

Wide Spread Adaption of Competitive Hydrogen Solution

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Nel Hydrogen

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90 years

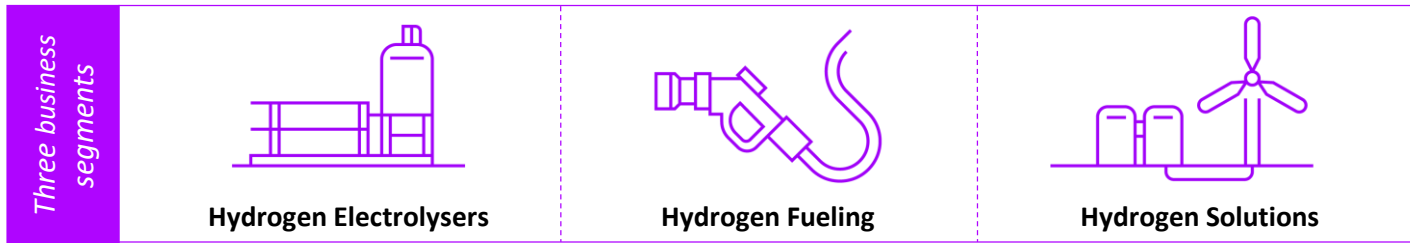
..of hydrogen technology
experience and excellence

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Nel ASA

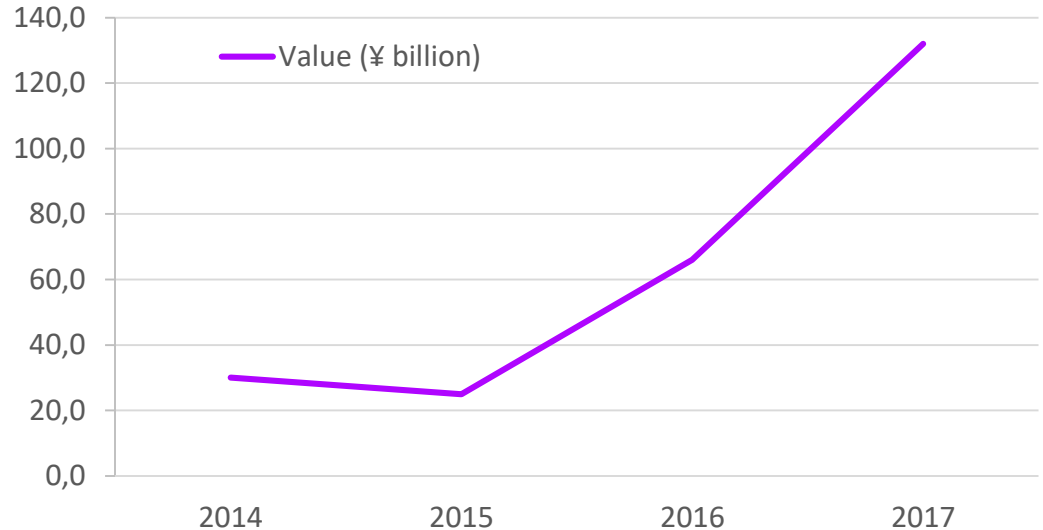
- Global, listed, pure-play hydrogen company – facilities in Norway, Denmark and the U.S.
 - Significant foothold in fast-growing markets & a solid backlog
- World-leading on hydrogen electrolyzers and fueling equipment – unrivalled performance and track-record
 - Complete range of products optimally positioned for large market opportunities
- Capable of delivering solutions to produce, store and distribute hydrogen from renewable energy – serving industry, energy and gas companies
 - >3500 hydrogen solutions delivered in ~80 countries world wide since 1927



Significant increase in hydrogen market activities

- Total value of offers amounted to ~130 ¥ billion in 2017
- Often long lead times between offer and order
 - From a few quarters to...
 - ...a few years
- Continued good lead generation is key to continued commercial success

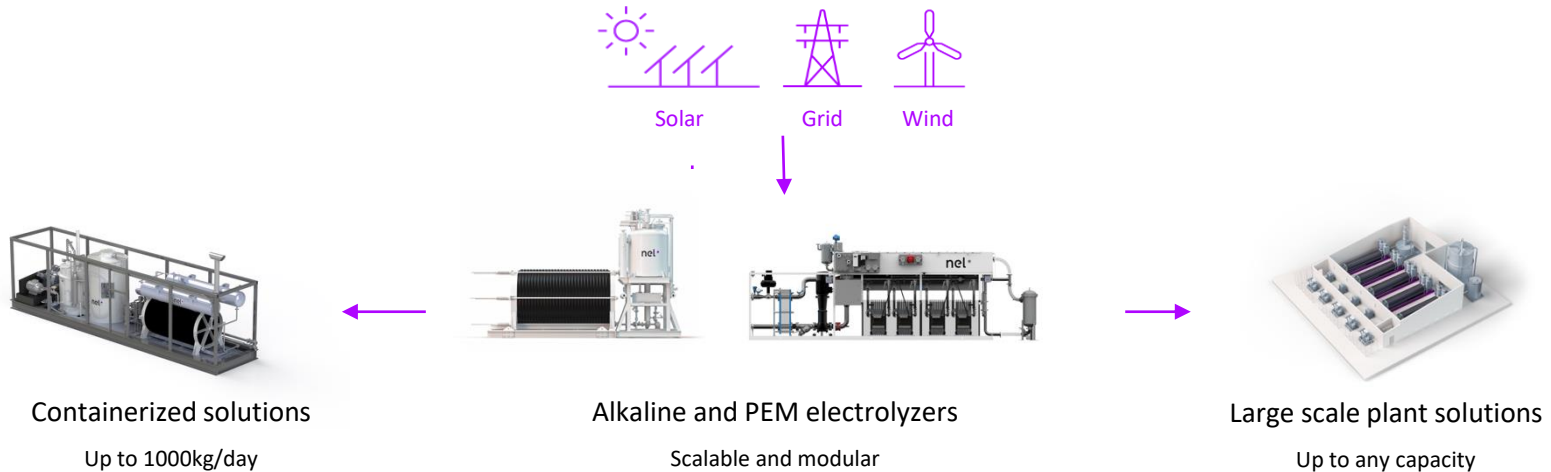
Historical, compound value of budget offers sent from Nel & Proton



