NEL Hydrogen – if the future could choose…

Company presentation, November 2014

Bjørn Simonsen, Director – Market Development and Public Relations

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PRESENTATION OUTLINE

NEL Hydrogen at a glance

Our technology and current business

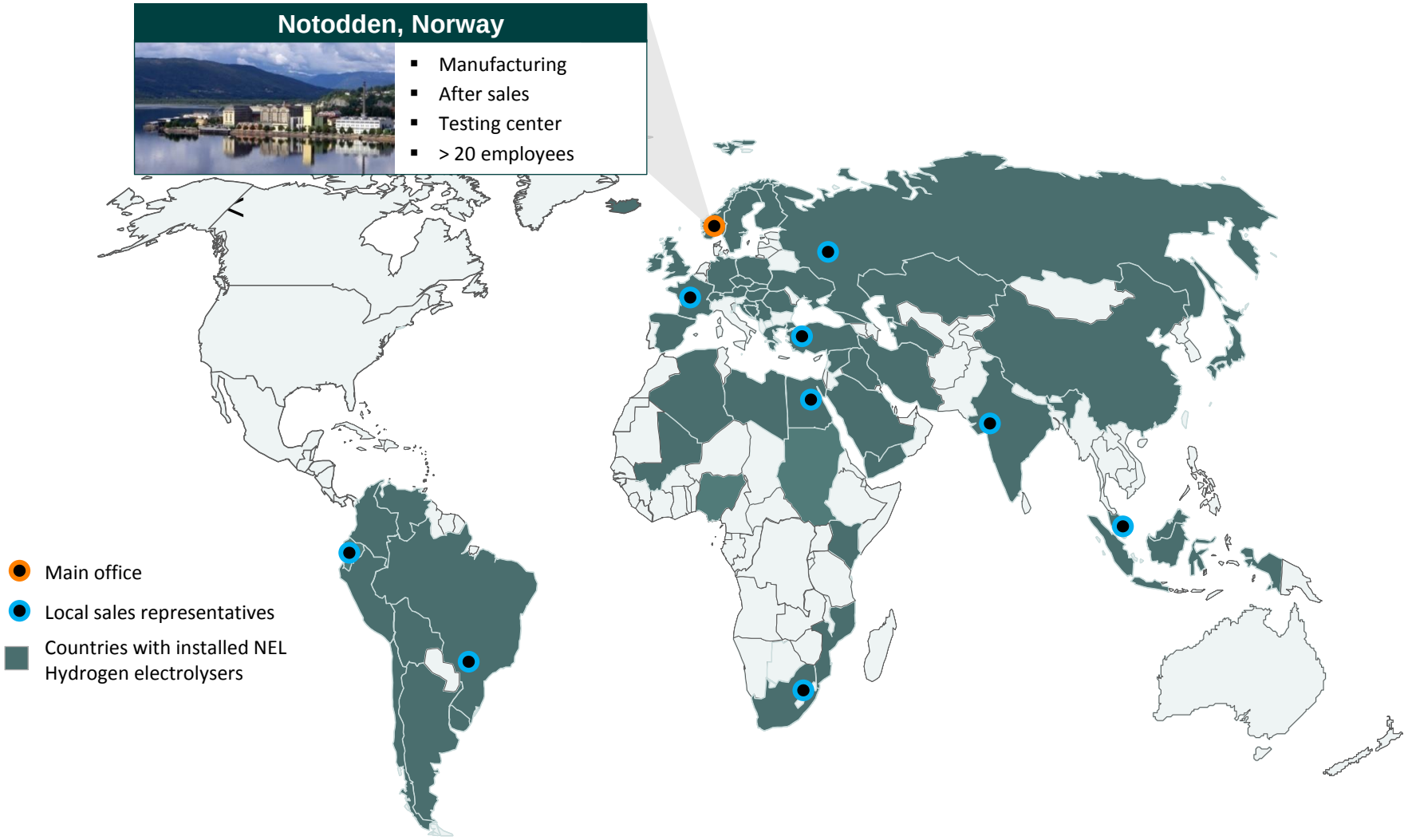
The game changer: Hydrogen as energy carrier

Our value proposition

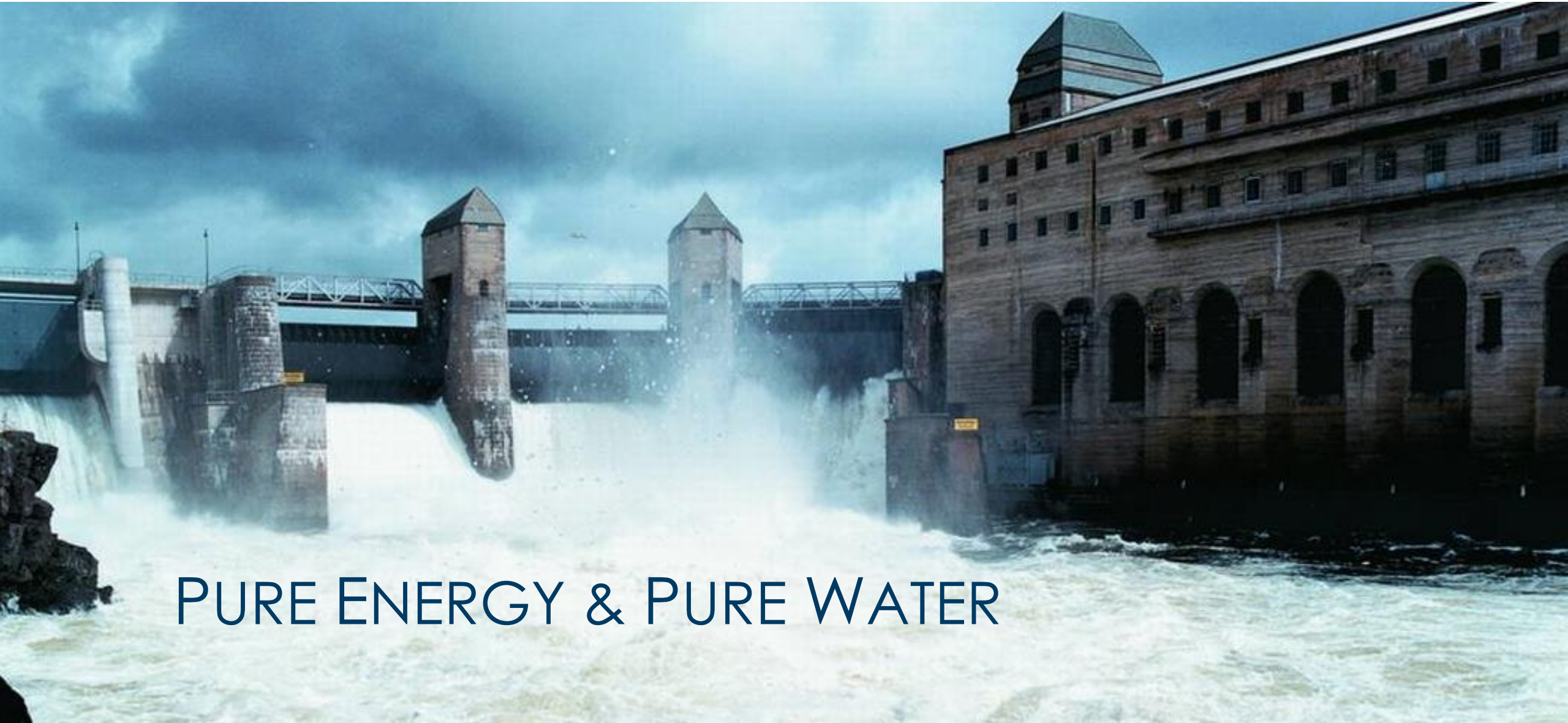
THIS IS NEL HYDROGEN

- We supply solutions for hydrogen generation
- Our roots date back to 1927 (Norsk Hydro)
- In-house technology with superior energy efficiency
- Over 500 electrolyser units sold; over 100 in operation
- Annual revenues of NOK ~80 million
- Production facility in Notodden, Norway
- Listed on the Oslo Stock Exchange (sept 2014)
- Positioned for an expected massive growth in the hydrogen market

LOCAL ROOTS, GLOBAL PRESENCE



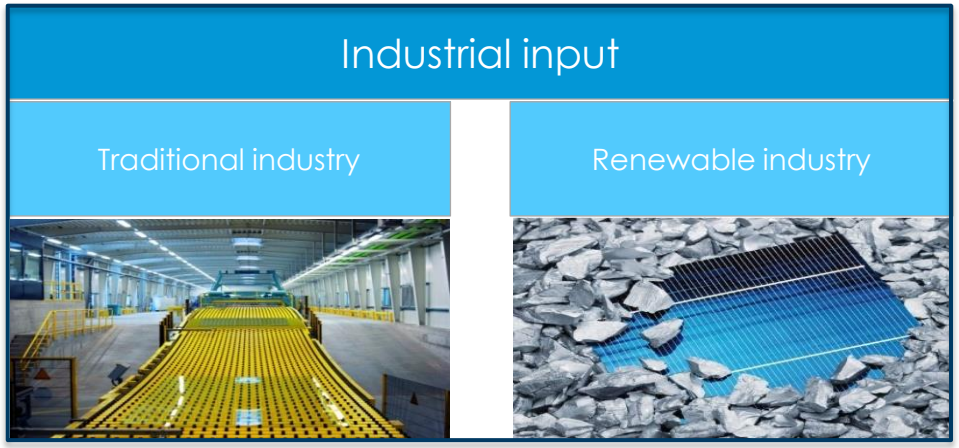
INGREDIENTS…

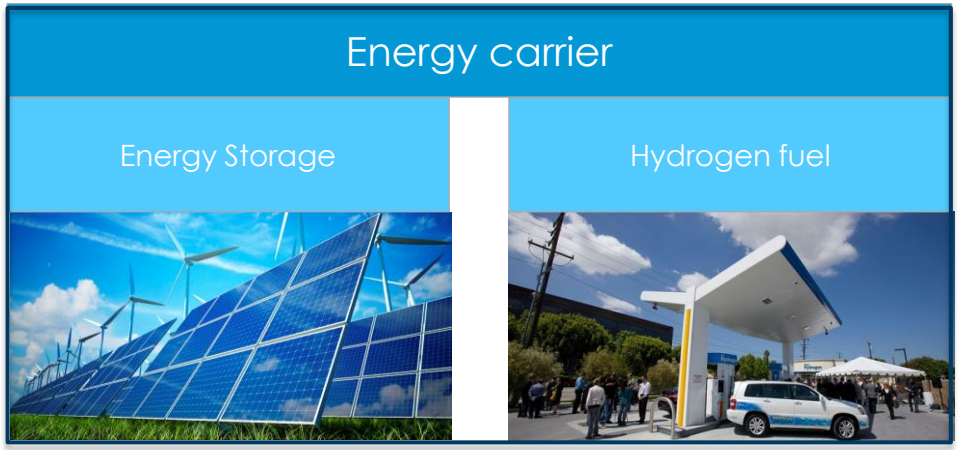


HYDROGEN - A MARKET IN TRANSITION:

