



Industrial  
Development  
Agency JSC



# Hydrogen market

May 2022



# Industrial Development Agency JSC



# Industrial Development Agency JSC



**1991 year**  
of incorporation



**PLN 6.2 billion**  
loans from 2015



**over 300 employees**  
headcount



**Wholly owned**  
by the State Treasury



## LOCATION

- Head Office:  
**Warsaw**
- Branch offices:  
**Tarnobrzeg, Mielec,  
Wrocław, Katowice**

## ENTITIES UNDER SUPERVISION

- **2** Special Economic Zones in south-eastern Poland and 10 industrial parks across Poland
- **over 75** companies, and in about **50** of them - majority stakes
- over **100** State Treasury companies entrusted IDA JSC to manage
- **4** foundations

# Industrial Development Agency JSC Offer



Thorough preparation of an investment offer in Poland



Income tax exemption for a new investment (CIT or PIT)



Dedicated site analysis for an investment



Site preparation



Workforce acquisition support



Financing energy/sewers/telecom infrastructure



Efficient investor service



Assistance in acquiring properties



Response to offer inquiries within 48 hours



Advising on the supply of utilities



# IDA JSC Experience

## They trusted us ...



**> 4,6 bn €**  
capital expenditure



**> 80 000**  
jobs created



**> 460**  
investors

## Countries of origin of investors



South Korea



Netherlands



Germany



Spain



United States



China



Sweden



United Kingdom

## Key industries



Automotive



Electromobility



Chemical



Construction



R & D



Electronics



Household appliances



Others

# HYDROGEN MARKET Europe and Poland



# Hydrogen production in Europe

## Total hydrogen production capacity by country per year

№ 2 Netherlands, which produces 1.5 Mt, № 3 Poland 1.3 Mt.

Further comparing Italy (0.8 Mt, 7%), France, Spain (0.7 Mt, 6%), and Belgium (0.6 Mt, 5%)

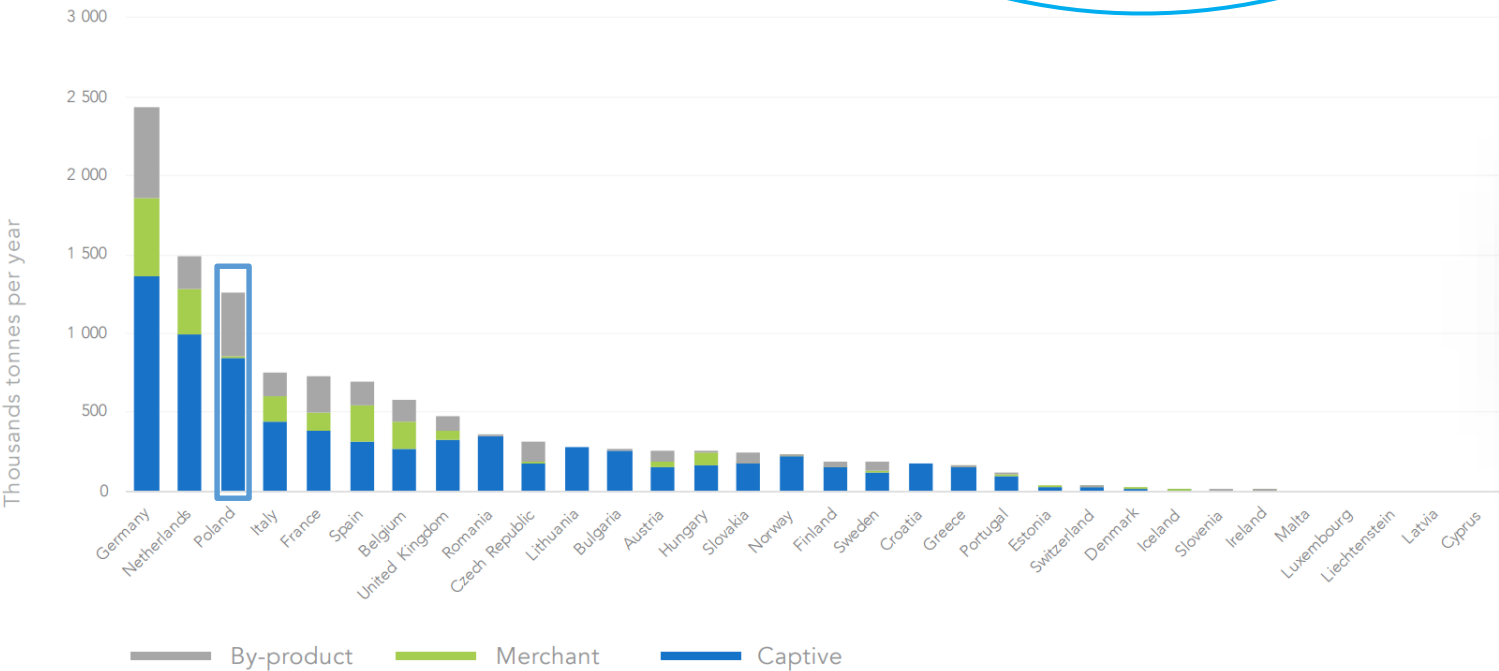
With almost 2.5 Mt of hydrogen per year (21% of the total), Germany has by far the largest hydrogen production capacity in the EU