Nel Hydrogen Electrolyser

Production and installation of water electrolyzers for hydrogen production

- Global leader in electrolysis based hydrogen production plants
 - highest uptime, lowest conversion cost, robust and reliable
- Unrivalled track-record with >3500 hydrogen solutions delivered in >80 countries world wide since 1927
- Scalable production capacity for industrial and energy/transport applications – small scale to large scale solutions



Nel Hydrogen Fueling

Production of hydrogen fueling stations for cars, buses, trucks, forklifts and other applications

- Global leader within hydrogen fueling solutions for vehicles, adapted to latest fueling standards
- Delivered >30 stations in 8 countries across Europe since 2003, expanding into US & Asia
- Highest reported availability and innovative, in-house developed technologies



H2Station®

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Dispenser assembly



5-stage H2Station® assembly



World's largest
manufacturing
facility for
H2Stations®:

300 station per
year capacity

Opening of the first fueling with Nel-technology in Japan

Nel Hydrogen Fueling

Ribbon cutting ceremony

- Mitsubishi Kakoki Kaisha (MKK) purchased the rights to manufacture Nel hydrogen stations based on a license
- Design adapted to Japanese regulations and local standards
- Opened in Kawasaki City on October 5th, 2017



Nel Hydrogen Solutions

Utilizing market opportunities across the Nel group and offers complete solutions to customers

- Unified delivery of complex renewable hydrogen solutions, efficient system integration, project development and sales across segments
- Sole provider of integrated solutions along the entire value chain:
 1. Fueling Networks
 2. Renewable Hydrogen & Storage Solutions



Fossil parity

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renewable hydrogen from electrolysis reaching a
tipping point

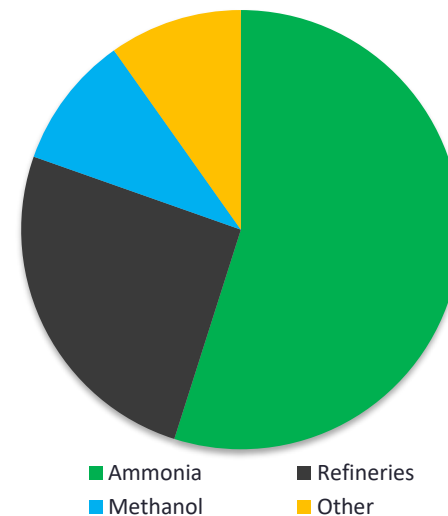
Global hydrogen market

General market update

Large opportunities for electrolysis within existing hydrogen market

- ~55 million ton/year market (~150 BUSD)
 - 15% merchant market (5 – 15 \$/kg)
 - 85% on-site (~2\$/kg)
- Only 1% from water electrolysis today, rest from SMR/gasification
- Large potential for growth, driven by increasing focus on:
 - climate and renewable energy
 - decreasing electricity prices
 - decreasing electrolyser CAPEX
- Special focus on refineries and green ammonia
 - Account for ~80% of market
- Assuming that total market is supplied by electrolysis, annual market potential would be >20 B\$/year

Global hydrogen market, by end-use:



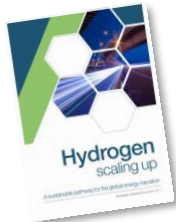
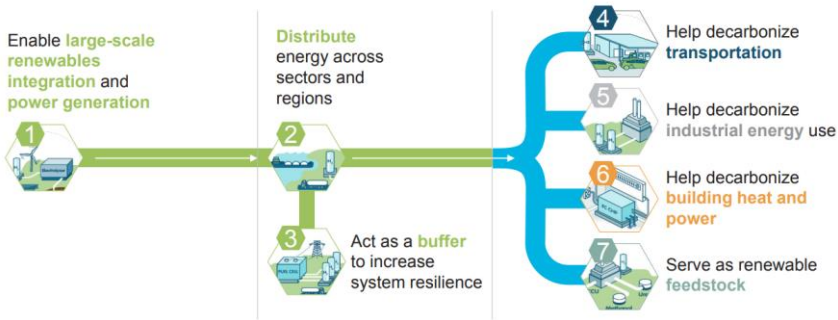
Overall hydrogen market set to grow 10x by 2050

General market update

If high share of renewables, electrolysis market can potentially grow >1000x...