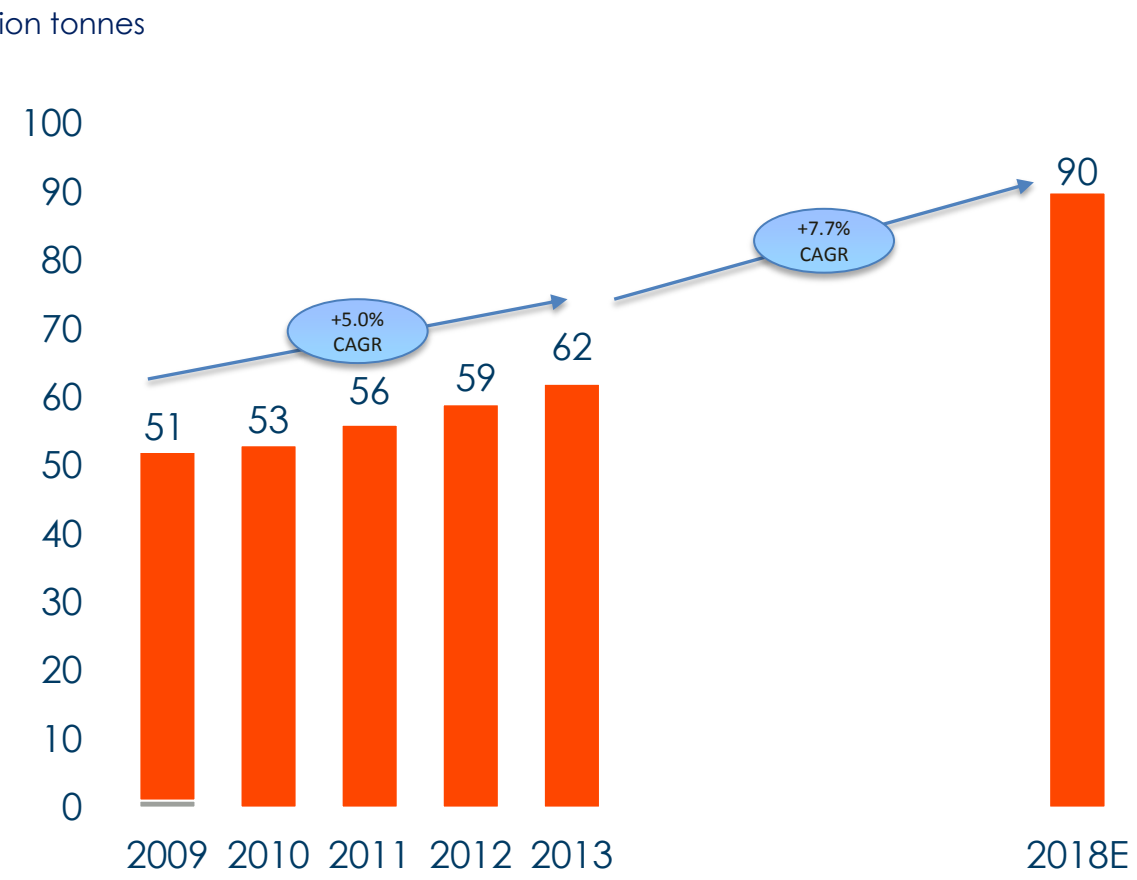
***TODAY:** Hydrogen used as an input to industrial applications*

***TOMORROW:** Hydrogen used as an energy carrier in the energy system*





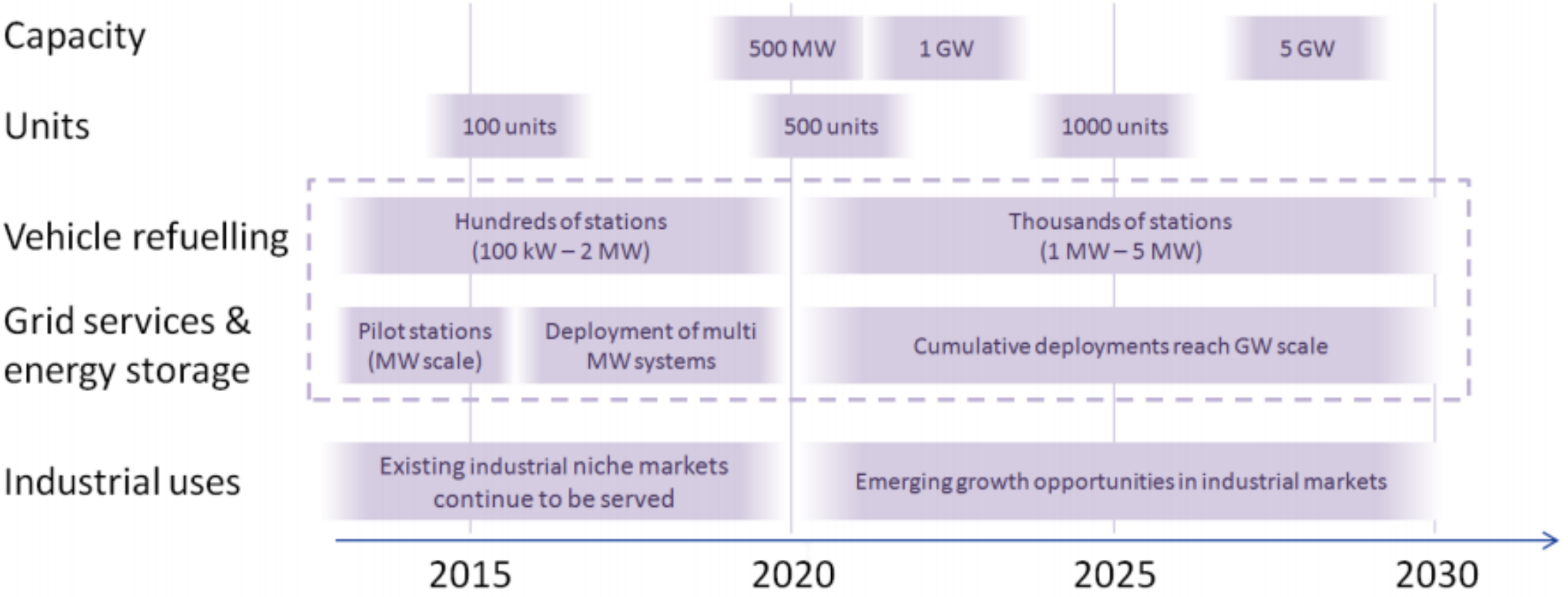
MARKET FOR HYDROGEN IS GROWING



Source: CryoGas International, MarketsandMarkets, Navigant Research. Compiled by Arkwright

- 78% reforming, 18% gasification, 4% electrolysis
- ~1% is from water electrolysers today
- General growth in market: lighter grade fuels (refineries), polysilicon industry & energy sector
- Water electrolyser market expected to grow significantly – refueling and energy storage being main drivers

MARKET OUTLOOK: WATER ELECTROLYSIS



Source: EU-report, 2014: Development of Water Electrolysis in the European Union

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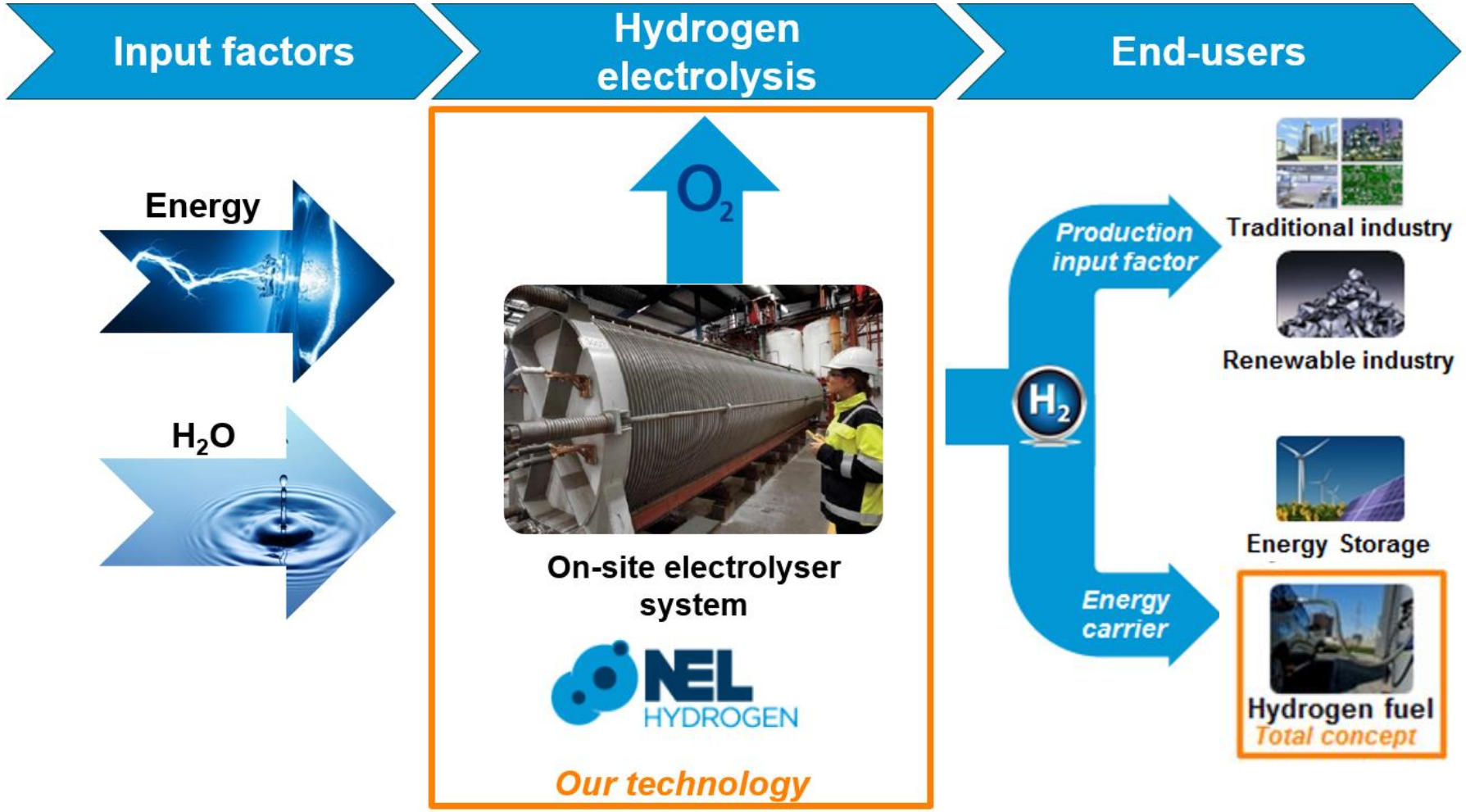
LOWERING THE CARBON FOOTPRINT