The structure of production by type and technology in different countries resembles the overall structure, with captive production dominating in most countries.



More than half of total European Economic Area hydrogen consumption takes place in just four countries: Germany (22%), the Netherlands (14%), Poland (9%) and Belgium (7%).

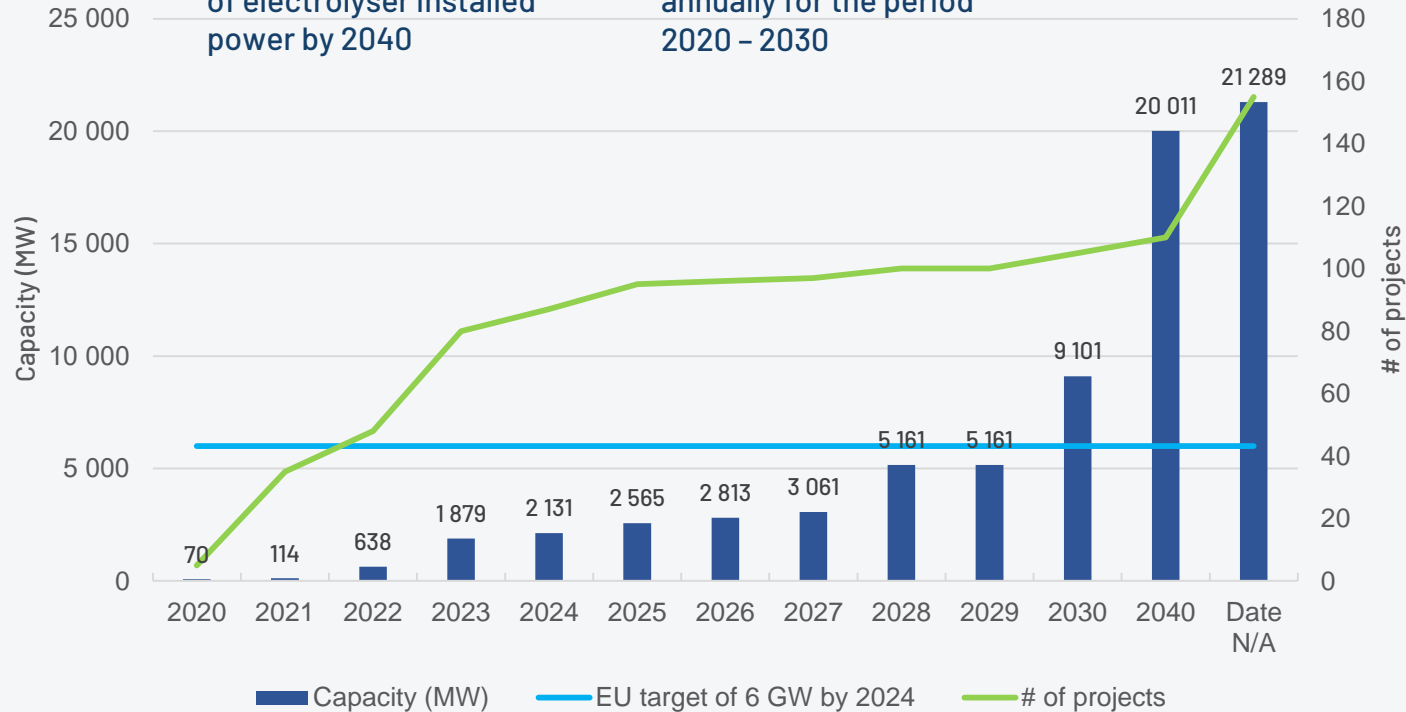


# Planned Power-To-Hydrogen (PtH) projects EU

## Cumulative planned PtH projects by year 2020 - 2040

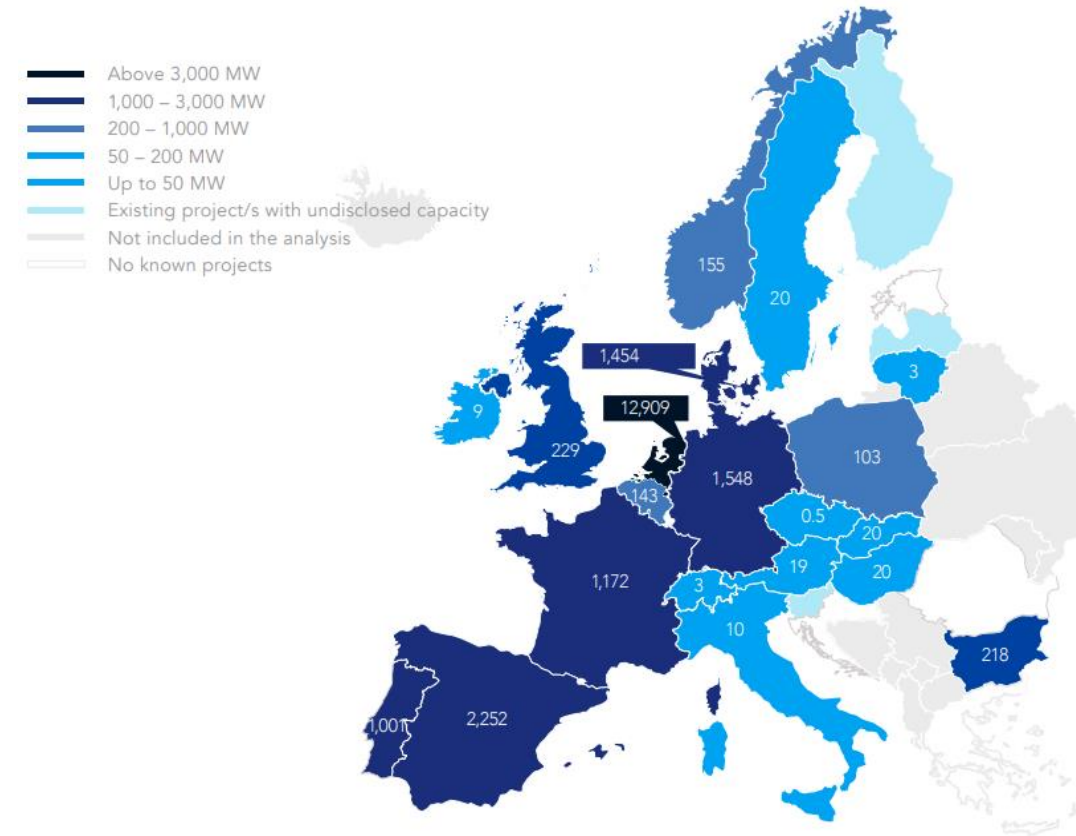
The total planned capacity of PtH projects is 20,011 MW of electrolyser installed power by 2040

The average tracked capacity growth rate is 63% annually for the period 2020 - 2030



## Map of PtH capacity additions by country 2020 - 2040 in MW

Six countries with the highest number of announced electrolyser capacity represent 96% of planned PtH capacity and 66% of planned projects