... and an IEA study confirms the competitiveness of renewable hydrogen

Enable the renewable energy system → Decarbonize end uses

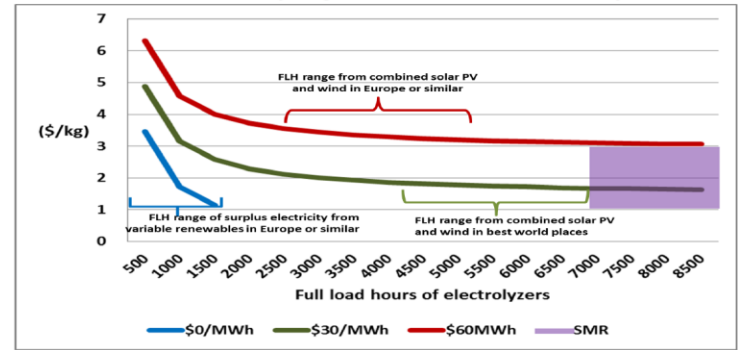


Report authored by the Hydrogen Council, consisting of senior executives of 18 companies in different industries, supported by McKinsey & Co



Clean H₂: electrolysis of water

Costs of hydrogen from alkaline water electrolysis



Assumptions: alkaline electrolyzers \$ 450/kW; efficiency 70%; WACC 7%; lifetime 30 y

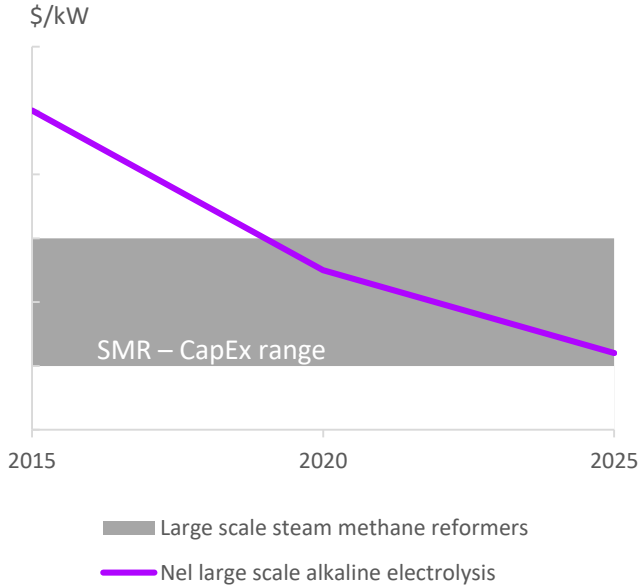
Renewables-based water electrolysis can compete with SRM in areas with excellent solar and wind resources combined

Source: https://www.iea.org/media/news/2017/Fertilizer_manufacturing_Renewables_01102017.pdf

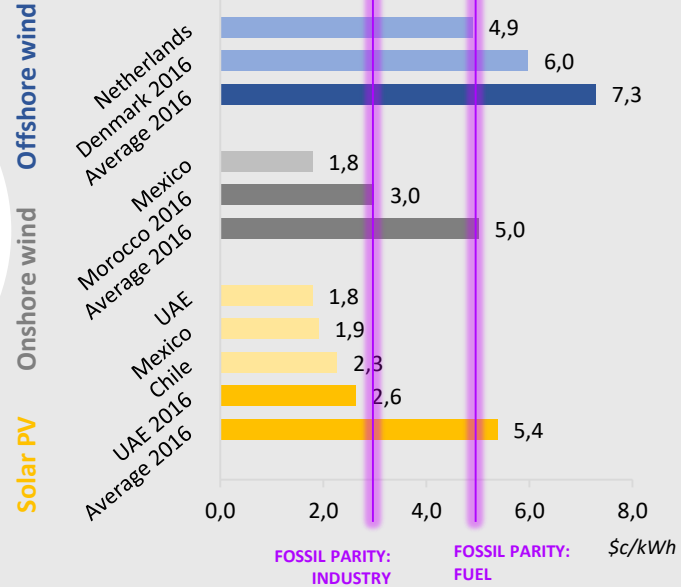
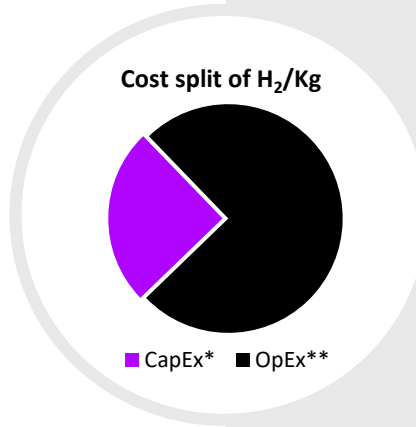
Electrolysers outcompeting fossil alternatives

General market update

CapEx: Electrolysers from Nel - becoming competitive with SMR



OpEx: Renewable energy already enables fossil parity for hydrogen



Source: Pareto Securities
EUR/USD: 1:1.2

*incl. service, maintenance & operation
**electricity

Current markets served by electrolyzers

General market update



Food Industry



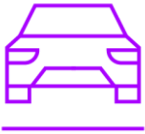
Glass Industry



Polysilicon Industry



Laboratories



Transport Sector



Chemical Industry



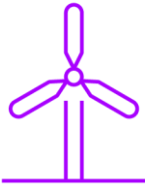
Steel Industry



Power Industry



Life support



Power-To-X
(renewable hydrogen)