OUR 3 ADVANTAGES

NEL A ATMOSPHERIC ELECTROLYSER

NEL A·150 **NEL A·300** **NEL A·485**

Efficient	Robust	Large
		

1 EFFICIENT

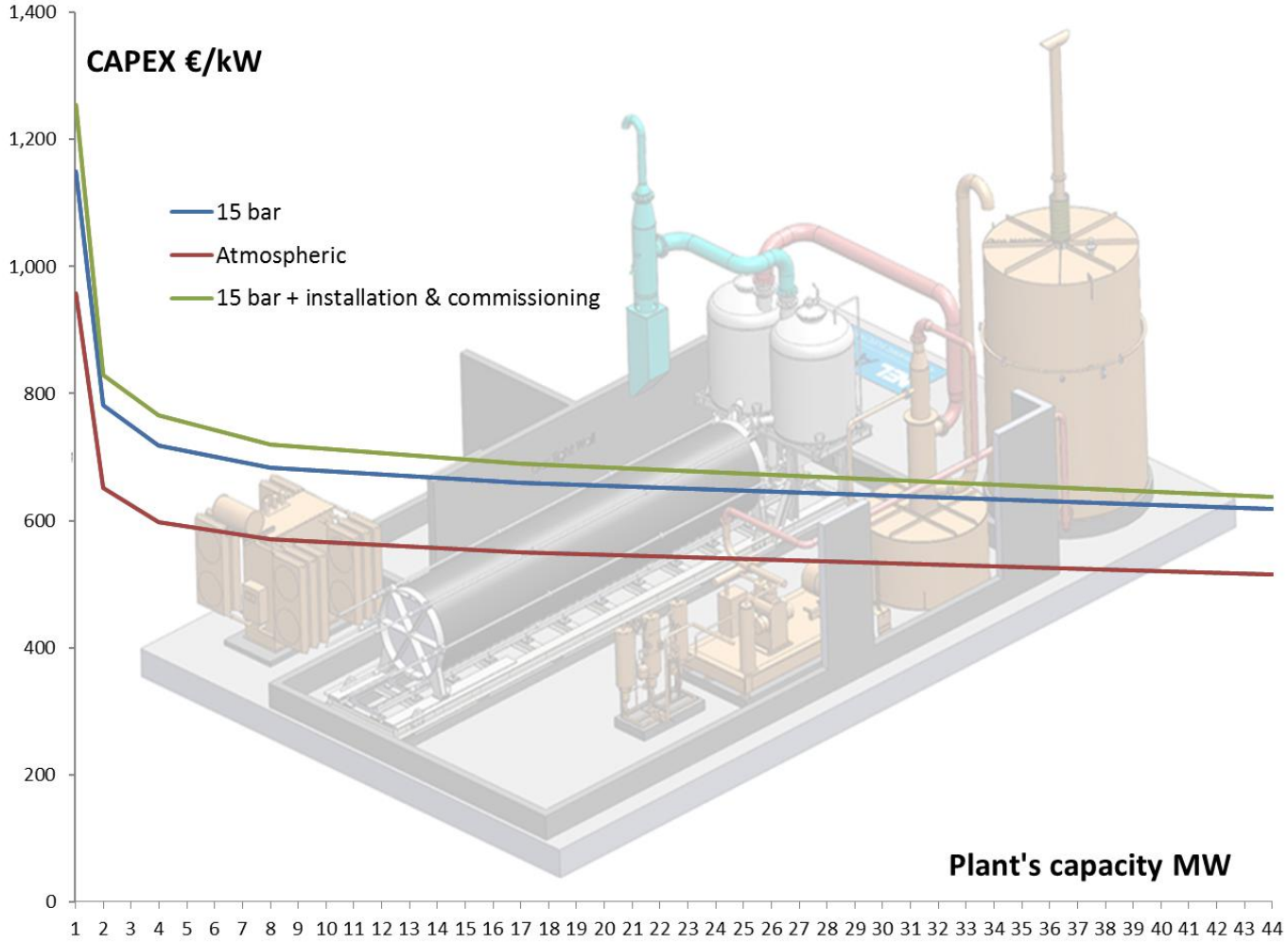
- NEL has currently the most energy efficient water eletrolyser in the market (3 – 15% better than competitors)
- High efficiency due to design & non-patented active coating

2 ROBUST

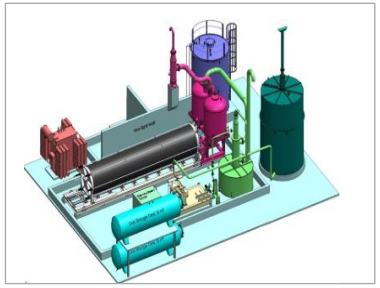
- Basis from 87 years of experience
- Uncomplicated and reliable operation
- Low need for maintenance shutdowns
- Cell stack replacement after 7 years, system lifetime 30+ years

3 LARGE - SUPERIOR SCALABILITY

- By increasing plant size from 250kW to 2,5MW, capex for production capacity reduced by >60%.



HOW WE SERVE TODAY'S INDUSTRY MARKET

Engineering	Procurement/ manufacturing	Installation	Commissioning	Aftermarket
				
• Tailor-made plant design	• Cell stacks based NEL technology • Manufactured in NEL's production facilities	• Contractor installation • NEL supervision	• NEL assures plant operates according to requirements	• Replacement of cell stack with 7 year intervals • Services & spare parts

In-house Outsourced/partners

NEXT GENERATION TECHNOLOGY

Pressurized electrolyser
Pilot stage

- Pressurized electrolyser – currently developed at 60 Nm^3/h (~250 kW)
- Increasing market share & entering new markets
- Higher operation flexibility and smaller footprint

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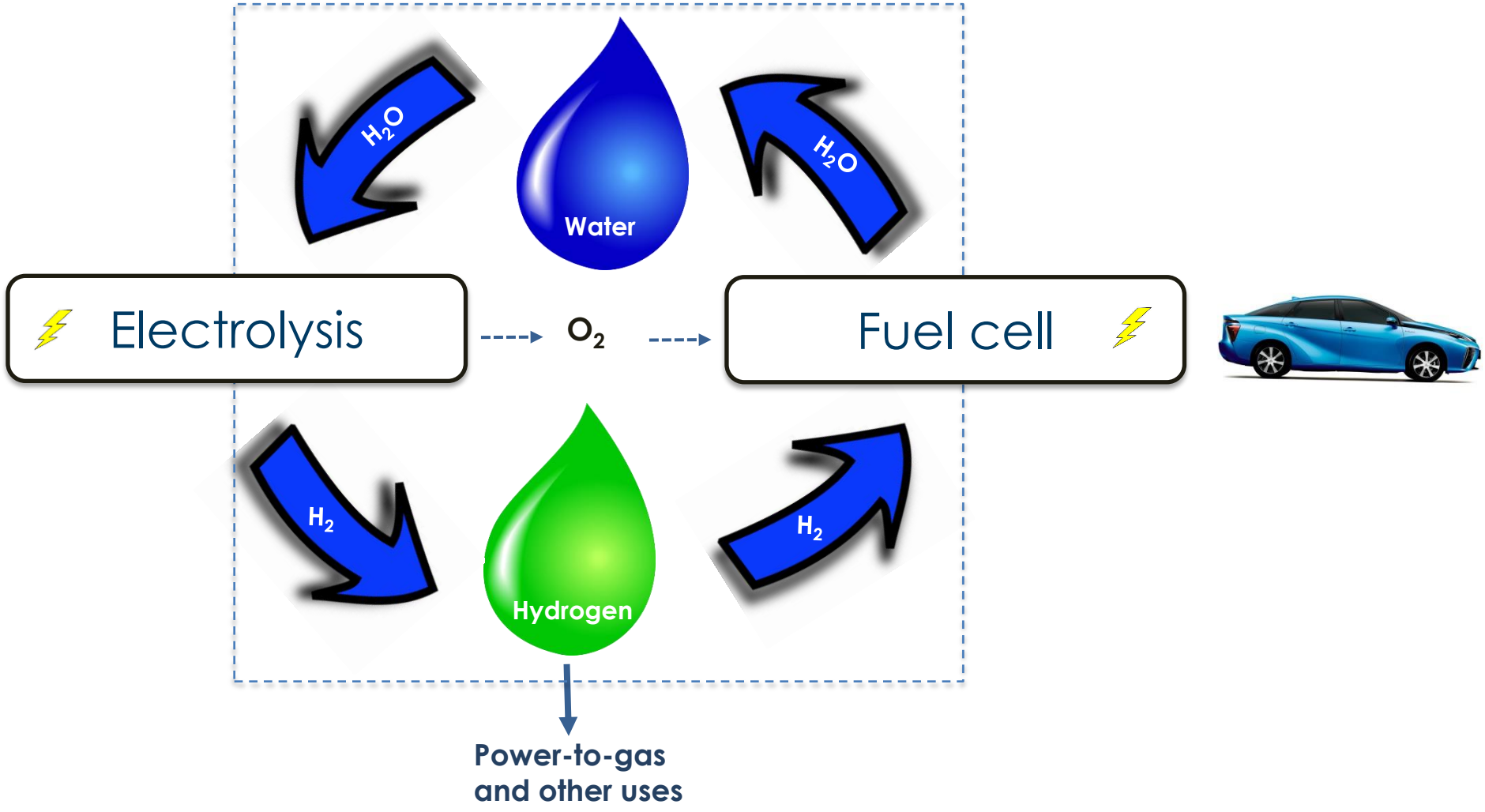
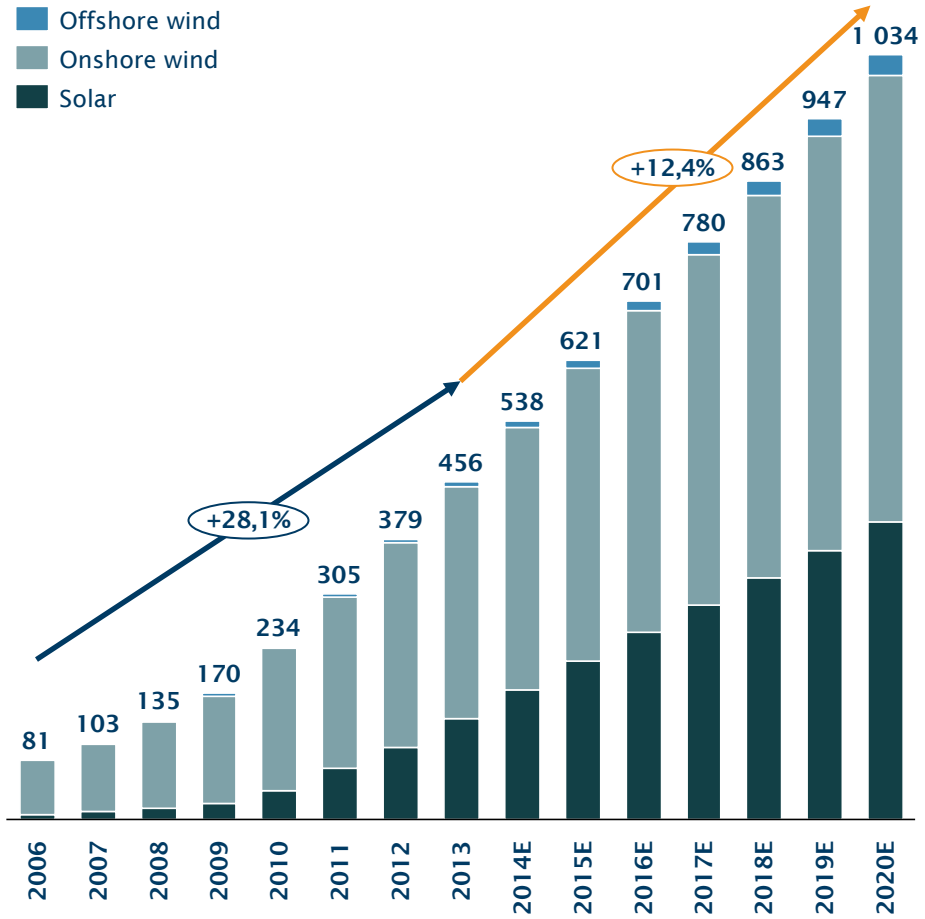
HYDROGEN AS AN ENERGY CARRIER