# European Hydrogen Backbone

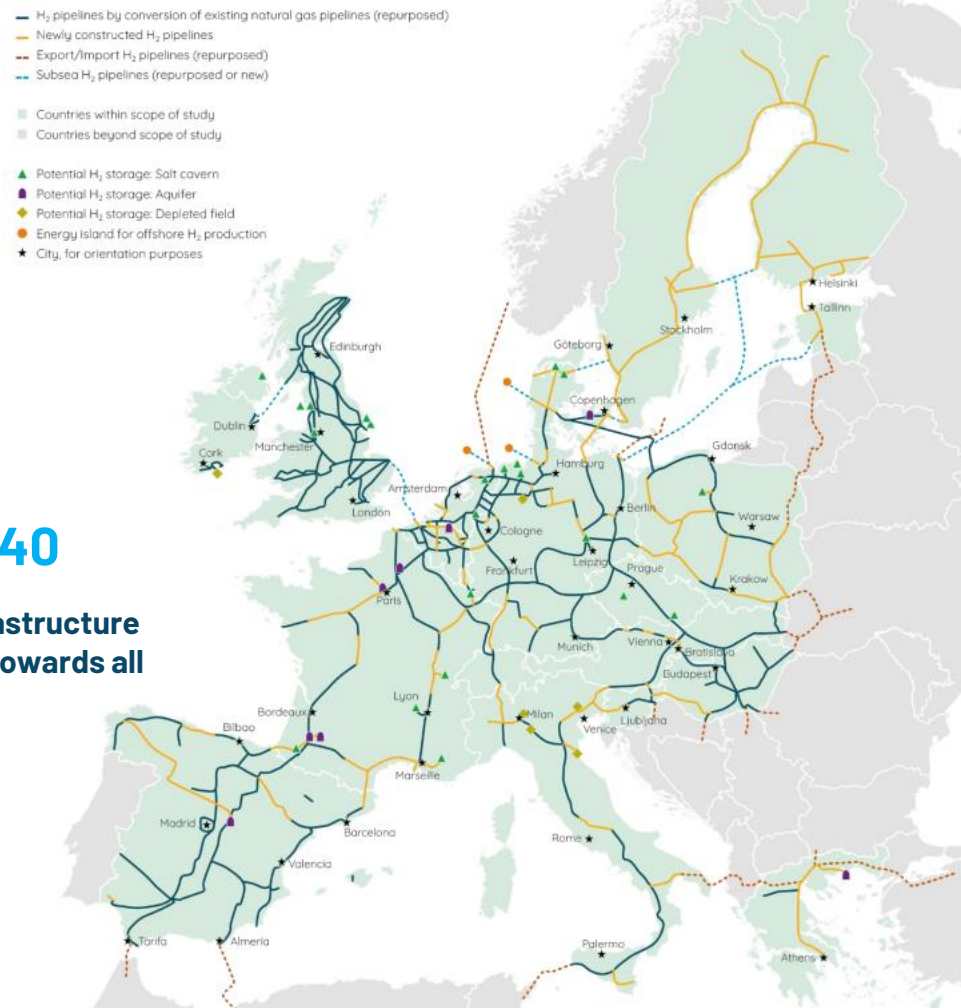
Almost **70%** of hydrogen pipeline infrastructure is based on repurposed existing natural gas pipelines

Vision for a **39,700 km hydrogen pipeline infrastructure in 21 countries by 2040**

**2030**  
Connecting industrial clusters to an emerging infrastructure

**2035**  
Growing network covers more countries and reaches large potential import regions of green hydrogen

**2040**  
Mature infrastructure stretching towards all directions



## Poland background

GAZ-SYSTEM operates a network of 11,000 km H2 Strategy 2030:

2 GW of installed electrolyser capacity Offshore wind capacity targets of 5.9GW

## Poland 2035

Network emerges in the north around of f-and onshore wind potential with storage possibility, interconnection to Germany in the east.

