

The logo for HYON, consisting of the letters H, Y, O, and N in a stylized, white, sans-serif font. The 'H' is formed by two vertical bars and a horizontal bar. The 'Y' is formed by two diagonal bars meeting at a point. The 'O' is a simple circle. The 'N' is formed by a vertical bar and a diagonal bar. The logo is centered on a blue background of water waves.

HYON

The hydrogen system integration company

Tomas Tronstad, M.Sc. - Managing Director

HYON – a hydrogen company owned by three leading players in the gas and hydrogen industry

*A joint venture owned by Nel ASA, Hexagon Composites ASA and PowerCell Sweden AB.
HYON deliver integrated systems for renewable hydrogen production, storage, distribution, dispensing,
and electricity generation via fuel cells*



HYON - one-stop-shopping for the product line offered by the three owners
HYON performs integration of core products and systems – offering turn-key solutions



Hexagon Composites ASA is a globally leading supplier of composite pressure cylinders and systems for gas applications. The value-added features are light weight, high capacity, long lifetime and a high level of safety. Hexagon has more than thousand deliveries of their Titan Tank, the worlds largest high-pressure tank of 8400 liters.



NEL ASA is a global dedicated hydrogen company, delivering solutions to produce and distribute hydrogen from renewable energy. NEL offer the world's most energy efficient hydrogen production technology, and also by far the world's most documented and endurance tested.

