hydrogen solutions cover the entire value chain: from hydrogen production technologies, to the manufacturing of hydrogen fuelling stations, to providing all fuel cell electric vehicles with the same fast fuelling and long range as conventional vehicles today.

The company is a leader in the industry, installing the first small electrolyser at Norsk Hydro's Notodden, Norway site in 1927. Since then, Nel has installed several of the largest hydrogen plants in history.

In 1940, Nel undertook the world's largest water electrolysis installation at Rjukan, Norway, with a total hydrogen production capacity exceeding 30,000Nm^3/hour from hydropower.

Just over a decade later, in 1953, Nel started up a second large-scale hydro-powered electrolyser plant for supplying hydrogen to ammonia production in Glomfjord, Norway. And in 1959 the company completely redesigned the electrolyser unit, forming the basis for today's atmospheric electrolyser.

The company served Norsk Hydro's own demand for green hydrogen, a critical component in the production of ammonia/fertiliser, until the 1970s, when Norsk Hydro started offering electrolyser technology to external customers.

Nel's first pressurised electrolyser was introduced to the market in 2001 and, in 2003, the company opened the world's first publicly available hydrogen refuelling station in Reykjavik, Iceland.

In 2014, Nel was developed into a separate entity and became the first 100% dedicated hydrogen company listed on the Oslo Stock Exchange. Since then, the company has grown significantly through a range of acquisitions, as well as organic growth, and has taken a leadership role in the development of the global hydrogen economy.

"Over the last few years, the development with hydrogen has been impressive. We believe the hydrogen industry is on the verge of experiencing the same development that we have seen for the wind and solar industries," Løkke tells gasworld. "As such, we believe the future is bright for the entire hydrogen industry."

Unique

Nel offers a one-stop shop, providing both production and distribution of hydrogen through its three divisions – hydrogen production, hydrogen fuelling, and hydrogen solutions.

Whilst Nel's corporate headquarters is in Oslo, Norway, the company manufacturers its alkaline electrolysers in Notodden, Norway, its PEM (proton exchange membrane) electrolysers in Connecticut, US, and its H2Station® hydrogen fuelling stations in Herning, Denmark. Nel also has local offices in California and South Korea, as well as a global sales network. It is very much a global company.

Since its inception, Nel has delivered more than 3,500 hydrogen solutions in 80+ countries worldwide, including: building and operating the first solar-driven hydrogen production plant in the US and constructing the world's largest electrolyser plant in Notodden.

"One of the things that makes Nel unique is that we have very strong capabilities both within alkaline and PEM electrolyser solutions, as well as in-house developed hydrogen fuelling station technology," Løkke highlights.

"We don't just put together components from sub-suppliers, we spend considerable effort and resources in developing the technologies, with a special focus on the Achilles heel sub-components in fuelling stations, like compressors and chillers, which are developed in-house."

"Our intimate knowledge across hydrogen production and fuelling has been one of the deciding factors for recent success with among others, Nikola Motor. Along with our commercial track record, I think this is what really sets us apart from our competitors."

As part of Nikola's development of a hydrogen station infrastructure in the US, Nel was awarded the contract for delivery of up to 448 electrolysers; one gigawatt of electrolysis. The multi-billion NOK electrolyser and fueling station contract is by far the largest electrolyser contract ever awarded.

Løkke says Nel is currently seeing success within all relevant markets, both in electrolysis-based hydrogen production and hydrogen refuelling.

"The two sectors go together and are pushed forward by the global megatrends of ever cheaper renewables, the focus on climate and air quality, as well as the transformation towards electromobility," he explains. "There is also already a huge market out there for consumption of hydrogen in the ammonia and refinery sector and we're experiencing increased interest from this sector."

"Empowering generations with clean energy forever, is the vision of Nel, and that's what's so great about hydrogen – based on renewable energy, the source is basically infinite."

Focus

Hydrogen technology has become more accessible recently with prices for the technology and gas continuing to fall, helped by renewable energy becoming increasingly competitive.

"These are the two main drivers," Løkke explains. "The key target for us is to make renewable hydrogen cost competitive, head-to-head with fossil hydrogen. We want to compete head-to-head on industrial applications and on mobility transport applications."

"We want to outcompete petrol and diesel completely and we also want to outcompete fossil hydrogen. With this, fossil parity has been achieved and that's our key driver at the moment."

With the recent drop in prices for wind and solar, as well as the cost reductions Nel can realise for electrolysers, Løkke says he can see renewable hydrogen gradually taking back the position it had at the inception of the company in 1927.

And Løkke wants to take the company full circle and expand once more into where it started out: as the preferred technology for ammonia and fertiliser manufacturing. "In fact, we have just begun this journey, with the project we announced with Yara International just before the end of 2018, where we are collaborating on developing a next generation green fertiliser concept, which is adapted for renewables."

The project's ambition is to realise zero-emission fertiliser production using innovative solutions and cost-efficient hydrogen production from electrolysis based on renewable energy. It leverages on the development of Nel's next generation alkaline electrolyser, which is basically tailor-made for large-scale ammonia production and other industrial applications.

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Another ongoing focus for Nel is 'Scaling Up', highlights Løkke. "We have experienced increased interest for large-scale renewable hydrogen production, and also increased development and interest within heavy duty transportation, such as buses, trucks, trains and ships."

"We are working on developing larger electrolyser units, large-scale production solutions, as well as eco-systems. This includes everything from production, to distribution and fuelling."

Future

"We don't have fortune tellers working in Nel yet," quips Løkke, "but many enthusiastic, dedicated and skilful people who believe in what they are doing, its importance for the world, and that Nel will have a positive impact on where things are going."

"We don't see the focus on zero-emission solutions slowing down anytime soon, and there aren't that many options out there, so that leaves an important role for hydrogen to play."

"And, with the technology being mature enough to be deployed on a massive scale, and most importantly, also being able to compete with the existing fossil solutions, we believe the future is looking bright – for Nel, for our colleagues in other hydrogen technology companies, and, crucially, for future generations."

Transitioning from fossil fuels to a renewable-based economy is an enormous challenge. But Nel and Løkke remain confident in this transformation. Something affirmed by the company's slogan, and also a bumper sticker on Løkke's very own Hyundai NEXO hydrogen car, signalling the end of centuries of fossil dependence and the advent of the hydrogen era: "Thanks for the ride, dinosaurs. We'll take it from here!" gw