



# Water Electrolysers & Fueling Stations For a Green H<sub>2</sub> Economy

Raymond Schmid  
Vice President Sales & Marketing

Fichtner H<sub>2</sub> Forum – 6.10.2020



# NEL: PURE H<sub>2</sub> PLAYER FOR 90 YEARS

350 Employees, Listed (NEL.OL)

## PEM water electrolyzers

Wallingford, USA



Systems delivered: **2,700+**

Nameplate capacity: **~40MW/year**

## Alkaline water electrolyzers

Notodden/Herøya, Norway



Systems delivered: **800+**

Nameplate capacity: **~40MW/year**  
→ **~500 MW/year (2021)**

## Hydrogen refuelling stations

Herning, Denmark



Stations delivered: **80+**

Nameplate capacity: **~300 HRS/year**

# PEM & ALKALINE WATER ELECTROLYSIS

Nel offers a neutral technology selection



- Technology Neutral
- Nel offers what suits your project most
- 10kW to 100MW
- Both with decades of field experience



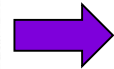
# NEL PEM WATER ELECTROLYSIS

High Performance Industry Legacy for Unique Commercial Solutions



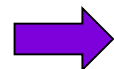
**1955**

GE develops PEM  
Military & Aerospace  
(Grubb & Neidrach)