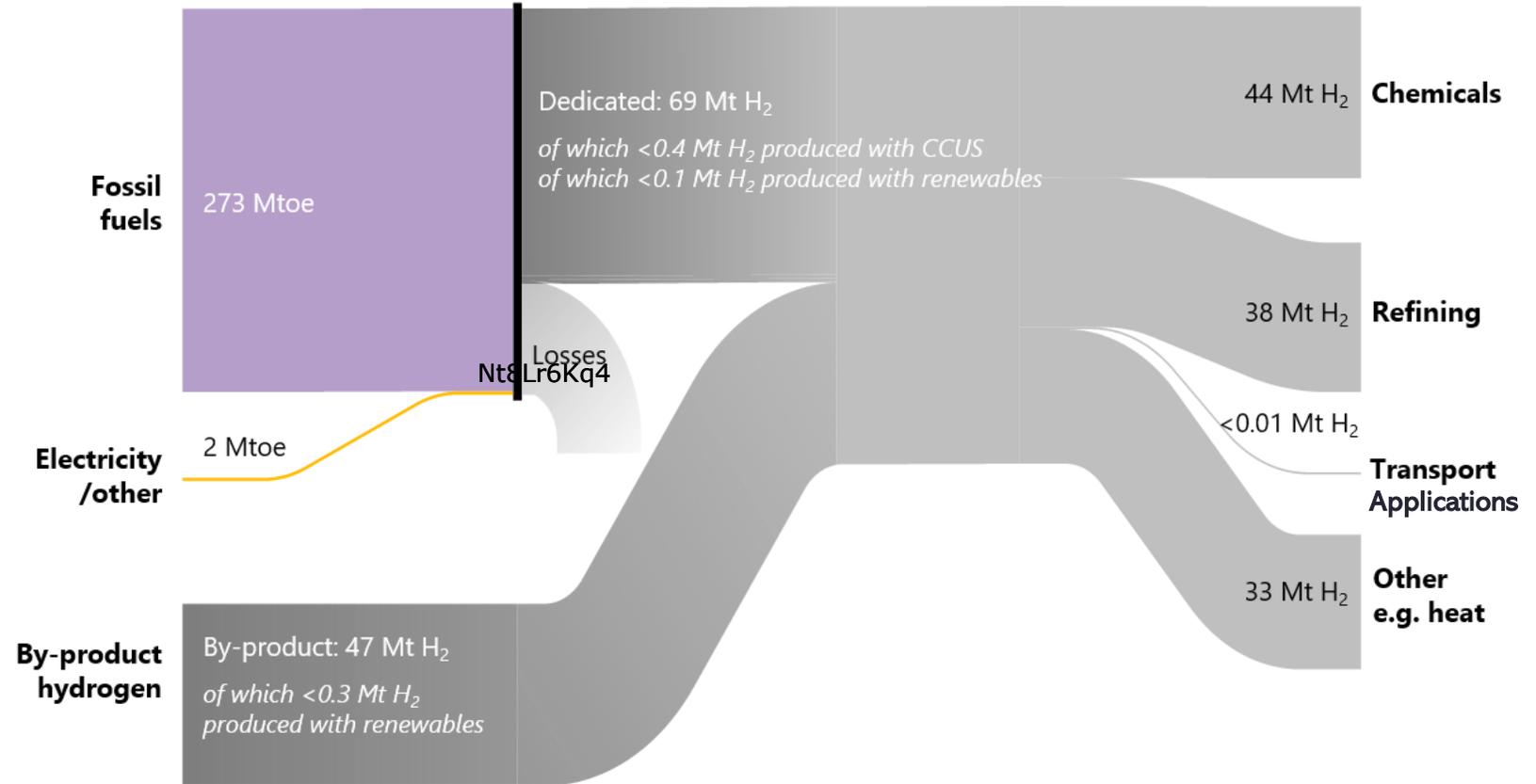


PowerCell Sweden AB is the leading fuel cell company, developing and producing state-of-art fuel cell power solutions for stationary and mobile customer applications. PowerCell's technology have the world record in fuel cell energy density, forming highly compact and energy efficient solutions.