Historical market

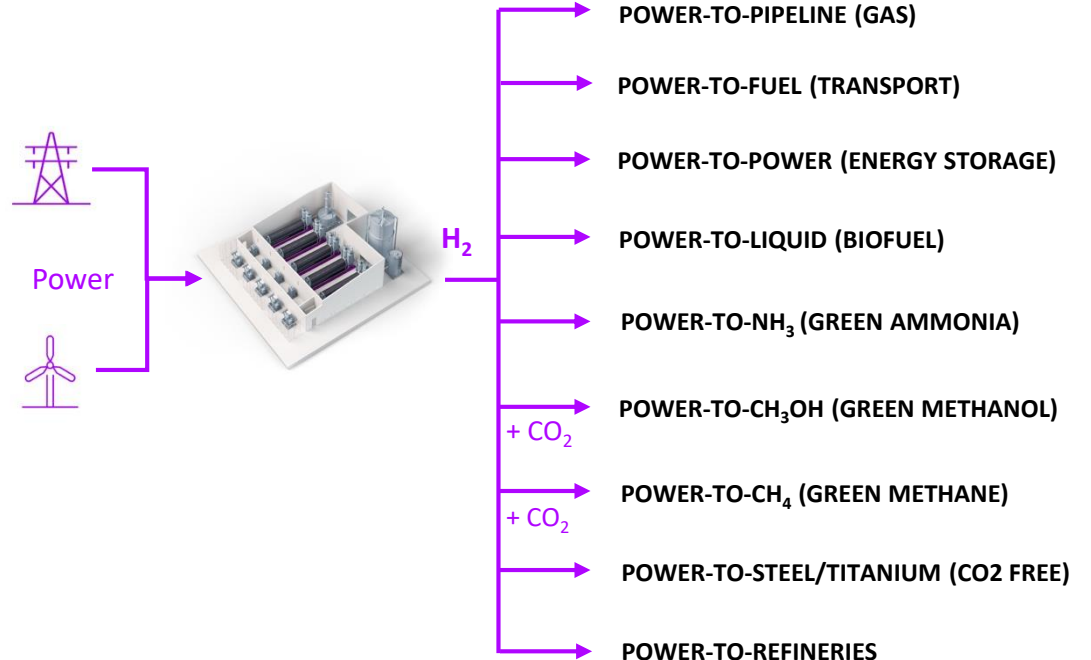
New markets

New markets, Power-To-X

General market update

Unparalleled position of electrolysis in producing other green energy forms

- Hydrogen from electrolysis will be key in producing large quantities of sustainable energy in various forms
- Ability to adapt to diverse and intermittent renewable energy sources becoming increasingly important



Project develop.: 400MW renewable H2 plant to outcompete natural gas reforming

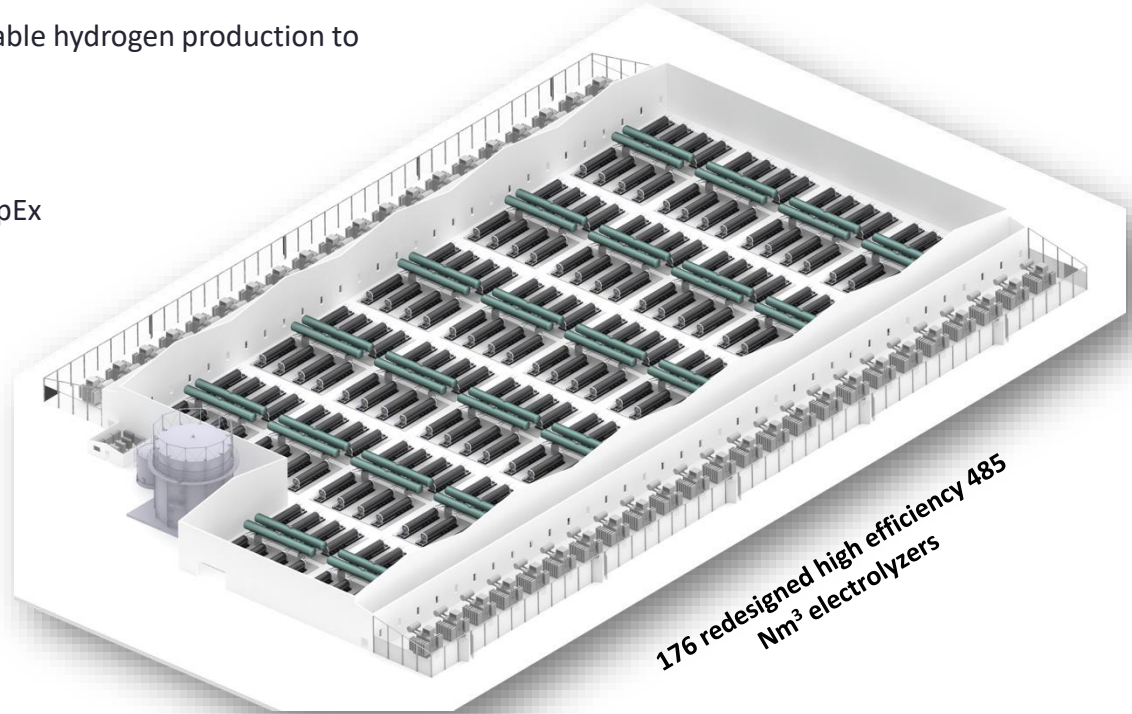
General market update

- Progressing on mega scale concept for renewable hydrogen production to **outcompete** natural gas reforming
- International industrial client
- Have developed “cluster design” to reduce CapEx