**1985**

GE sells the technology  
to United Technology  
Military & Aerospace



**1996**

Spin Off Company  
Proton Onsite develops  
commercial products



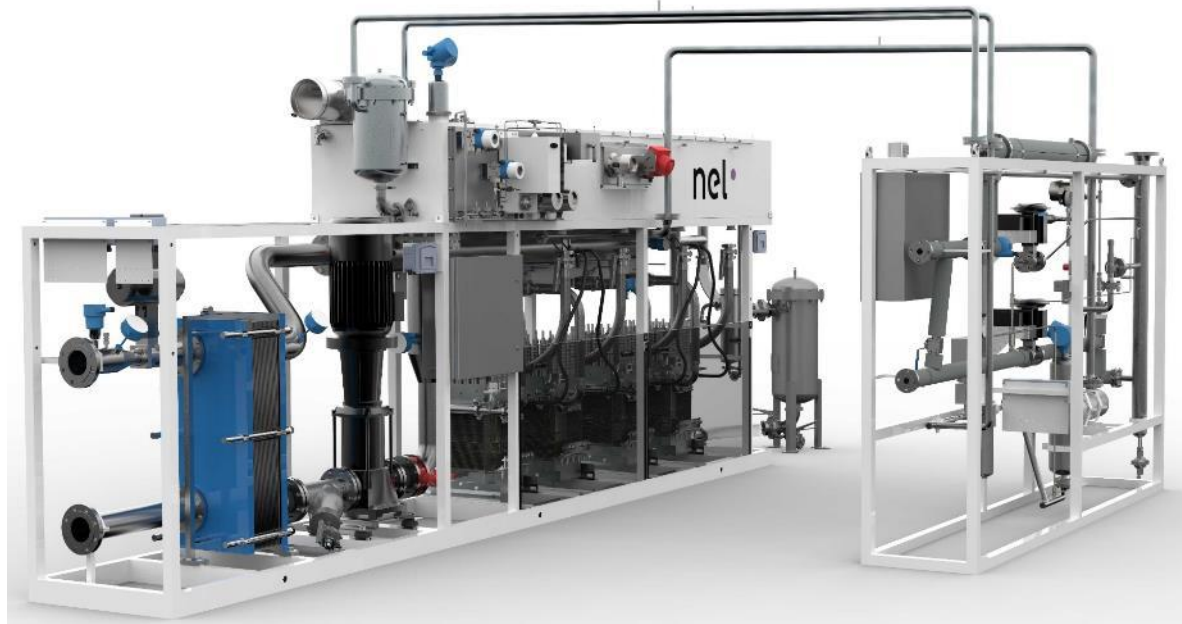
**nel**•

**2017**

Proton Onsite  
becomes part of Nel

# NEL PEM WATER ELECTROLYSIS

Complete Integrated Field Proven Solutions

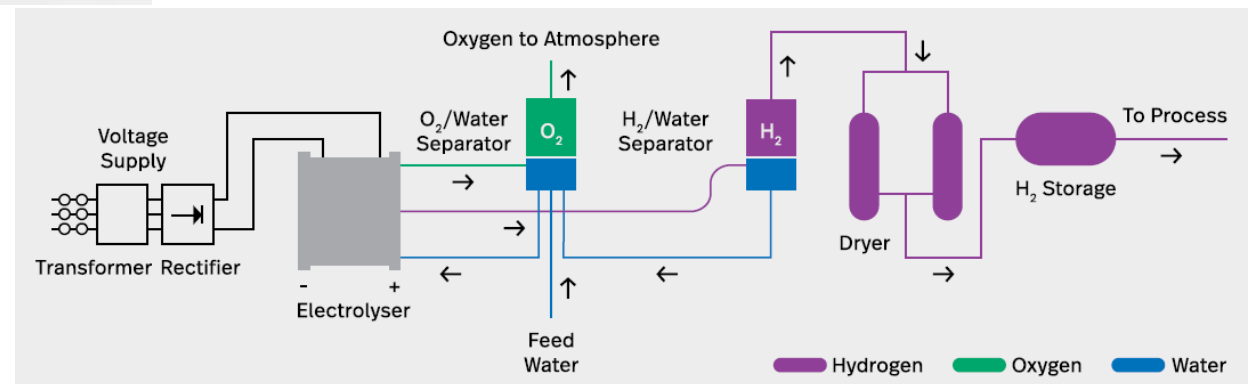


Power Supplies, Power Distribution & Controls  