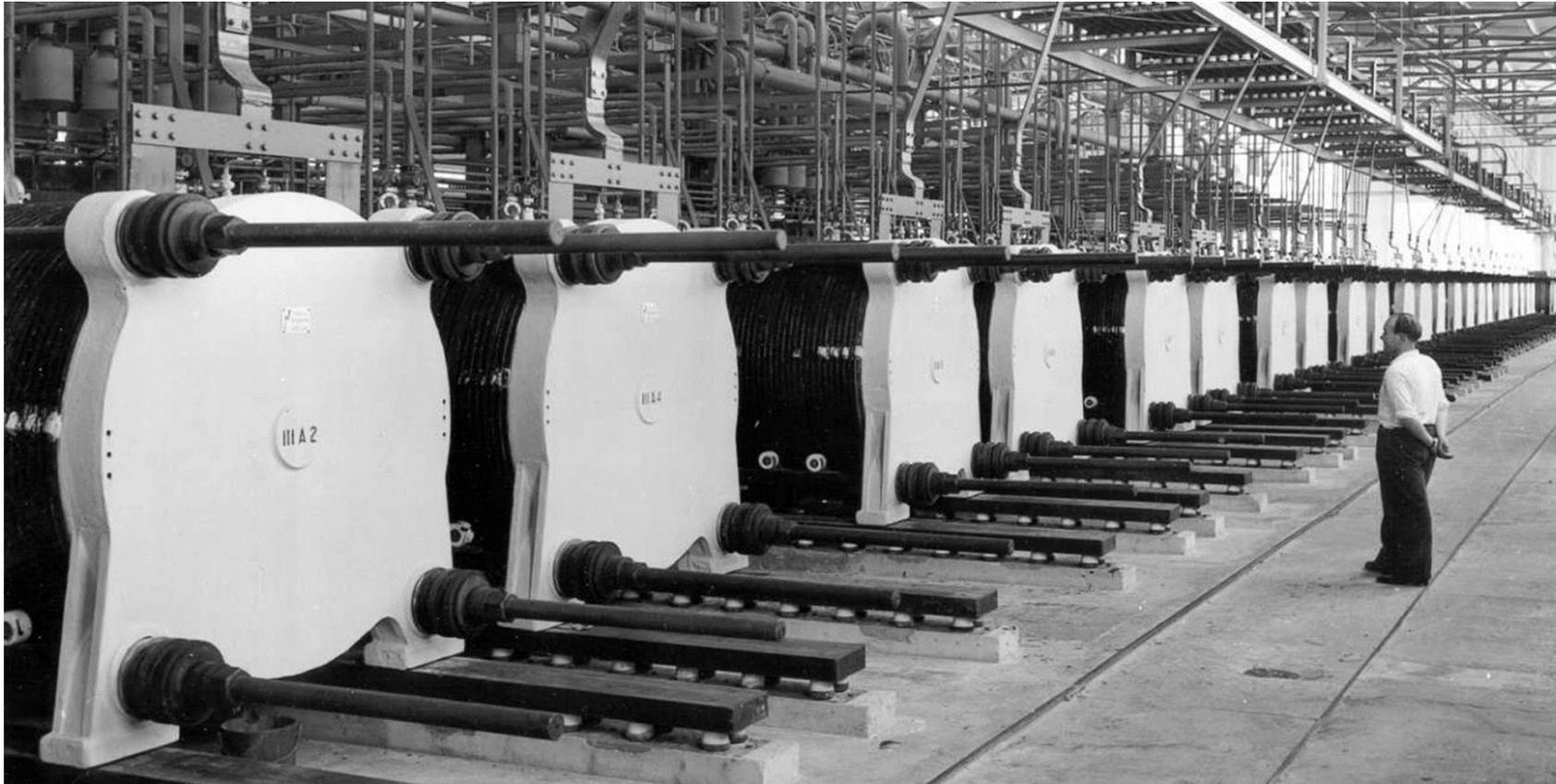
Hydrogen is a giant global industry

A main substance in petroleum, chemical and food industry

Yearly production of hydrogen is 116 million ton



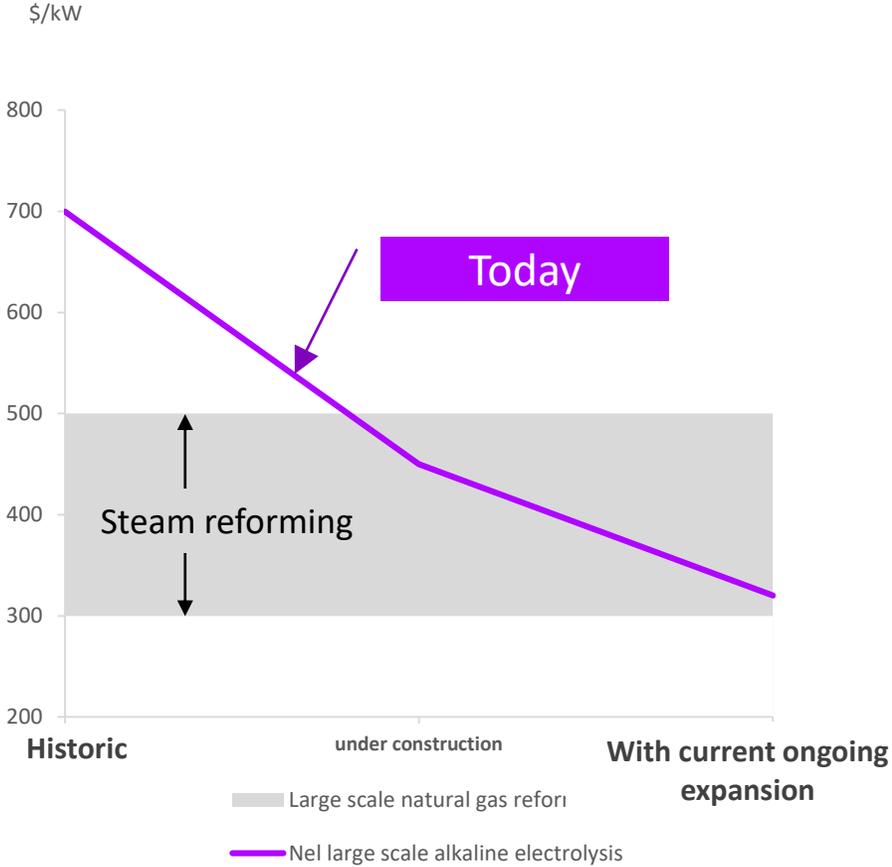
**Green hydrogen is produced by renewable power,
splitting water through electrolysis**