GROWTH IN RENEWABLE ENERGY

Electricity generation from wind/solar (GW)

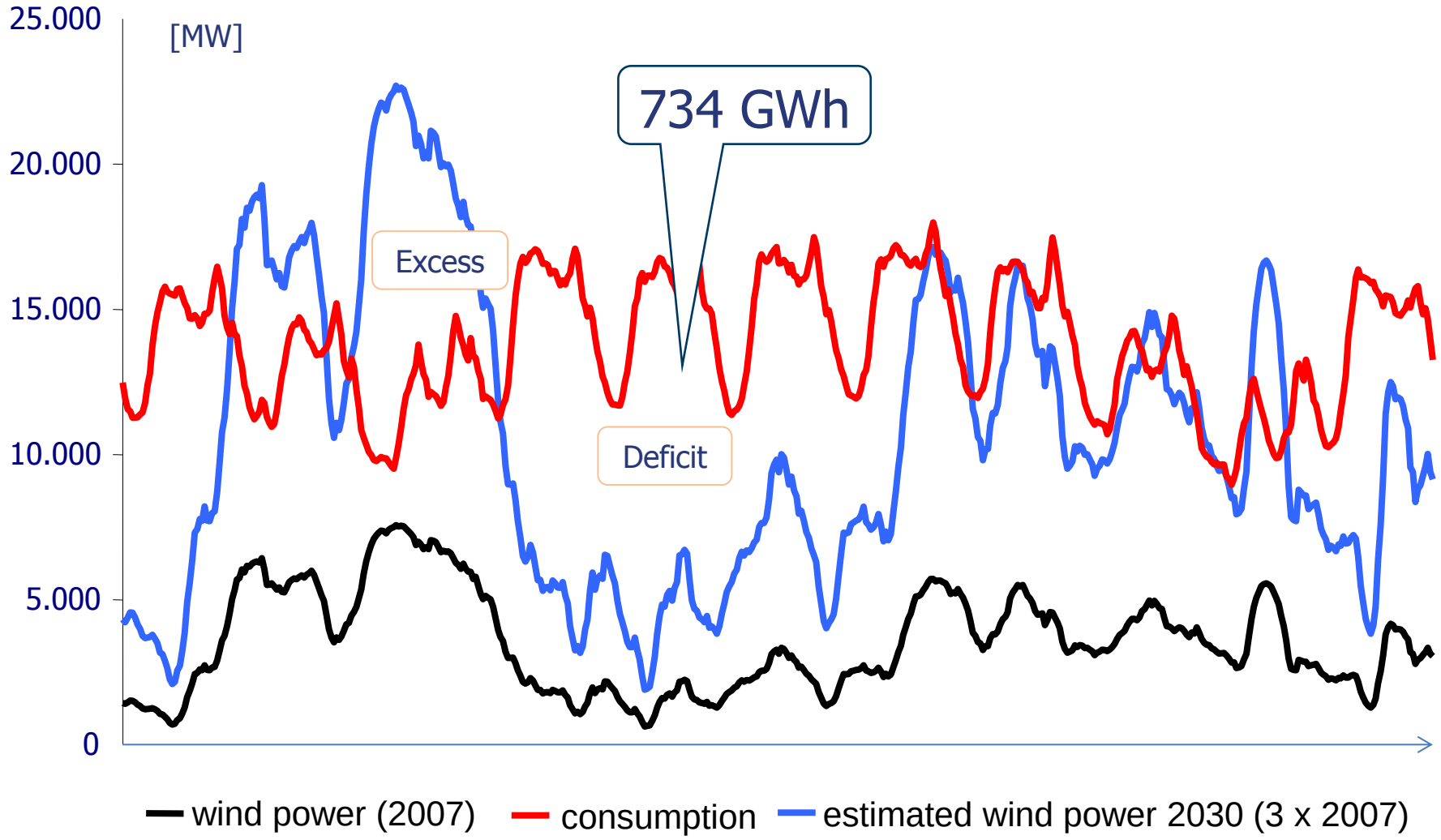


Source: EIA – "Medium-Term Renewable Energy Market Report 2014"

- 40% of renewable electricity in 2020 from wind and solar (27% in 2013; EIA)
- Cost competitive with conventional electricity generation in many locations
- Main driver for hydrogen energy storage
- Several energy storage projects initiated world wide

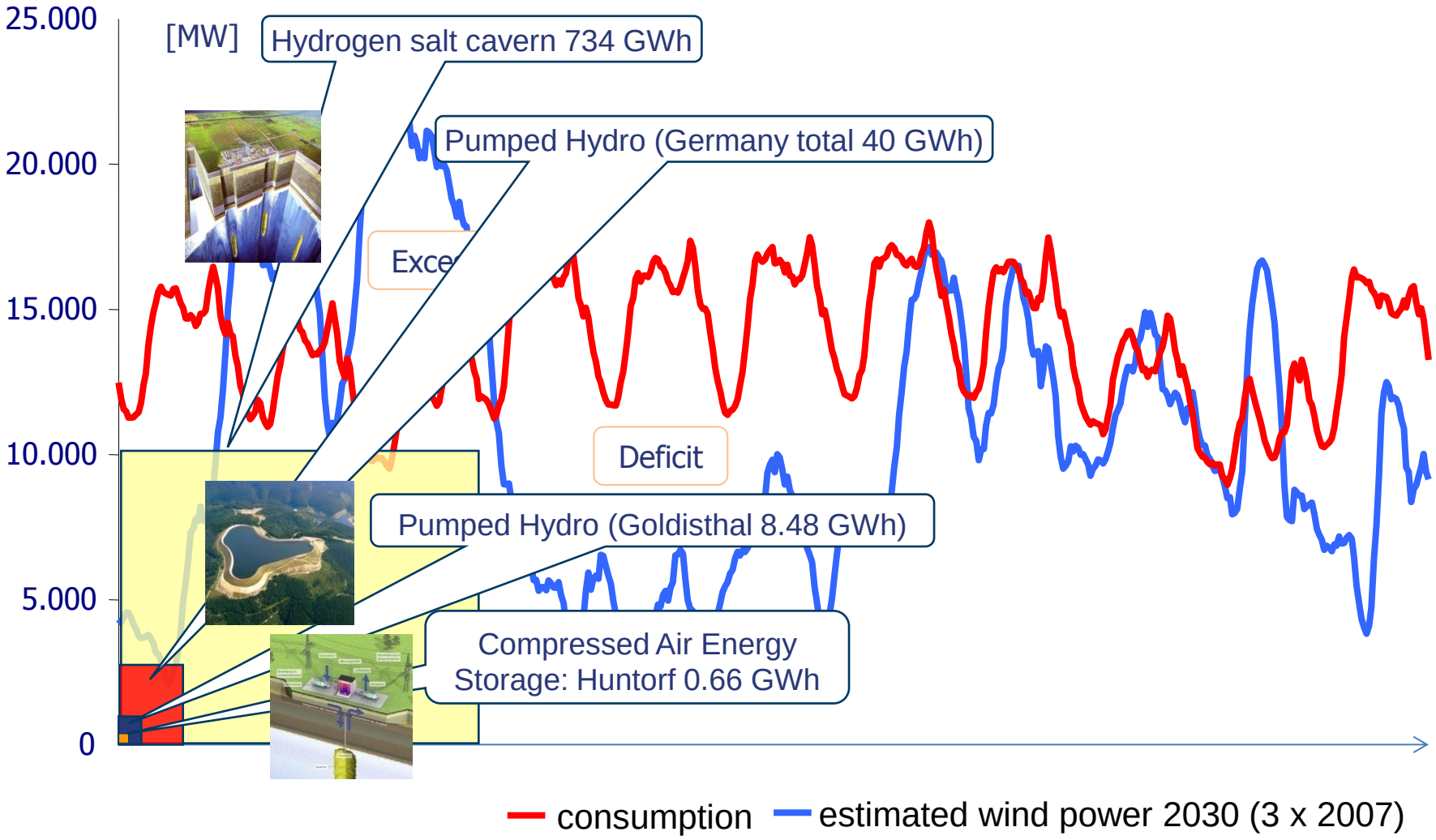
THE CHALLENGE OF RENEWABLES

INTERMITTANCY



Source: U.Bünger, NTNU/LBST, E.ON

HOW TO STORE 734 GWh?