PLC-based HMI Interface

Process Skid – Stacks, Cooling & O<sub>2</sub> Mgt (WOMS)  
H<sub>2</sub> Gas Mgt Skid – Water Removal (HGMS)



Cell Stack  
(1,25MW, 250Nm<sup>3</sup>/h)



# NEL PEM WATER ELECTROLYSIS

Fueling: 2MW – 328Tons/Year



# NEL PEM WATER ELECTROLYSIS

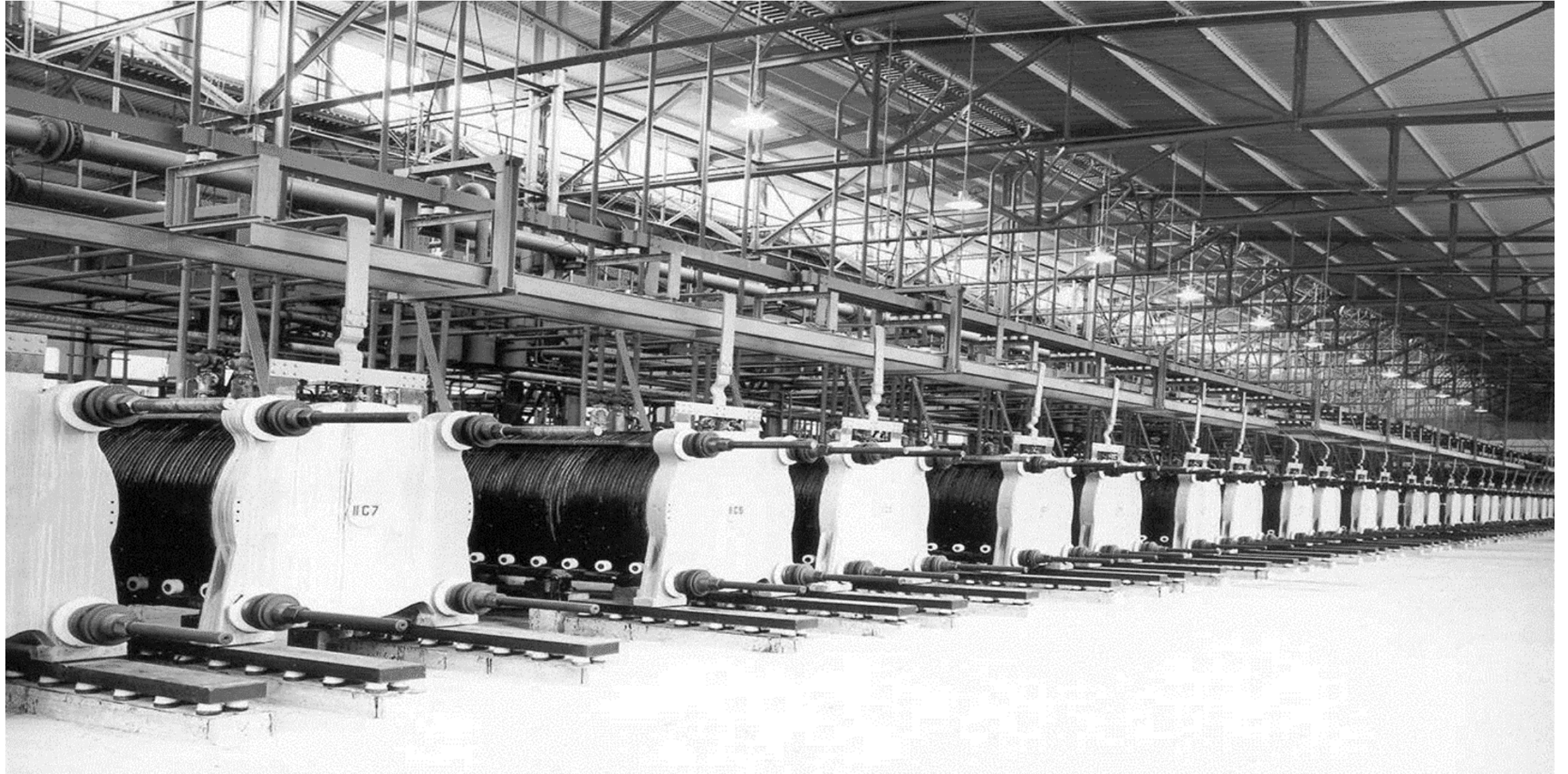
Hydrospider: 1<sup>ST</sup> Nationwide 1,600 Hyundai FC Truck Network (Niedergösgen, Switzerland – 2020)