8-Cluster Electrolyzer



- Benchmark CapEx ratio:
 - 450 \$/kW



176 redesigned high efficiency 485
Nm³ electrolyzers

Fossil parity in the transport sector achievable

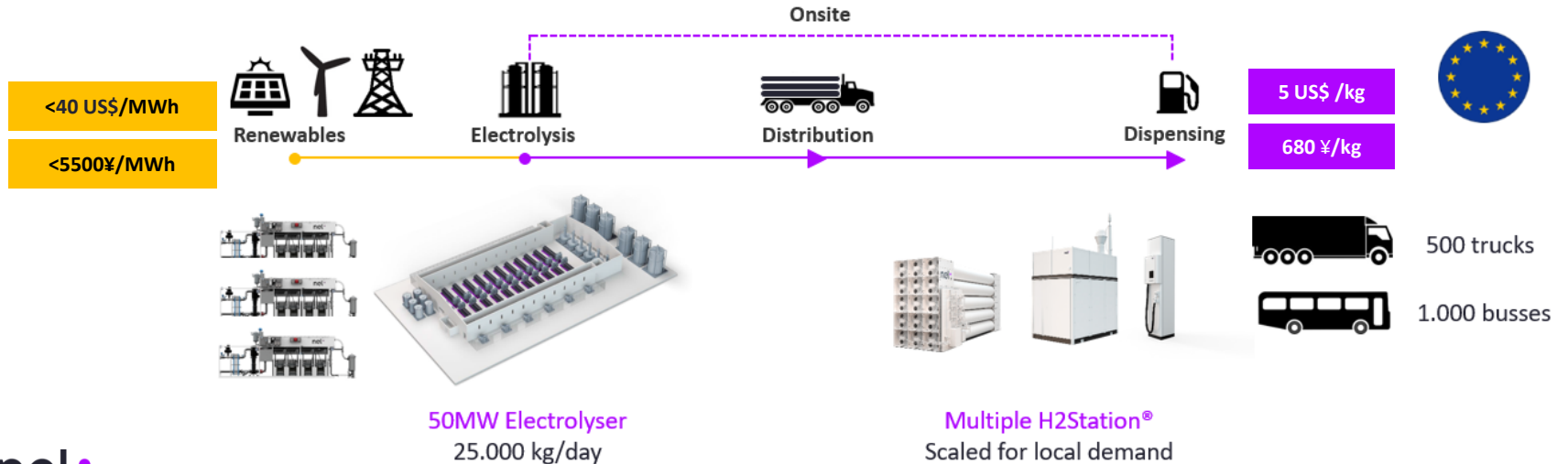
General market update

Centralized production can use low cost RE and achieve high scale – Onsite prod. eliminates costs for distribution

Centralized vs Onsite depends on power availability and pricing in the specific market

<40 US\$ | 5,500€/MWh is needed for central production together with 50/70MPa trailers

<60 US\$ | 8,200€/MWh is needed for onsite



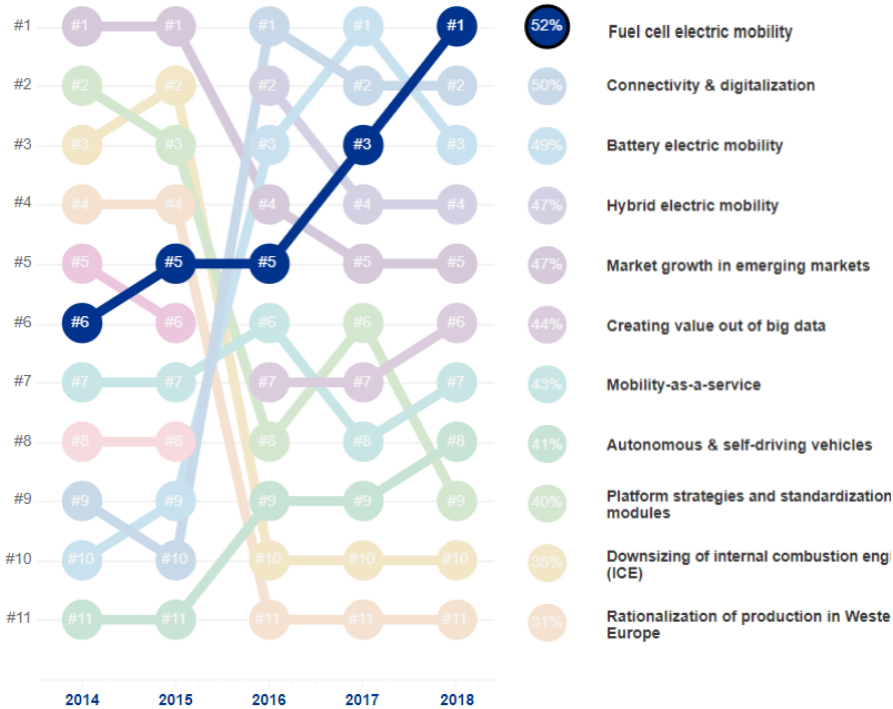
Hydrogen is becoming relevant in all forms of transportation

General market update



Recent survey increases the importance of hydrogen as a fuel

General market update



Fuel cell electric mobility is now the #1 trend until 2025

“There will not be a single solitary drivetrain technology: Executives project a split by 2040 for BEVs (26%), FCEVs (25%), ICEs (25%) and hybrids (24%).”