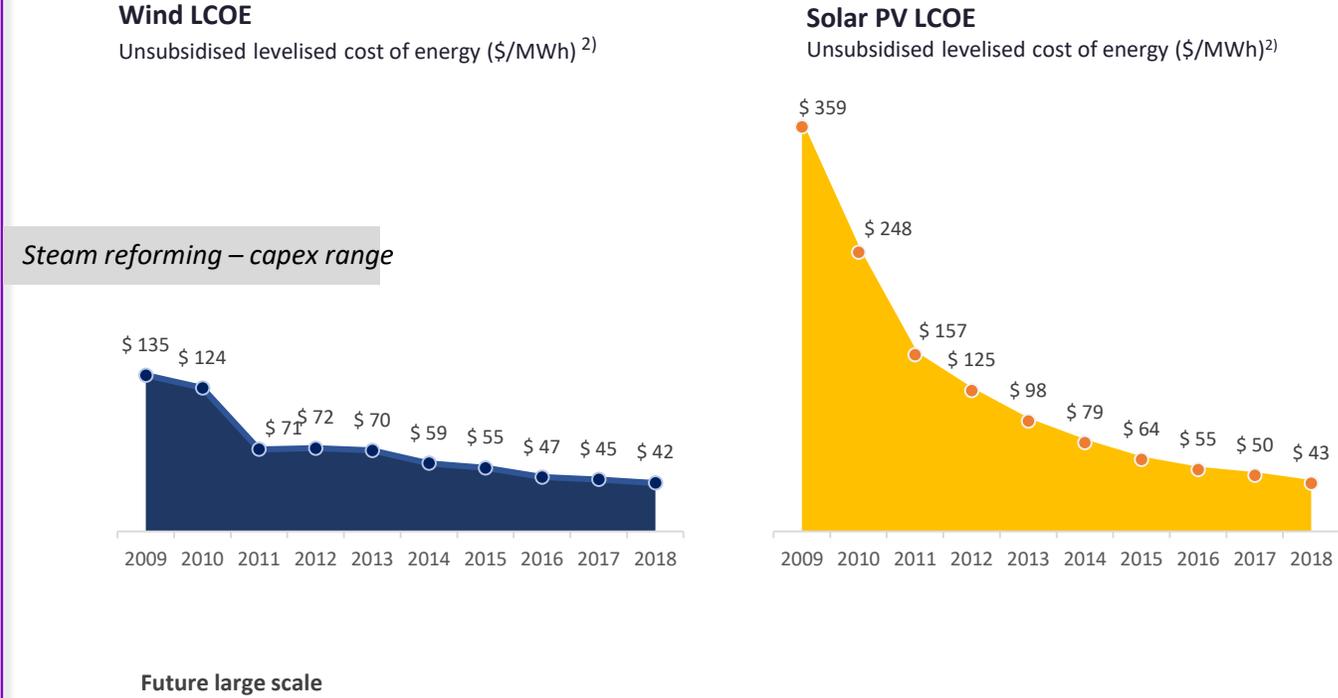
Very mature technology; dates hundred years back

Hydrogen is becoming increasingly cheaper, partly because:

CAPEX of electrolyzers will drop below natural gas reforming



Steadily falling price of renewable power



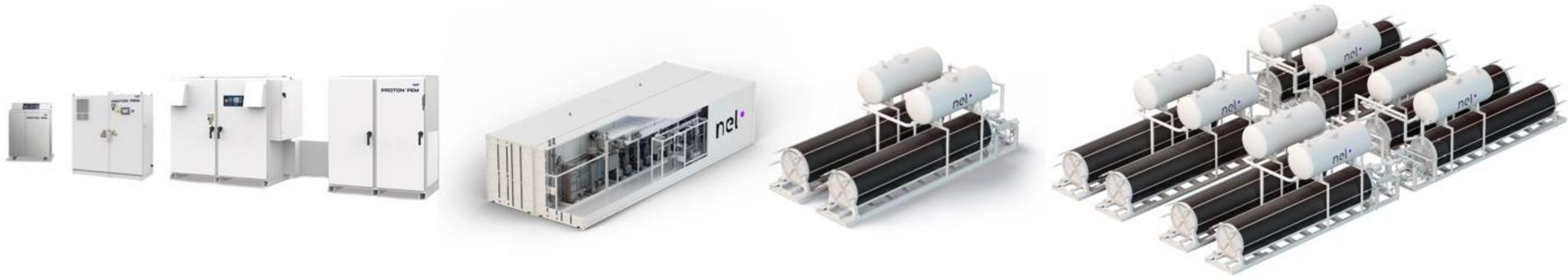
The latest solar power plant in Dubai produce at 1.6 US dollarcent/kWh



Source: Nel

PEM and alkaline electrolysers – mature and very scalable technology

- Nel have offered Alkaline electrolysers since 1927 and PEM electrolysers since 1996
- Scalable design from < 1 to >8.000 kg/day production capacity – able to deliver 100+ MW systems
- Designed for high volume manufacturing to achieve large scale plants with fossil price parity



From lab size to hundreds of tons/day industrial size hydrogen production plants



Driving range on hydrogen – 1900 km

**Nel Hydrogen is increasing production capacity 10 fold
– drastically reducing CAPEX**

H2 STORAGE TANKS IN CARBON COMPOSITE - BEING INTRODUCED TO THE MARITIME INDUSTRY



Photo: GKP7H2/Brødrene Aa

PowerCell MS-100

The game changer for electrification

Net power	100 kW (one stack)
Volume	276 liters
Weight	170 kg
Features	Flexible packaging (vertical and horizontal installation) Freeze start from -30°C Durable and robust design