- 30MW PEM framework agreement
- MC400 Proton® PEM – 300T H<sub>2</sub>/year
- 360barg H<sub>2</sub> dispatched to station
- 40 Hyundai XCIENT – 190kW FC – 400km
- Network also used for cars



# NEL ATM ALKALINE WATER ELECTROLYSIS

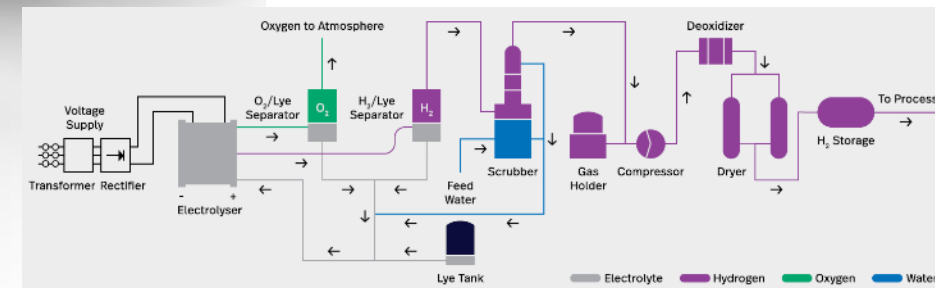
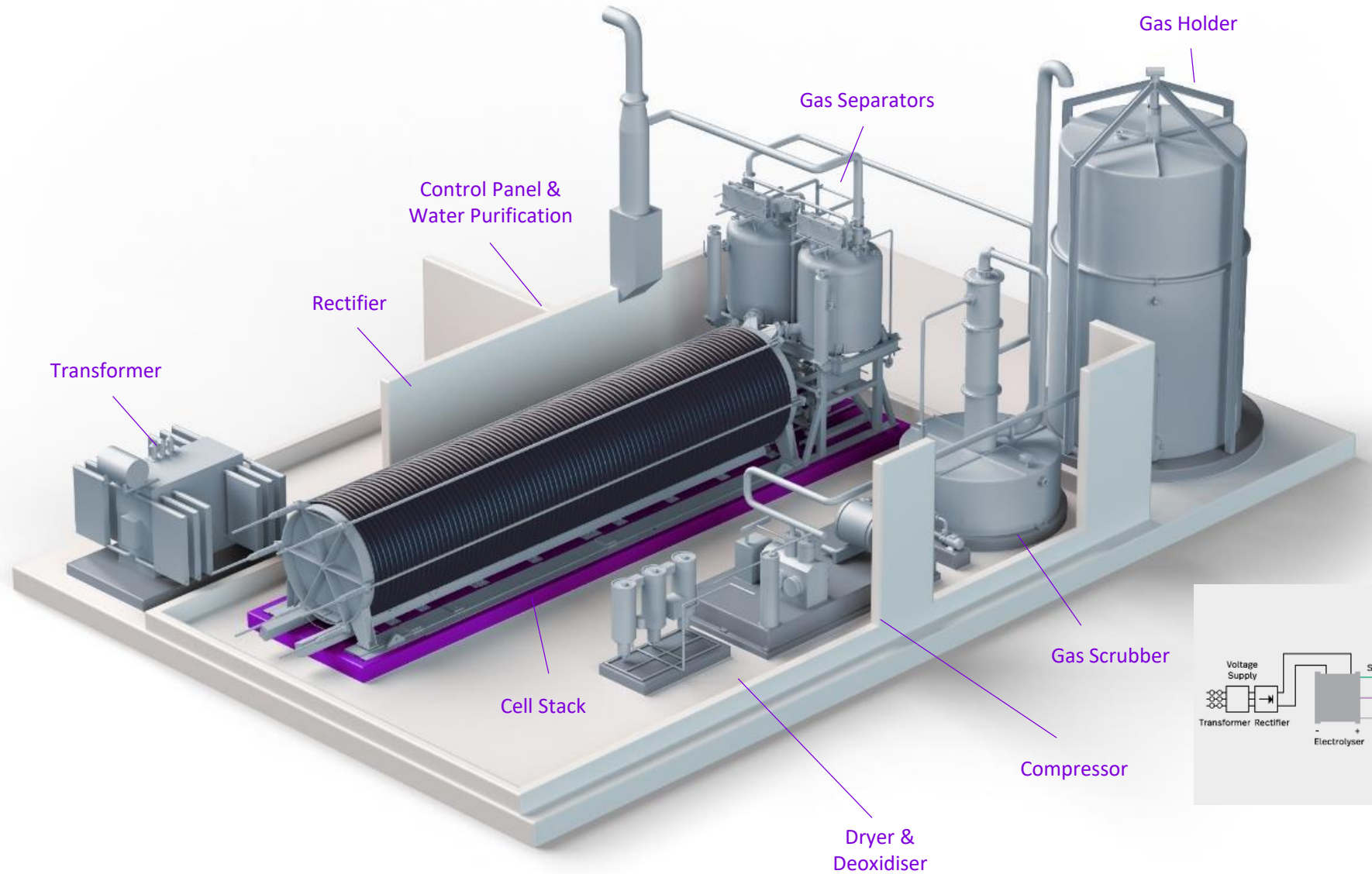
Past Field Learnings for Future Performance





# NEL ATM ALKALINE WATER ELECTROLYSIS

Complete Integrated Field Proven Solutions



# NEL ATM ALKALINE WATER ELECTROLYSIS

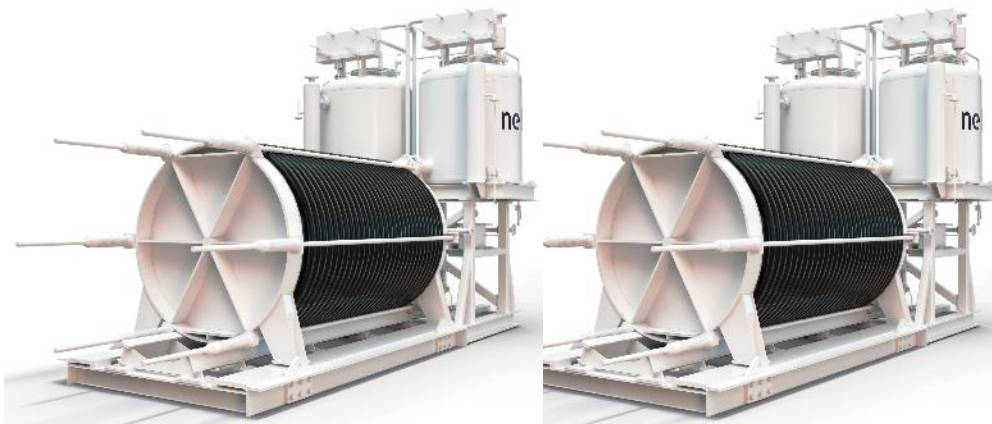
Polysilicon - Malaysia: 25MW – 4,333Tons/Year – From hydroelectricity