KPMG Global Automotive Executive Survey is the compound input from 1000 executives from the automotive industry

Project examples

Showcase Denmark

Project examples

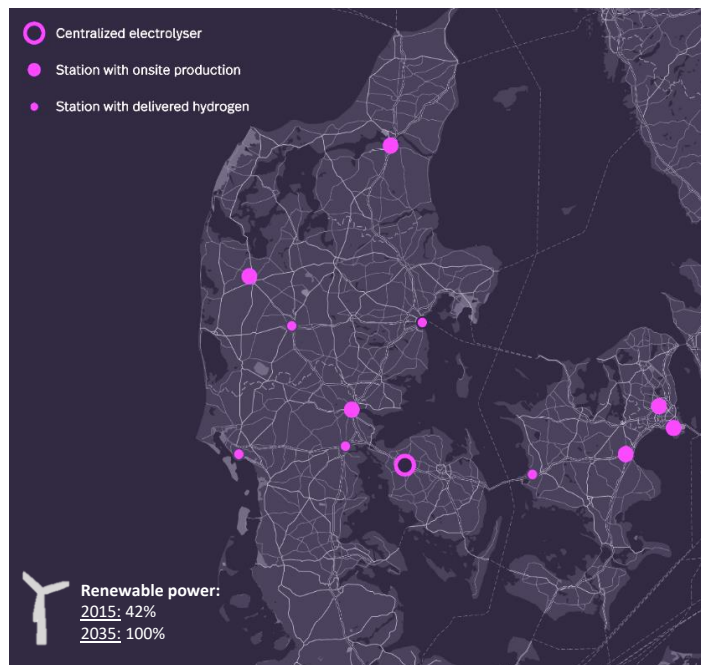
The world's first country-wide network in daily operation:

- Nel constructed entire network
- Nel undertakes service, maintenance and surveillance
- Collaborating with leading oil, energy and gas companies*

Key facts:

- 100% of hydrogen from electrolysis
- 6 stations with onsite electrolysis
- 5 stations with centralized Nel electrolysis
- All stations approved by OEM's

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Additional support from Enova to Uno-X Hydrogen fueling stations

Project examples

20 MNOK support for establishment of 2 additional HRS in Akershus in 2018

- Uno-X Hydrogen received support to establish 2 new hydrogen fueling stations in Ås & Hvam, Akershus
- After installation, JV will operate 5 HRS in Southern Norway
- Åsane, Bergen opens formally 26th of January 2018
- Currently ~90 FCEVs in Norway, annual sales growth of >2x
- Total of 4 HRS in Norway in 2017, 8 HRS in 2018



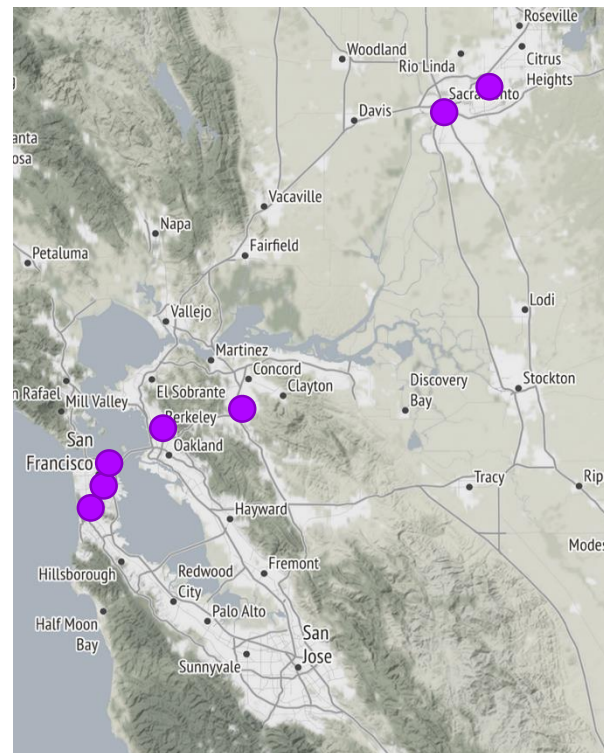
Supplying fueling stations to Shell in California

Project examples

Exclusive framework contract with Shell

- Nel has exclusive framework contract with Shell (in partnership with Toyota and Honda) for supply, construction and maintenance of hydrogen stations San Francisco CA
 - Initial purchase order received Q1'17 with value of NOK ~140 million
 - Received additional purchase order with value of NOK ~50 million during Q3
 - H2Station® modules expected to ship in H1'18
- Shell has issued an RFI for additional 100 hydrogen stations to California
 - Visibility on deliveries will help the industry to reduce costs