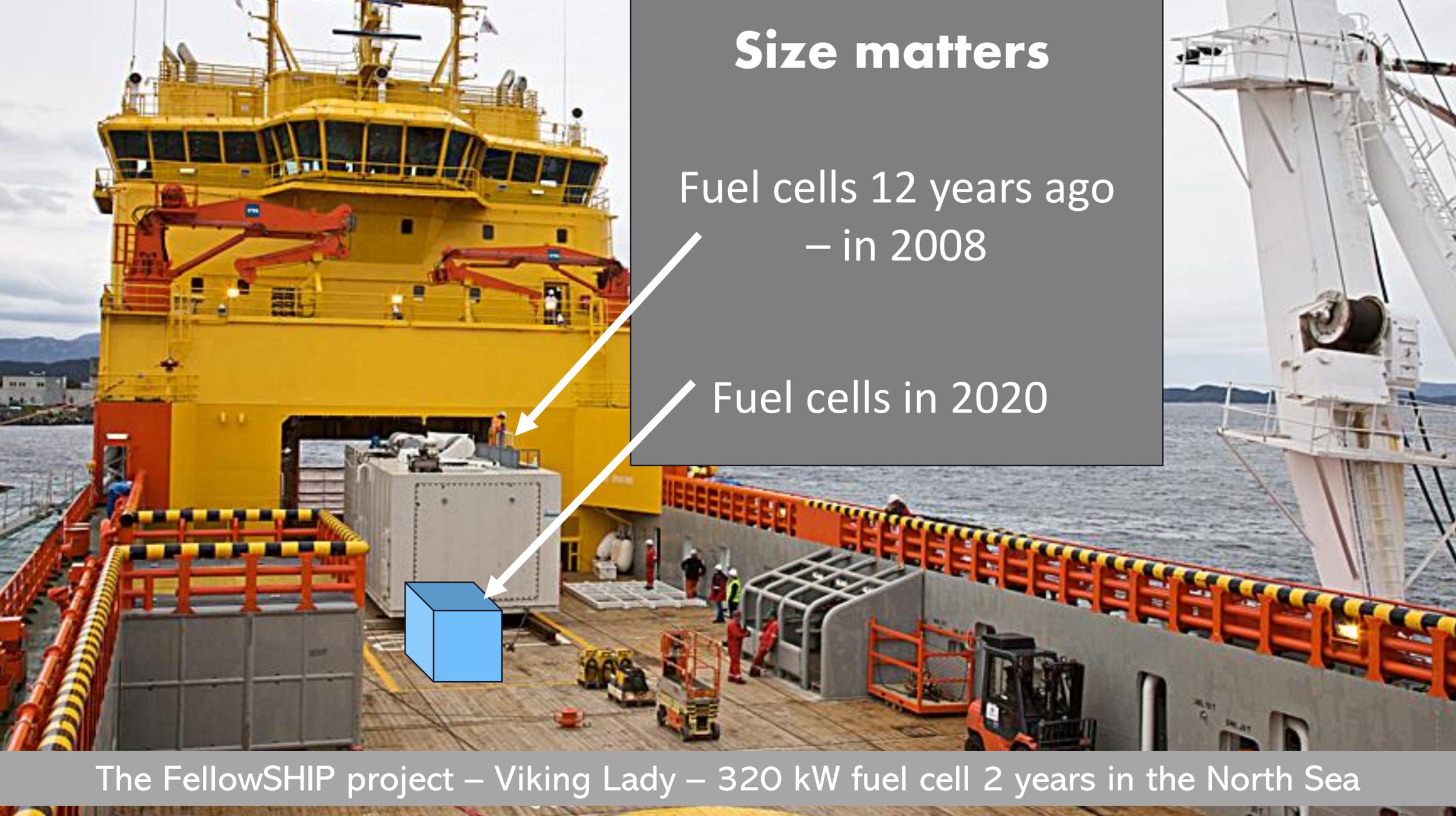
Service and training procedure



- Subscription based service model
- 24 hour response time
- 24/7 remote monitoring
- Long life time
(comparable to diesel-gen sets)
- Rotational system upon end of life

Hands on training with fuel cell systems at PowerCell test center in Gothenburg:

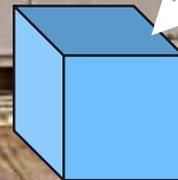
- System layout and understanding of fuel cells
- Operation modes and basic functionality
- On sea trial, training will be done simultaneously with PowerCell staff