Source: U.Bünger, NTNU/LBST, E.ON

734 GWh STORED IN BEVs

8,600,000 Tesla Model S P85

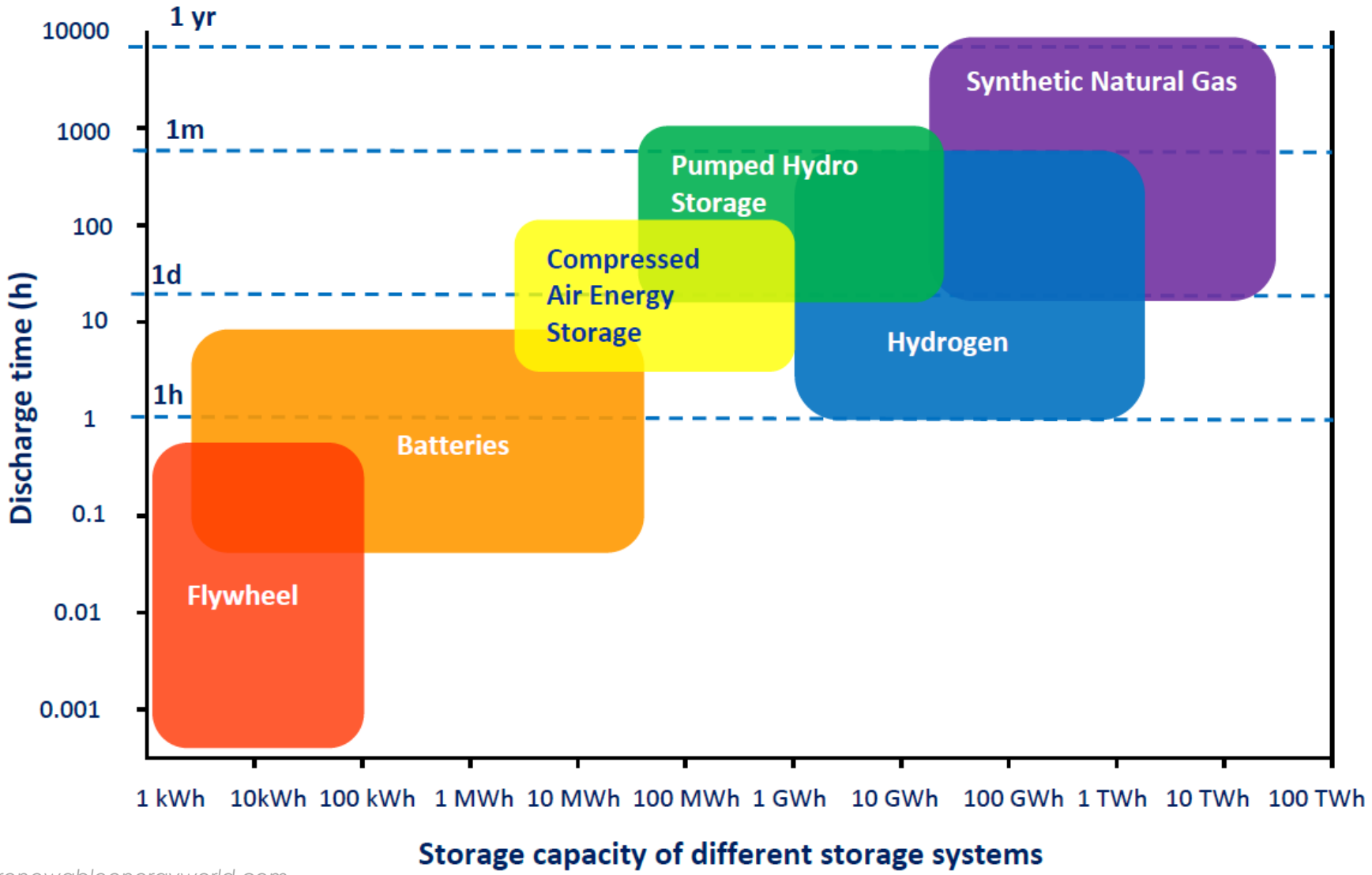
30,500,000 Nissan Leaf

734 GWh STORED IN BEVs (50% DISCHARGE)

17,200,000 Tesla Model S P85

61,000,000 Nissan Leaf

ENERGY STORAGE OPTIONS

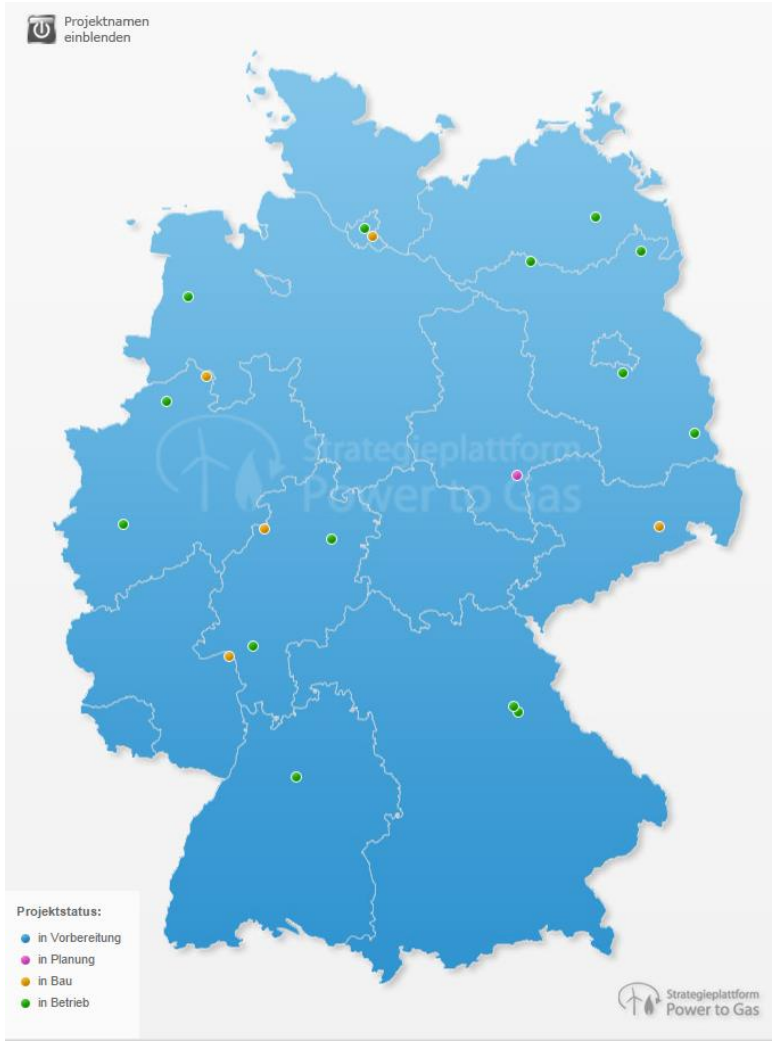


Source: www.renewableenergyworld.com

POWER… TO GAS

POWER-TO-GAS, MAIN CONSIDERATIONS:

- ELECTRICITY PRICE
- GRID BALANCING SERVICES
- HYDROGEN
  - FOR FUEL
  - INJECTED INTO GAS GRID
- RE-ELECTRIFICATION
- METHANATION
  - TO VEHICLES
  - INJECTED INTO GAS GRID
- HEAT FOR CENTRAL HEATING GRID



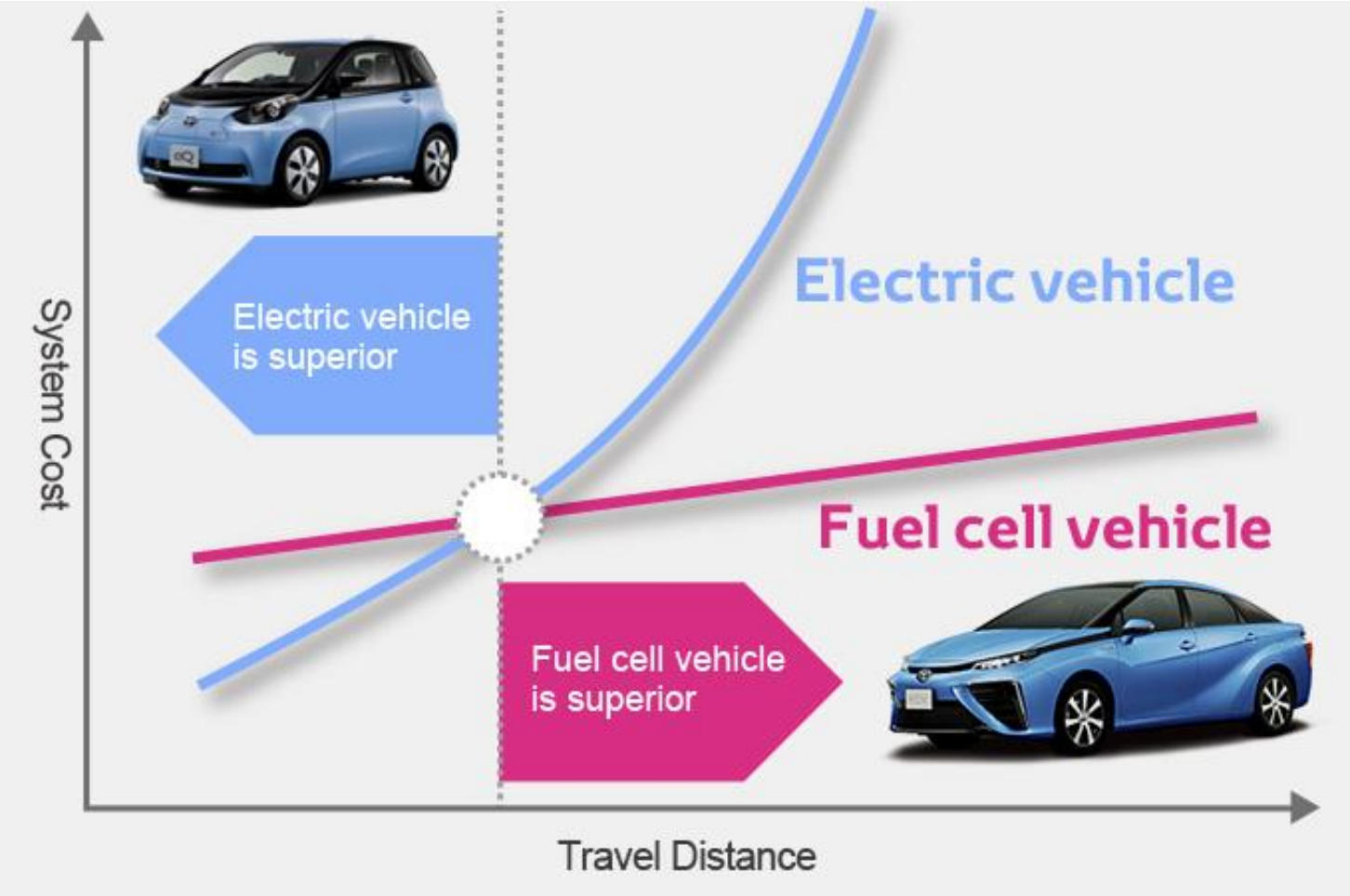
Source: http://www.powertogas.info/power-to-gas/interaktive-projektkarte.html

THE FUEL OF THE FUTURE, AVAILABLE TODAY

DO WE NEED HYDROGEN VEHICLES?