# NEL ATM ALKALINE WATER ELECTROLYSIS

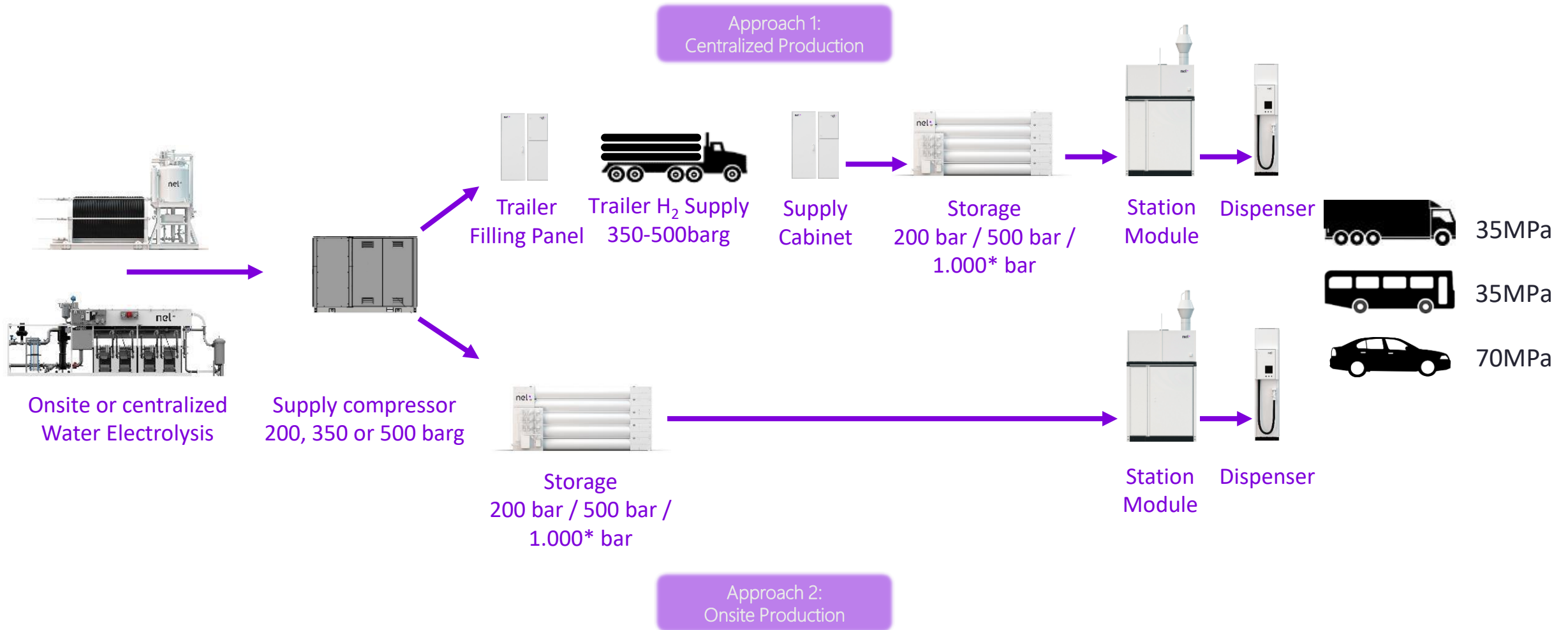
HYBRIT: 1<sup>ST</sup> Fossil-Free Steel Plant (Luleå, Sweden – 2020)

- Steel Industry: 7% of Global CO<sub>2</sub> Emissions
- No CO<sub>2</sub> footprint (fossil-free sponge iron, electricity, and H<sub>2</sub>)
- Replacing coking coal needed for ore-based steel making by H<sub>2</sub>
- 715 Tons/Y Green H<sub>2</sub>
- 2 x A485 Alkaline Electrolyser
- SSAB: high-strength steels / LKAB: iron ore producer / Vattenfall: electricity producer