Size matters

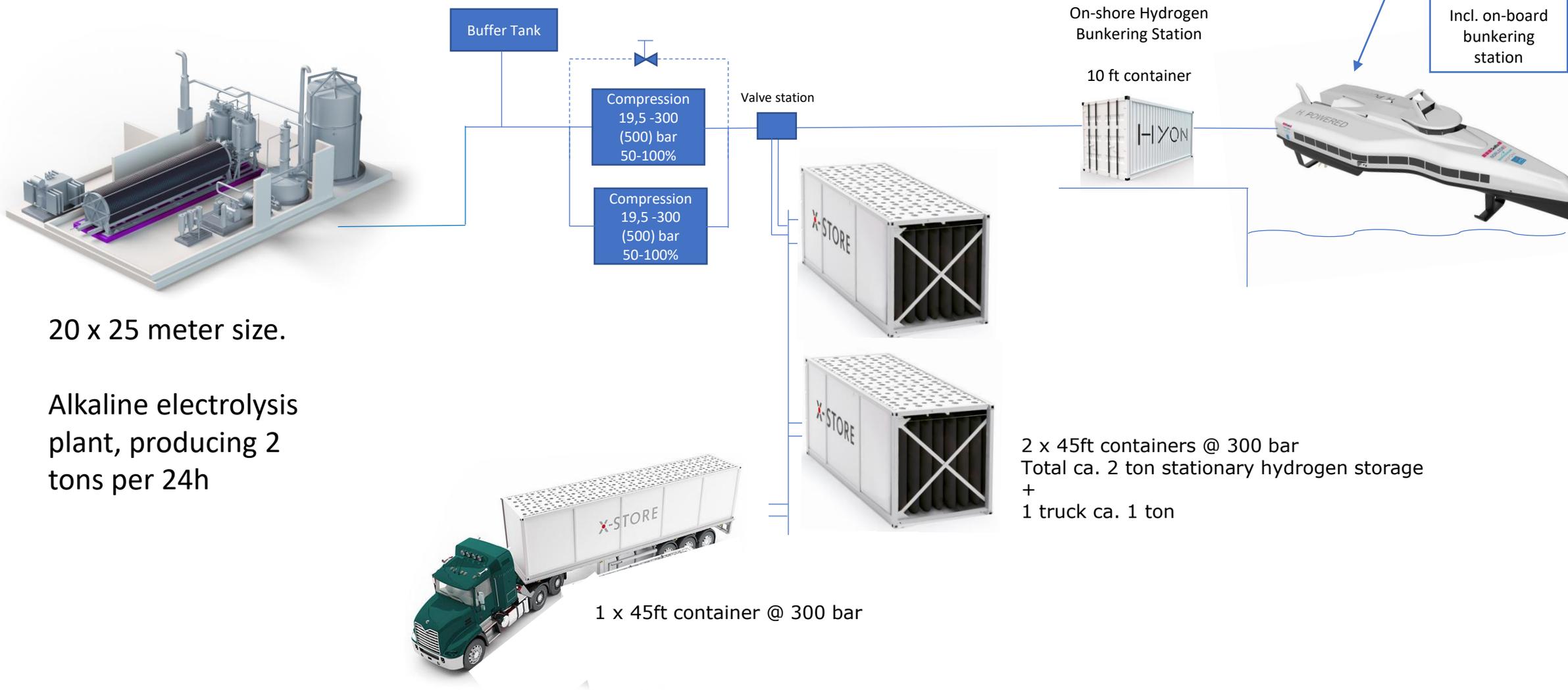
Fuel cells 12 years ago
– in 2008

Fuel cells in 2020



The FellowSHIP project – Viking Lady – 320 kW fuel cell 2 years in the North Sea

Production in vicinity of quay – for delivery and bunkering of 2 ton pr 24h
4 high speed vessels operating 4 routes



20 x 25 meter size.