50% OF VEHICLES

25% OF EMISSIONS



50% OF VEHICLES

75% OF EMISSIONS

Source: Toyota Motor Corporation & Report: A portfolio of Powertrains for Europe

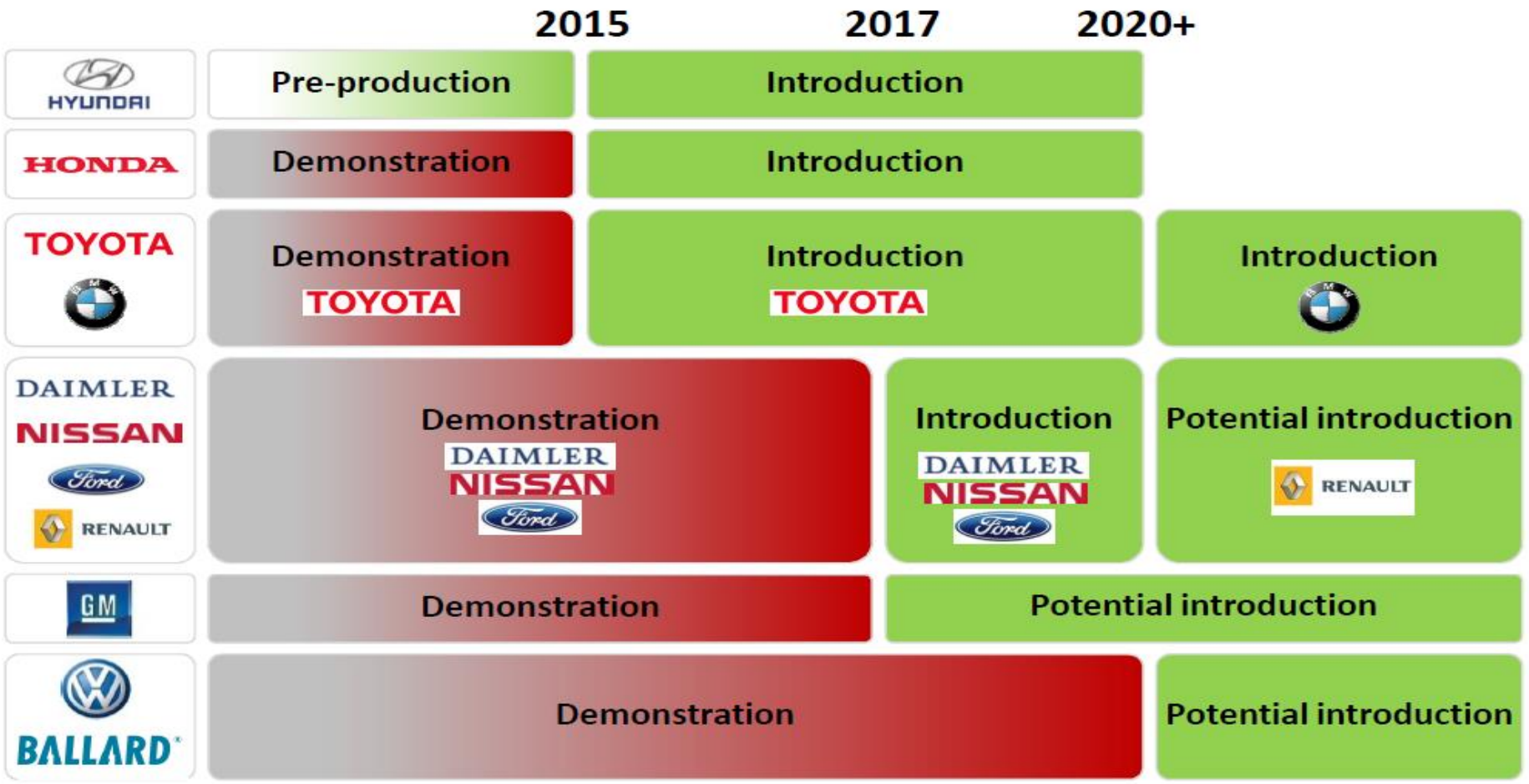
…"THEY ARE JUST LIKE THE CARS OF TODAY"

- FCEV: Fuel Cell **Electric Vehicle**
- Range: 600+ km

  1 kg H_2 = 100 km
- Refueling time: 3 – 4 minutes
- No limitations on vehicle size
- Low impact on range from cold climate operation
- Noise & emission free (pure water)

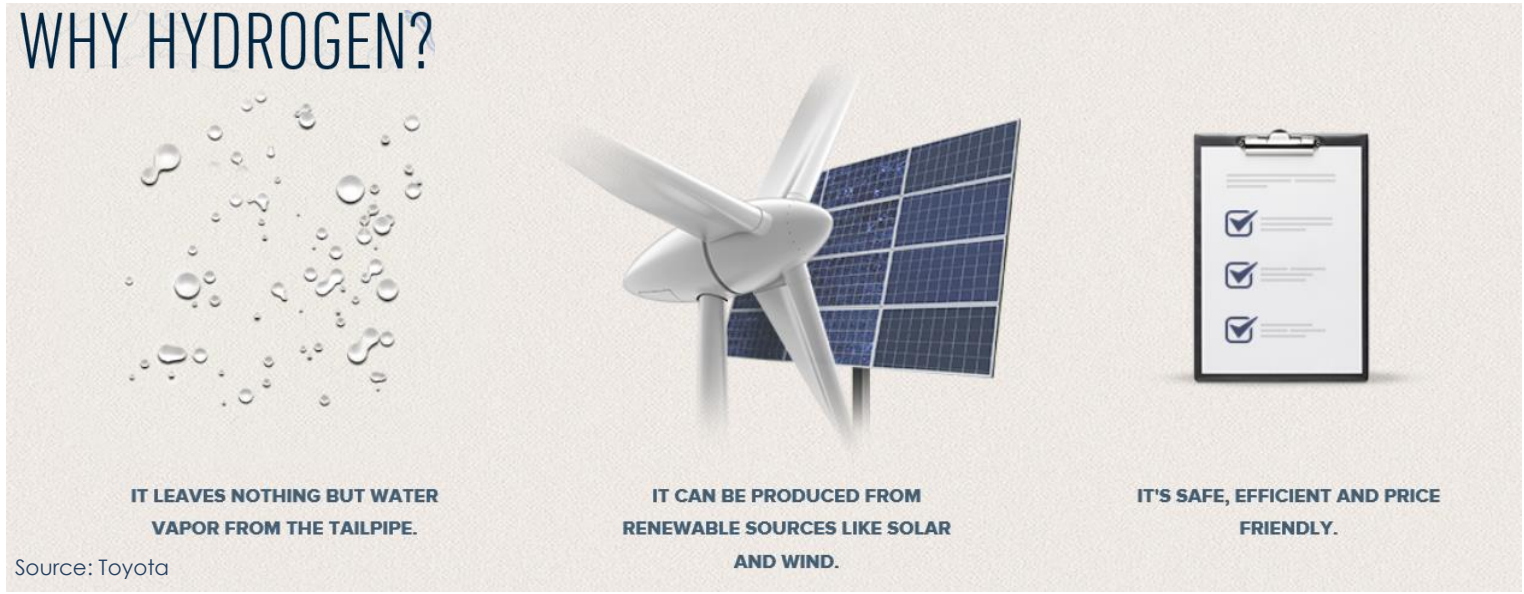
"It's the most important car since the car was invented" - James May, Top Gear

FCEV ARE BEING INTRODUCED NOW



TOYOTA OFFICIAL LAUNCH: APRIL 2015

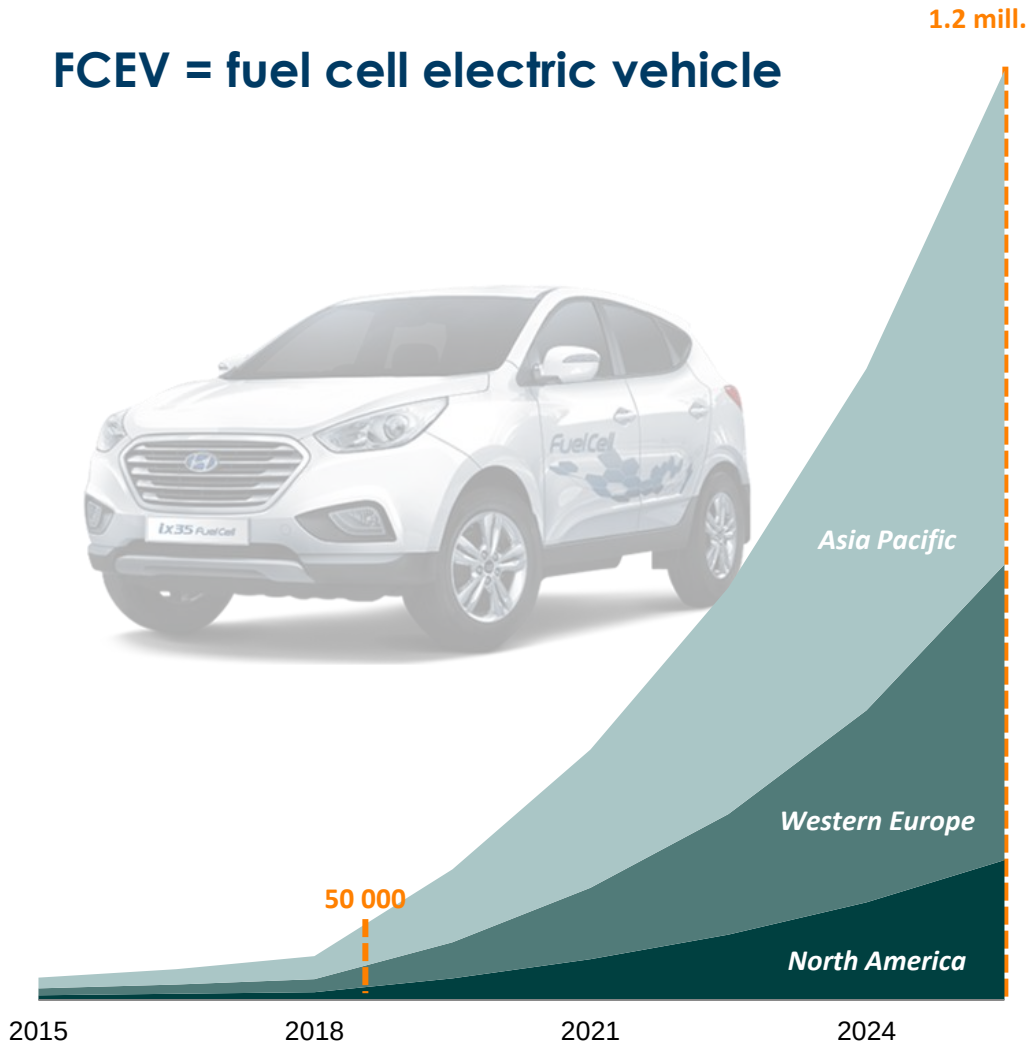
> *The need for an alternative to fossil fuel is real. And in time,* ***hydrogen will be our most sustainable option****. Not only because hydrogen can be produced from renewables like solar and wind but also because the only emission from the tailpipe is water vapor.* ***So what was once seen as a pipe dream now has more potential than ever.***"
>
> - Toyota Motors, 2014