Shell hydrogen stations in Northern CA



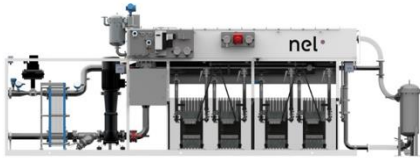
Locations where Shell receives CEC grants from current round of funding

PEM electrolyzer and H2Station® for bus fueling in California

Project examples

High capacity station for 25 buses in CA

- First integrated Nel/Proton product offering
- One M-400 2 MW Proton PEM electrolyzer
- Two H2Station® for buses
- Total contract value of USD >8 million
- Delivery during 2018



2 MW PEM electrolysis



Hydrogen storage



Station module



Dispensers



35MPa

35MPa

Fueling station for hydrogen trucks in Trondheim, Norway

Project examples

First ever triple-dispenser station

- For ASKO, Norway's largest grocery wholesaler
- Onsite renewable hydrogen from electrolysis
- Connected to rooftop solar on warehouse
- Containerized turn-key C-150 electrolyser
- H2Station[®] for trucks, cars and forklifts



Electrolyzer



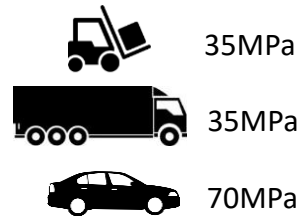
Hydrogen storage



Station module



Dispensers



Fueling station for buses and cars in Riga, Latvia

Project examples

High capacity station for 20 buses in Riga

- Bus depo facility in Riga, Latvia
- Onsite reforming of natural gas
- H2Station® for busses and cars
- 10 busses and 10 trolley busses



Reforming



Hydrogen storage



Station module



Dispensers



35MPa



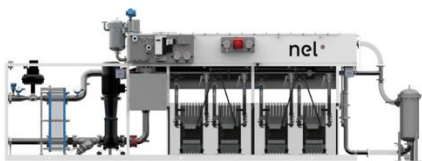
70 MPa

Awarded contract for combined fueling solution in Estonia

Project examples

Received PO of EUR 4.5 million from NT Bene in Estonia

- Combined solution with PEM electrolyzer and H2Station® will have hydrogen capacity of >400 kg/day
- To be installed in Pärnu, Estonia, where it will serve cars and a fleet of buses and trucks
- Expected delivery and installation during 2019



1 MW PEM electrolysis



Hydrogen storage



Station module



Dispensers



35MPa



35MPa

Hydrogen trains

Project examples

Exchanging diesel with hydrogen trains makes environmental and business sense

- Rather than high CapEx electrification, hydrogen can be used at a fraction of the investment
- Opportunities in Norway:
 - Raumabanen (114 km)
 - Rørosbanen (384 km)
 - Nordlandsbanen (729 km)
- Newly launched ALSTOM train has 600 - 800 km range, capacity for 300 passengers
- More than 50 trains already ordered by regions in Germany
- Infrastructure can be shared with other transport modes



Coradia iLint – world's first hydrogen train by ALSTOM, will go into operation during 2018

Hydrogen ferry project

Project examples

Nel part of the Norwegian project “HYBRIDskip”

- Purpose of project: establish knowledge base for longer journeys/operational times in bigger vessels, based on battery and hydrogen technology
- Target to realize a hybrid-ferry in operation by 2020
- Nel role: provide information on fueling/bunkering, technological analysis and safety considerations



Fiskerstrand FV Hydrogen powered – Zero emission

Hyon AS, a one-stop-shop for complete hydrogen energy solutions

Project examples

Scandinavian powerhouse on hydrogen

- Joint venture between Nel ASA, Hexagon Composites ASA and PowerCell Sweden AB
- Utilizes each partner's respective world-leading technologies and competencies to manage and develop projects for effectively integrating and optimize zero-emission power solutions for the customers
- Main, initial focus: maritime sector
 - Strong maritime competence in Hyon, and high focus on zero-emission maritime solutions in Norway
- Also targeting hydrogen energy storage projects