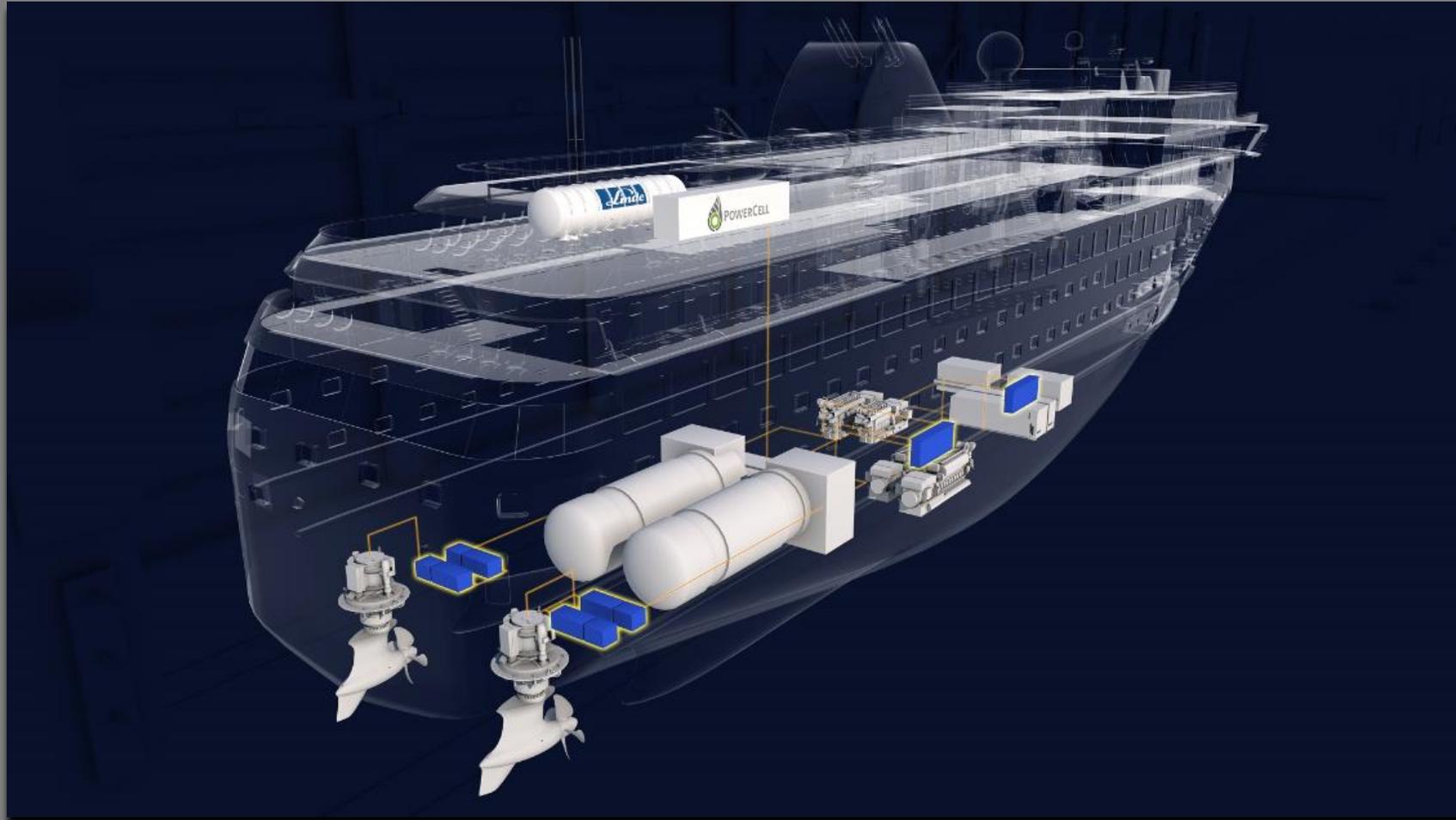
Alkaline electrolysis plant, producing 2 tons per 24h

1 x 45ft container @ 300 bar

2 x 45ft containers @ 300 bar
Total ca. 2 ton stationary hydrogen storage
+
1 truck ca. 1 ton

On-board storage
250 bar/xxx kg
Incl. on-board bunkering station

Some of the ongoing maritime HYDROGEN projects



Ongoing maritime HYDROGEN projects



The SeaShuttle logistic concept

- Short Sea Shipping route between Poland and East /West Norway
- 20% hydrogen in energy consumption, with compressed storage and 1500kW fuel cells
- Autonomous crane handling and shore control centre
- Receives funding through Pilot-e scheme for engineering, design and construction of the new systems
- Companies Samskip, Flowchange, HYON, Masterly, Wilhelmsen, Kongsberg Maritime, Kalmar



The ZEFF high speed vessel

- High speed light craft route between Trondheim and Kristiansund (95 naut. mile)
- 100% hydrogen in energy consumption, Liquid H2 or Compressed H2 with 2200 kW fuel cell installation
- Pioneering vessel foil design with up to 50% reduced resistance
- Receives funding through Pilot-e scheme for engineering, design and construction of the new systems
- Companies Norled, Selfa, HYON, LMG marin, Servogear



Thank you for your attention !