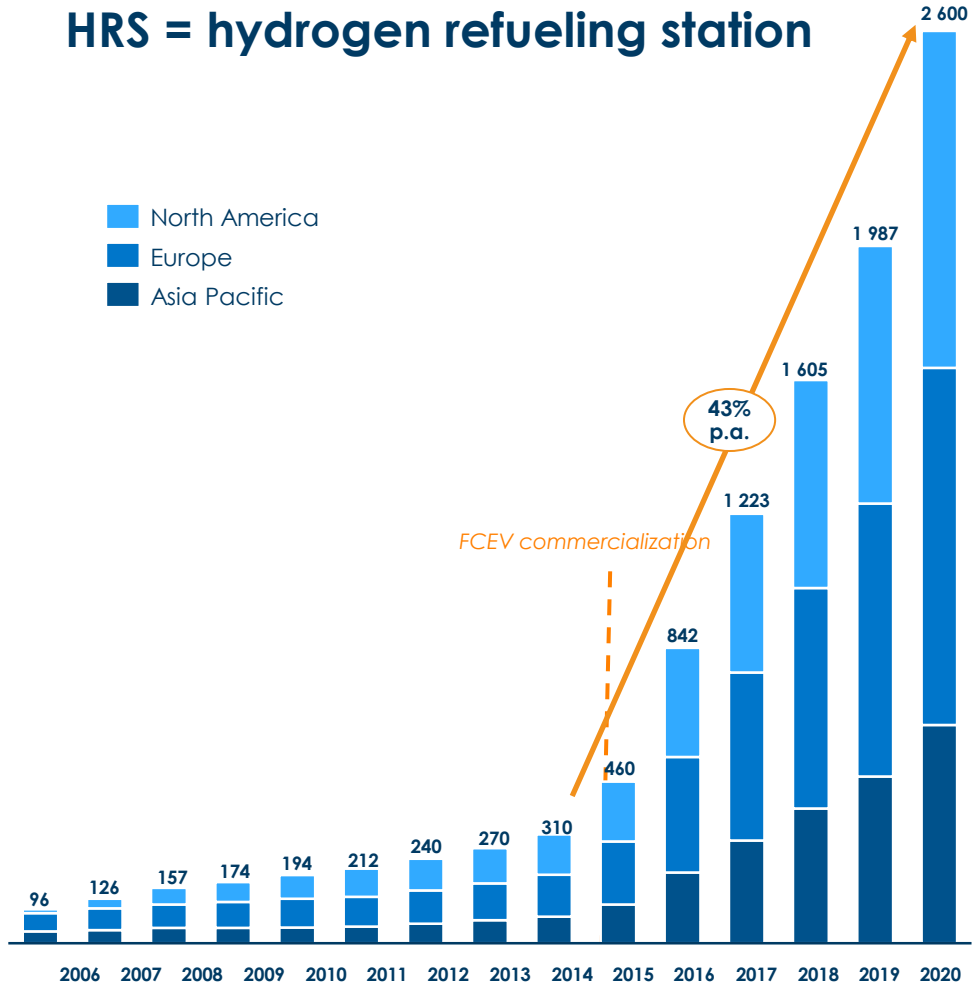
Source: Toyota

FORECAST OF GROWTH IN FCEVs AND HRS

FCEV = fuel cell electric vehicle



HRS = hydrogen refueling station



Source for forecast: Navigant Research and company webpages. Compiled by Arkwright

BUSINESS CASE FOR HRS IN OSLO REGION

- **Energy input:** 60 kWh/kg
- **Sales price:** NOK 90/kg (full tank: 5 – 6 kg)
- **CAPEX, HRS + production:** NOK 15+ million
- **HRS refueling capacity:** 500 kg/day

HYOP

Business case depends on electricity/hydrogen price & number of customers

HYOP AS dedicated Norwegian HRS operating company

Viable business case in Oslo-region: >10,000 FCEVs

OSLO & AKERSHUS HYDROGEN STRATEGY

Ensuring commercial introduction of hydrogen in the Oslo-region.

- 2014 – 2018: 400 MNOK (high public share)
- 2019 – 2020: 1000 MNOK (gradually lower public share)
- Action plan 2015 – 2016 approved by Akershus: 23 MNOK (of ~100 MNOK)
- Other financers: Transnova, EU

Oslo kommune

AKERSHUS fylkeskommune

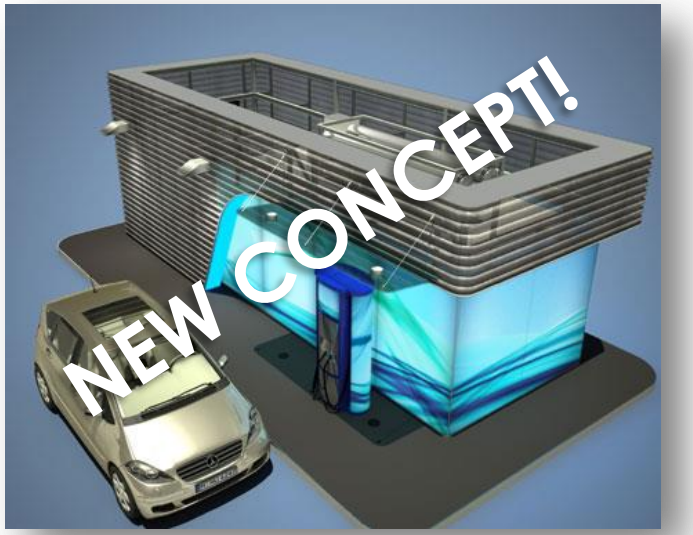
HYDROGEN REFUELING STATIONS

NEW REFUELING STATION PROJECT

COMMERCIAL GRADE STATION

10 X CAPACITY

30% COST REDUCTIONS



Based on unique experience & well functioning technology

AKERSHUS fylkeskommune

NEL HYDROGEN

HYOP

PRESENTATION OUTLINE

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Our value proposition

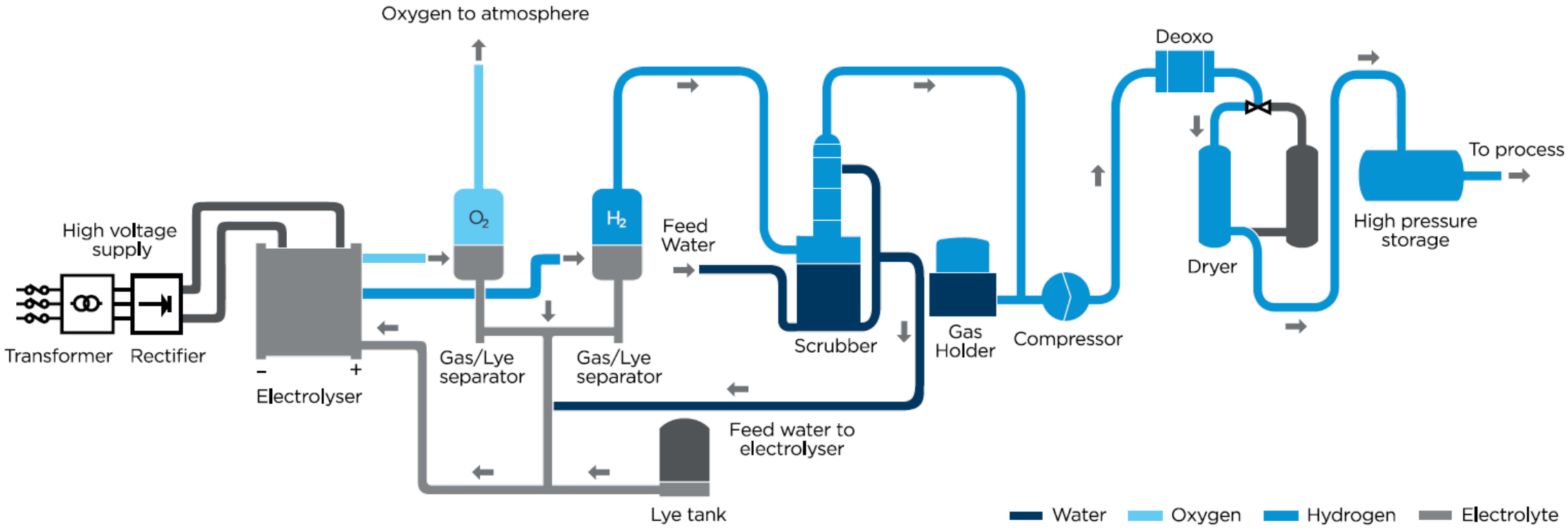
OUR VALUE PROPOSITION

Unique electrolyser technology	Non-patented active coating
Superior energy efficiency	3 - 15% more efficient than competitors
Design and scalability	Flexible design & competitive systems from 500 kW – multi-MW
Quality and reliability	High regularity & long lifetime
Green technology	Enables fully zero-emission hydrogen production
Profitable business	Positive cash flow from current business