Delivering mega-scale hydrogen fueling stations for Nikola

Project examples

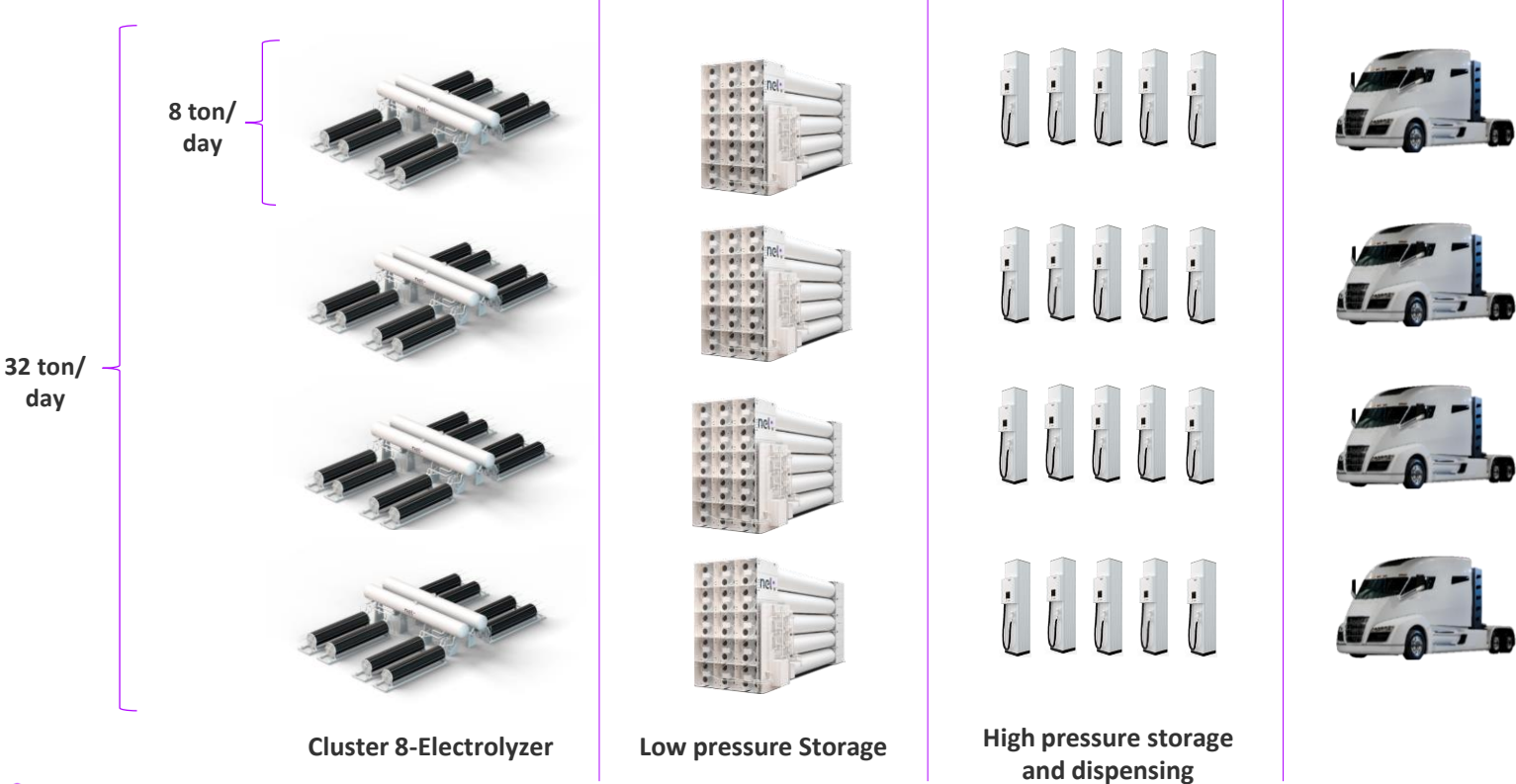
Entered into exclusive partnership with Nikola Motor

- Sole equipment supplier to create the largest hydrogen fueling network in the world
- 16 mega-scale stations covering 2000 miles & up to 450 ton/day
 - Signed PO for first two demo stations
- 14 commercial stations with capacity of up to 32 ton/day
 - Installation during 2019 – 2021
- Contact potential equivalent to ~1,000 MW of electrolysis and >250 hydrogen fueling dispensers



Nikola: 14 commercial stations – from 8 to 32 ton/day at each site

Project examples



Other large, industrial opportunities

Project examples

Exchanging coal with hydrogen as a reduction agent

- If employed at Tizir, currently the largest CO₂-emitting source in Norway (in one location)
- Reduces emissions drastically, ~90%
- Needs ~30 tons of hydrogen per day
- Equivalent of 60,000 vehicles
- Applicable for several other industries, e.g. large steel mills, etc.



TiZir plant in Tyssedal

Potential large scale energy storage project in Fredericia, Denmark

Project examples

Multi-value stream project in Denmark

- Potential project of ~20 MW electrolysis
- Renewable hydrogen for multiple purposes:
 - Replace fossil hydrogen used in refinery process
 - Energy storage and power generation
 - Hydrogen used for transportation purposes
- Other value streams:
 - Oxygen used locally within refinery
 - Heat used for city district heating
- Solution relevant for oil refineries across the globe



Shell oil refinery in Fredericia, Denmark

World's largest power-to-gas project planned for France

Project examples

700 MW electrolyser plant for power-to-gas in Northern France

- H2V PRODUCT (FR) will inject hydrogen into natural gas grid in France
 - In dialogue with French government on incentive scheme to realise the project
- Largest power-to-gas project in history
 - 700 MW | 380 M\$ project
 - Direct injection of hydrogen and biogas in natural gas grid
- Design is ready & land secured
- Project phase during 2018 – 2025
- Location: Les Hauts and Normandie-regions in France
- **Planning for significant expansion of electrolyser manufacturing capacity**



How to maintain a leading cost position

Evaluating 10x capacity increase to maintain leading cost position

How to maintain leading cost position

Scaling production capacity by 10x puts Nel in first-mover/pole position for next growth cycle

- Evaluating a total 10x capacity increase, from 25MW to 250MW
- Production capacity ramp-up reduces production cost by >30%

Available	Capacity	Scaling	Status
2017	25MW	+15MW	Completed
2018	40MW	+210MW	Preparing
2019	250MW		



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Number one by nature