## Poland 2040

Matured network, north-south highway, storage and interconnections to Ukraine, Denmark via Baltic Pipe and possibly to Baltic states via Lithuania

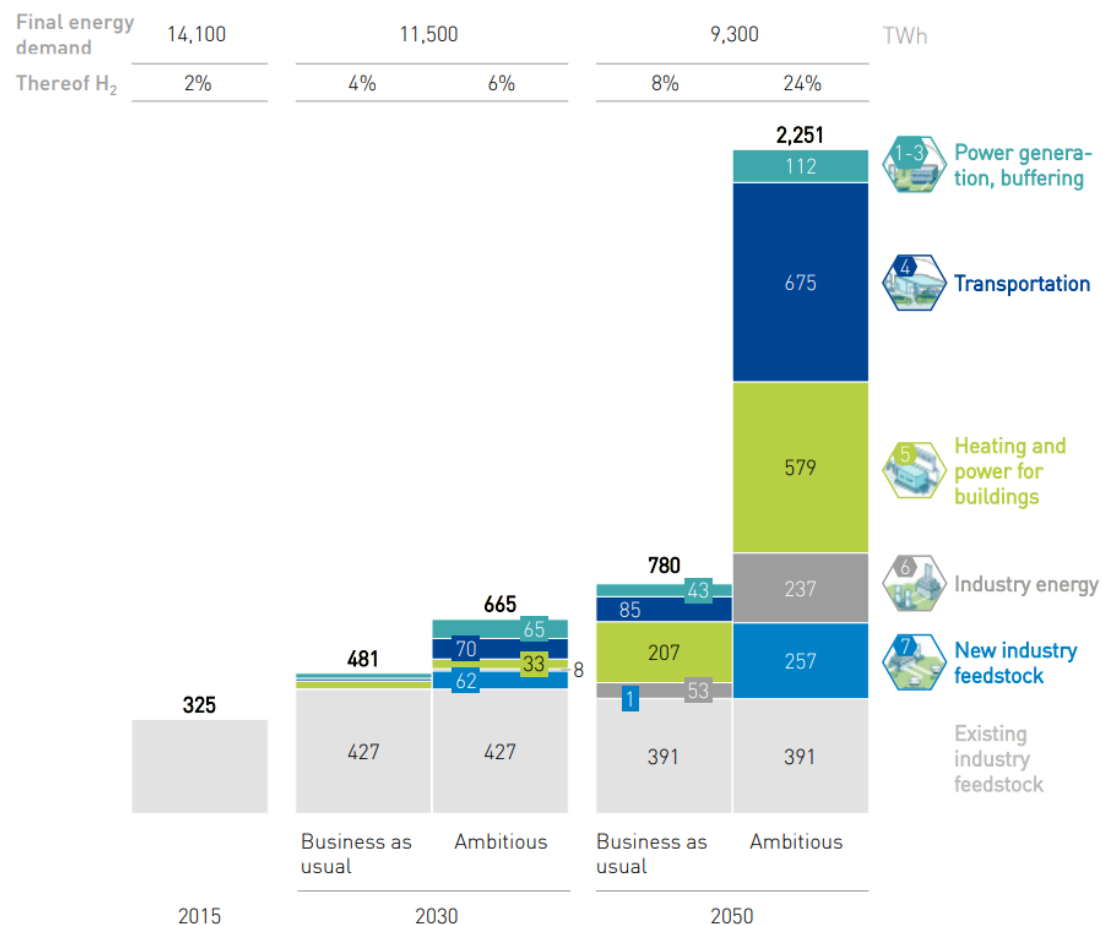


# Expected hydrogen demand in Europe

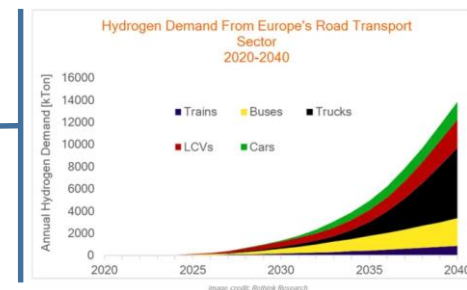
**HYDROGEN COULD PROVIDE UP TO 24% OF TOTAL ENERGY DEMAND, OR UP TO ~2,250 TWh OF ENERGY IN THE EU BY 2050**