Appendix

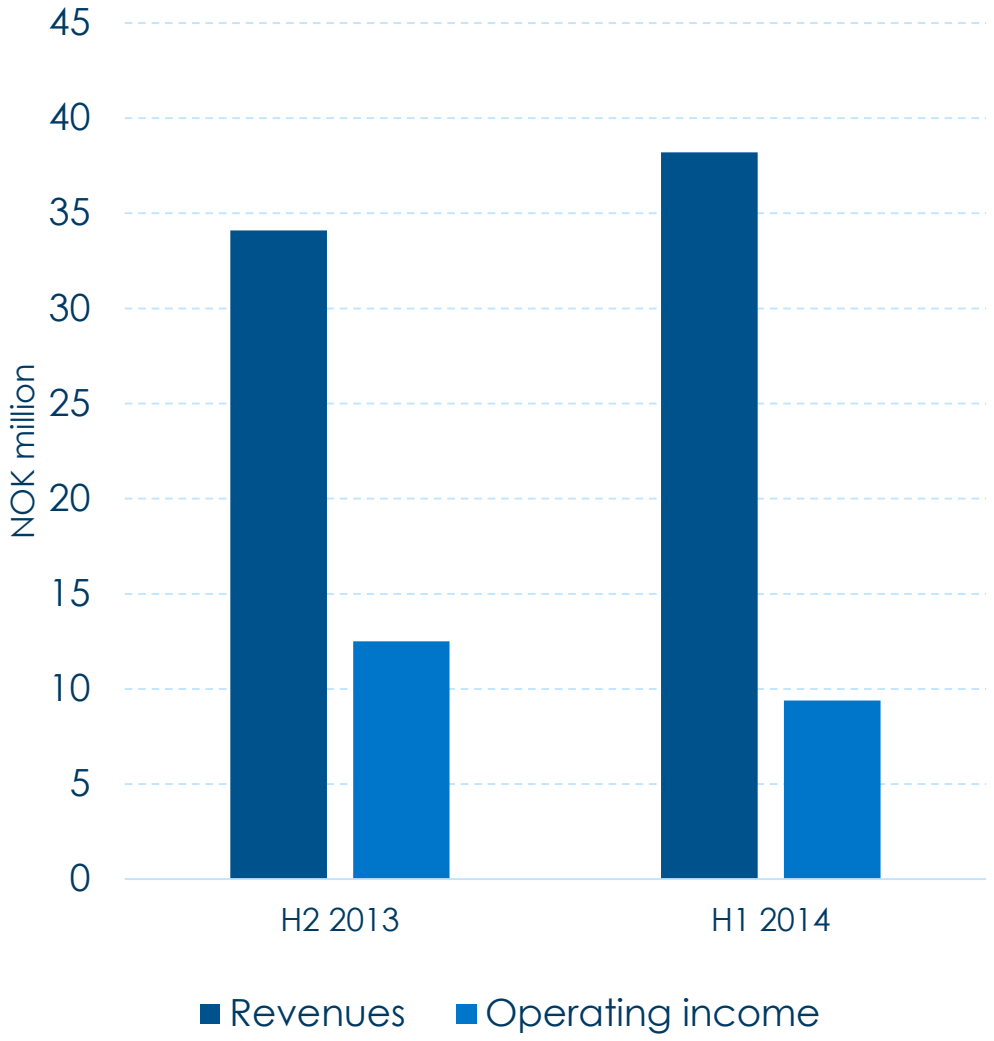
WHAT IS "*ELECTROLYSIS*"?

Electrolysis is the process of splitting water into hydrogen and oxygen using an electrical current. The inputs to this process are simply feed water and electrical power. Below a schematic of a typical hydrogen generation plant is seen:



OUR CUSTOMER REFERENCE LIST

SALES AND PROFITABILITY



- Sales H1 2014: NOK 38 million
  - New sales: NOK 11 million
  - After-sales NOK 27 million
- Operating income H1 2014: NOK 9.4 million
  - Operating income margin of 24.6%

MANAGEMENT, OWNERS AND CONTACTS

Management

Lars Markus Solheim
CEO

- With NEL Hydrogen since 2005
- Long experience from employment in NEL, with previous positions as Lead Automation Engineer and Director Operations
- BSc in System Engineering from Buskerud University College

Erik Evju
Director, Finance

- With NEL Hydrogen since 1994
- Education: Bank, insurance and business administration from Norwegian School of Management (BI)
- Norwegian School of Export

Bjørn Simonsen
Director Market development and public relations

- With NEL Hydrogen from September 2014
- Experience with hydrogen since 2008: Researcher (IFE), followed by key positions in the HyNor-project, The Norwegian Hydrogen Council and Norwegian Hydrogen Forum.
- Education: M.Sc. in Energy and Environmental Engineering (NTNU)

Ole Arnt Lindgren
Director, Production

- With NEL Hydrogen since 2009
- Previous experience include ABB (assembly and logistics mgr) and GPV (production and logistics mgr)
- Education: Spec. In Logistics, Norwegian School of Management (BI)

Contact details

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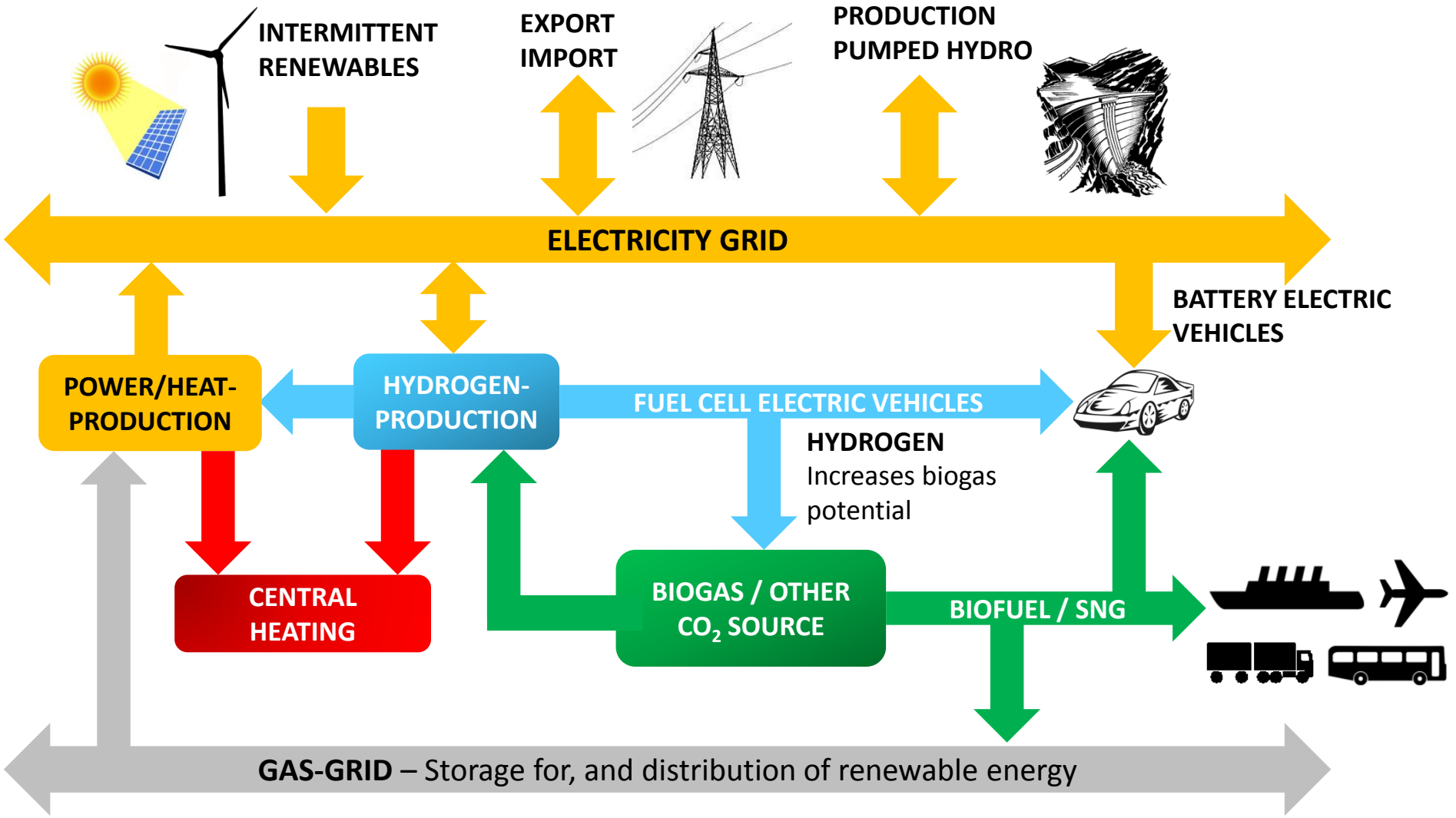
Web: www.nel-hydrogen.com

Address: P.O. Box 24, NO-3671
Notodden, Norway

POWER-TO-GAS (more in-depth)



P2G: EFFICIENT ALTERNATIVE TO BATTERIES

- For large scale energy storage, power-to-gas (P2G) is the most attractive pathway
- P2G in brief: conversion of electricity to gas
- Electrolysers are the key component of P2G-systems
- NEL Hydrogen is well positioned to be part of this growth
  - Superior large-scale supplier (> 120 Nm^3/h)
  - Experienced and reliable supplier

NEL A - TECHNICAL SPECIFICATIONS

Capacity / Nominal Flow Rate	NEL A·150	NEL A·300	NEL A·485
Capacity range (Nm^3 H_2/hr) per unit	50 - 150	151 - 300	301 - 485
Production capacity dynamic range	20 - 100% of nominal flow rate		
Energy (electrolyser cell stack)			
Typical power consumption (kWh/Nm^3 H_2)	3.8 - 4.4		
Purity (measured on dry basis)			
H_2 purity (%)	99.9 ± 0.1		
O_2 purity (%)	99.5 ± 0.2		
After purification[1]			
O_2-content	< 2 ppm v		
H_2O-content	< 2 ppm v		
Pressure			
H_2 outlet pressure after electrolyser	200 - 400 mm WG		
H_2 outlet pressure after compressor[2]	Max 250 bar g		
Operation			
Operating temperature	80ºC		
Electrolyte	25% KOH aqueous solution		
Feed water consumption	0.9 litre / Nm^3 H_2		

CASE STUDY(1):
ILLOVO SUGAR SA Ltd

COMPANY	Illovo Sugar SA Ltd
COUNTRY	South Africa
PRODUCT	NEL A•485
CAPACITY	360 Nm^3/hour
APPLICATION	Refined Sugar
INSTALLED	1983

"The original electrolyser is still in operation today and is extremely reliable. It runs at full capacity 24 hours a day. No significant maintenance is required"

Alastair Warman
Engineering Manager
Illovo Sugar Ltd

CASE STUDY(2)

GUARDIAN – EGYPTIAN GLASS CO.

COMPANY	Guardian – Egyptian Glass Company
COUNTRY	Egypt
PRODUCT	NEL A•150
CAPACITY	120 Nm^3/hour
APPLICATION	Float Glass
INSTALLED	1998

"Since the start-up of the plant in May 1998, we have enjoyed a stable production with high gas purity, without any problems whatsoever"

Ihab Ishak
UtilityManager
Egyptian Glass Co.

GUARDIAN
Glass • Automotive • Building Products

CASE STUDY (3)

INDUSTRIAS DE ACEITE FINO S.A.

COMPANY	Industria de Aceite FINO S.A.
COUNTRY	Bolivia
PRODUCT	NEL A•300
CAPACITY	300 Nm^3/hour
APPLICATION	Edible Oils & Fats
INSTALLED	2012

"The refurbished electrolyser works perfect for us. It is very easy and safe in operation. In addition we have made significant savings in our energy costs with this electrolyser."

Cesar Campoverde
Production Manager
Industrias de Aceite Fino

FINO

CASE STUDY (4)

HYDROGEN FOR POLYSILICON INDUSTRY

CUSTOMER	Tokuyama Corporation
COUNTRY	Malaysia
PRODUCT	11 x NEL A•485
CAPACITY	5500 Nm^3/hour
APPLICATION	Polysilicon (20,000 tonnes/yr)
INSTALLED	2013 - 2014
ORDER VALUE	160 MNOK

Even though large resources of natural gas is available nearby the plant, electrolysis based hydrogen was chosen due to its superior purity, alongside with good access to local, renewable electricity.