# NEL H<sub>2</sub> FUELING STATIONS

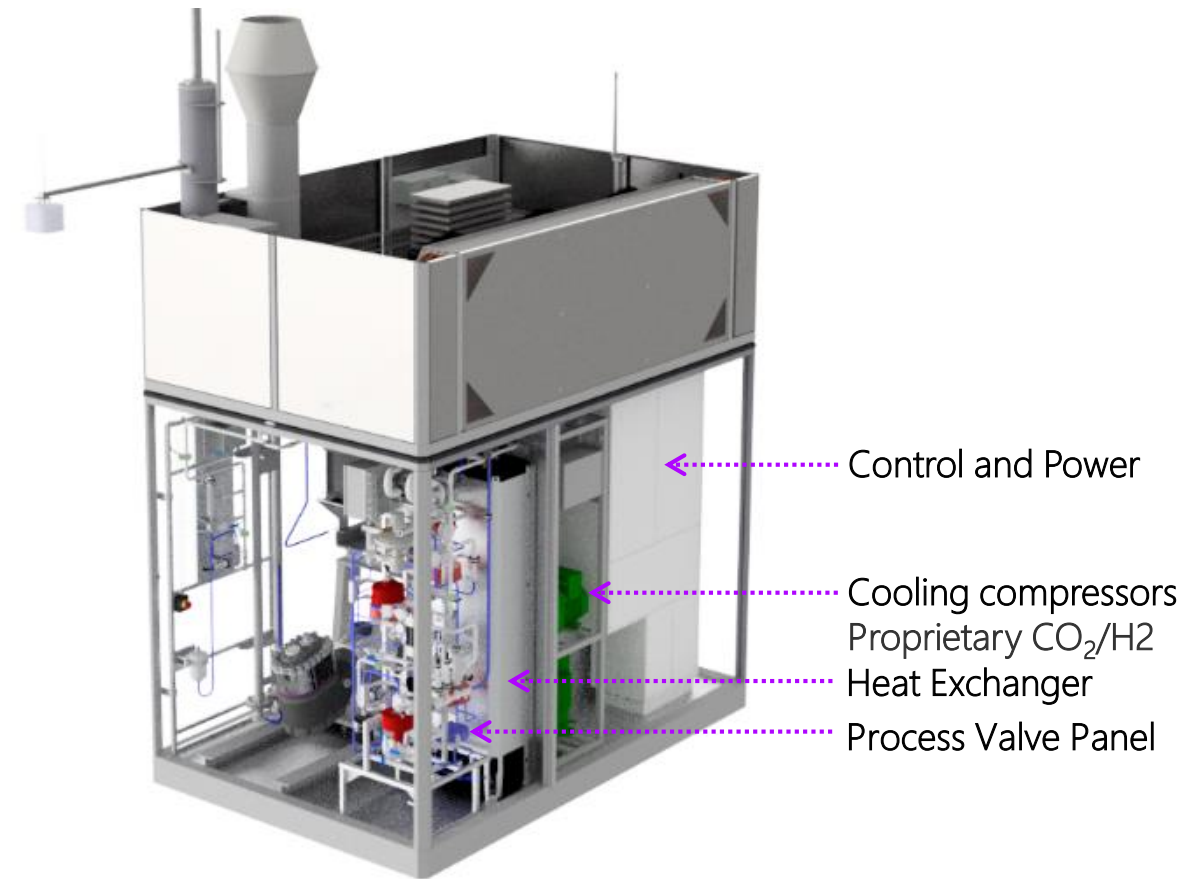
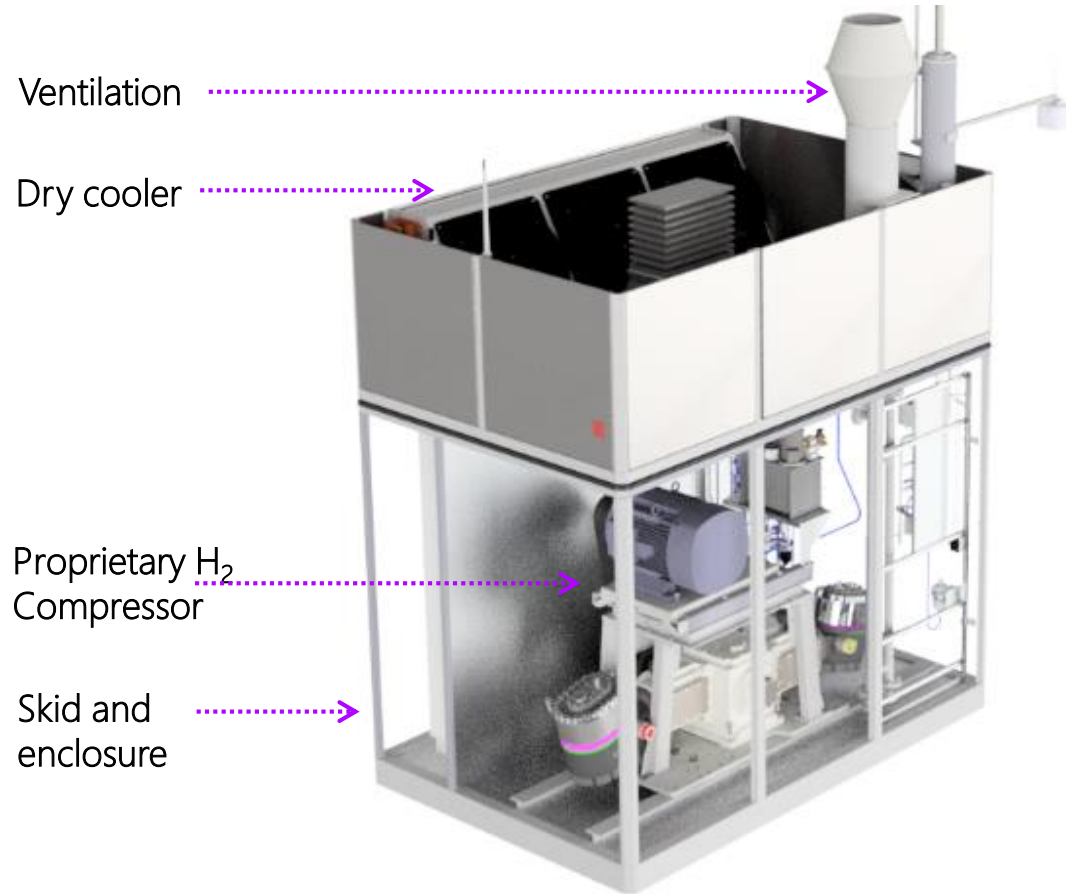
A deep understanding of Safety & Technological Performance