Benefits of hydrogen for the EU

- ~ 24 % of final energy demand
- ~ 560 Mt annual CO<sub>2</sub> abatement
- ~ 820 bn € annual revenue (hydrogen and equipment)
- ~ 15% reduction of local emission [NO<sub>x</sub>] relative to road transport
- ~ 5,4 m jobs (hydrogen, equipment, supplier industries)



USING



Industrial heat production and electricity for private use

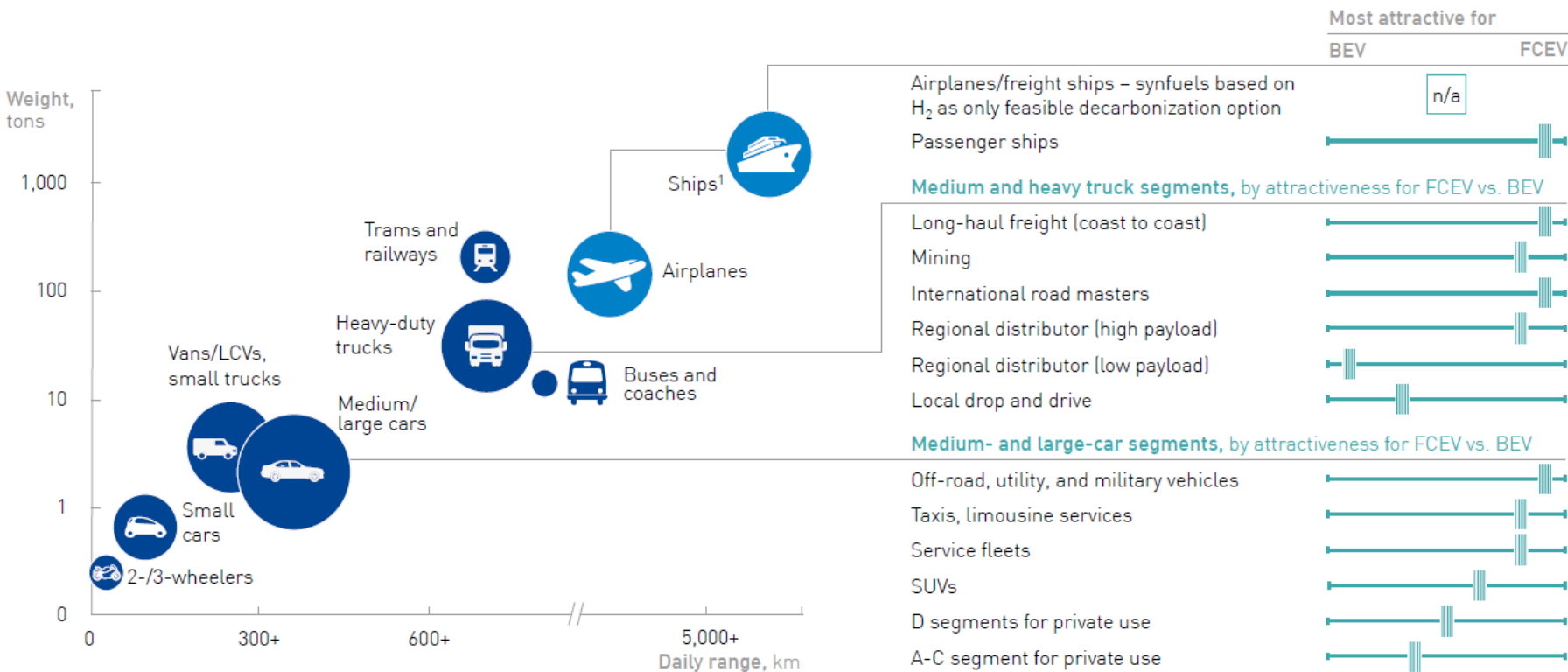
e.g. metallurgy or petrochemicals

Consumption in industry today:

- refineries: 133 TWh / a
- ammonia: 87 TWh / a
- methanol: 13 TWh / a

# Cost effectiveness of applied fuel

Bubble color representing FCEV or **synfuel** application of H<sub>2</sub> ○ Bubble size roughly representing the annual energy consumption of this vehicle type in 2050



## ANALYSES SHOWS THAT THE BIGGEST POTENTIAL FOR HYDROGEN TRANSPORTATIONS IS IN HEAVY DUTY VEHICLES

- Hydrogen has a significantly higher energy density than batteries, both in terms of volume and weight
- FCEV can drive further and transport more payload than a BEV, but it is more expensive technology
- For mass products and long distance shipment Bio- and (H<sub>2</sub>-based) synthetic fuels is the most profitable choice
- Small cars/ urban mobility is expected to be explored by electric vehicle

1 H<sub>2</sub>-based fuels or fuel cells

# Demand for electrolysers

213.5 GW of electrolysers are planned for implementation by 2040, which is a **thousand-fold increase** compared to the currently operating 0.2 GW

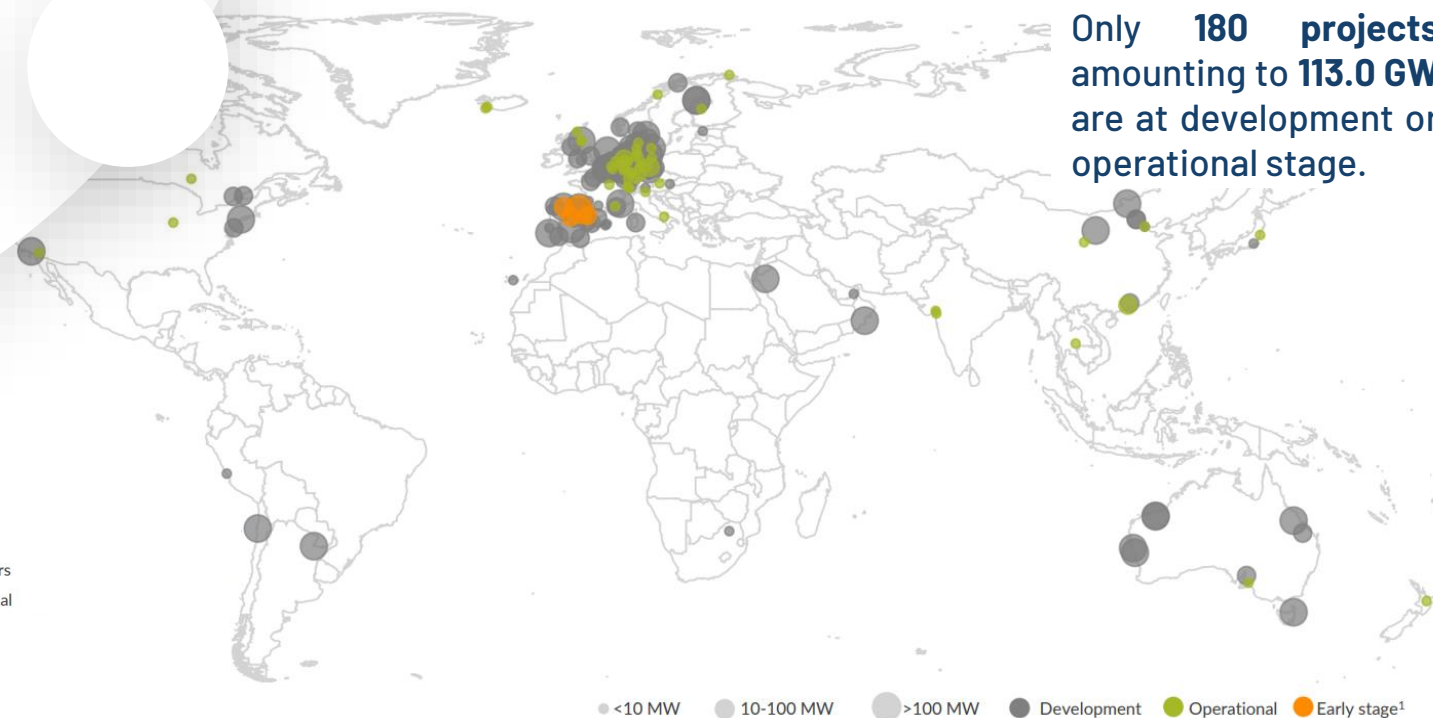
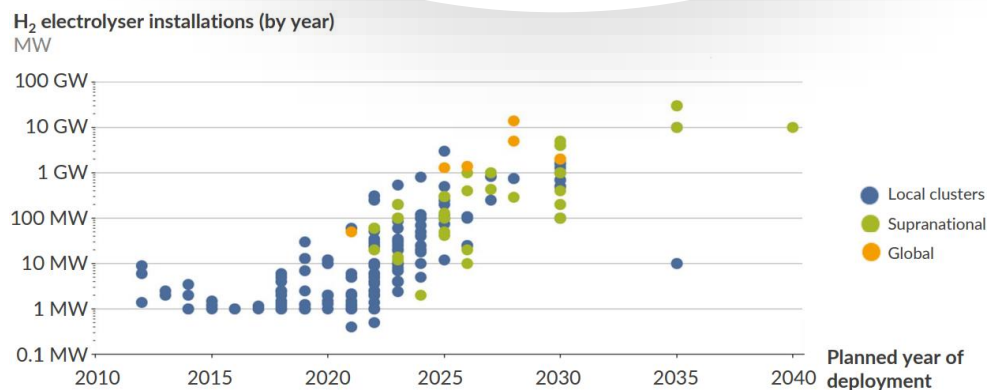
## Target capacity of the electrolyser