12 \* 1.000bar storage not required for latest direct fill platforms

# NEL H<sub>2</sub> FUELING STATIONS

Station Module: 3 - 45MPa inlet – up to 240kg/hr at 350barg - up to 66kg/hr at 700barg  
Optifill™ based on SAE J2601-2.



## HYDROGEN FUELING STORAGE

- Storage capacity: More than 100 kg per storage rack – multiple racks possible to achieve higher capacity.
- Maximum storage pressure: 50-100MPa
- Nominal storage pressure: 45-95MPa
- Placement: Up to 50m from Station Module
- Ready for later upgrade with more storage capacity (to grow with station)



## LIGHT DUTY DISPENSER EU – 70 MPA

- World's most compact hydrogen dispenser enabling easy and fast installation also next to conventional dispensers.
- Flexible placement at site up to 50 meters from the Station Module.
- Proprietary fueling protocol ensuring fast fueling with high state of charge (SoC).
- Type Approved for compliance with SAE J 2601-1 v. 2016.
- Integrated nozzle dryer to avoid freezing to receptacle during refuelling.



# NEL H2 FUELING STATION

Sunline Bus Station (Palms Springs, CA, USA – 2019)

- Up to 25 busses per day
- MC400 Proton® PEM – 328T H<sub>2</sub>/year
- 200barg supply storage (320kg)
- Two H2Station™: up to 120kg/hr at 350barg
- 2 X 350barg H<sub>2</sub> Dispenser



# Purchase order for 85 megawatt of electrolysers from Nikola



## Reached major milestone with Nikola

- Partnership with Nikola, global leader in zero-emission transportation and infrastructure solutions
- PO on June 3, 2020
  - Excess of USD 30 million
  - 85 MW alkaline electrolysers related to development of world's first 8 ton/day hydrogen fueling stations
  - Electrolysers will primarily be delivered from new electrolyser mega-factory currently under development in Norway
- PO for remaining station equipment expected when Nikola has firmed up exact station locations

Source: Nikola Two hydrogen electric class-8 truck



nel

# number one by nature

- Raymond Schmid

[Rschmid@NelHydrogen.com](mailto:Rschmid@NelHydrogen.com)