- EU: 40 GW by 2030
- PL: 2 GW by 2030

213.5 GW of electrolyser capacity is under development globally, of which **182.3 GW is within Europe (85%)**

Electrolyser project sizes are scaling up very quickly, from 1-10 MW currently to **100-500 MW in 2025**

Only **180 projects** amounting to **113.0 GW** are at development or operational stage.



# Hydrogen production in Poland

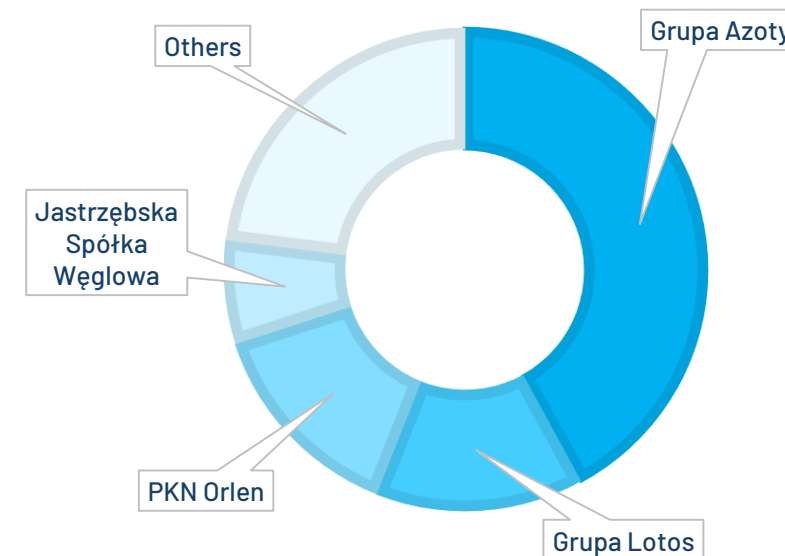
The annual production of hydrogen in Poland is 1 million tonnes. **It takes 3<sup>rd</sup> place in Europe**

## Grupa Azoty

- Market share **42%**
- Annual production **420 k. tone**

## PKN Orlen and Grupa Lotos

- Market share **28%**
- Annual production **290 k. tone**



## Total hydrogen production capacity

- Captive: 0,94 Mt/a (69%)
- By product: 0,41 Mt/a (30%)
- Merchant: <0,1 Mt/a (1%)

## Hydrogen production mainly occurs on own needs

current production capacity installations are not used 100%

producers indicate the possibility of increasing production

## Poland's strengths

- experience
- know-how in the field of production and warehousing
- strong partners for the production of hydrogen

# Hydrogen projects implemented in Poland

Poland's hydrogen strategy defines specific goals of building the economy with the use of hydrogen in the energy, heating, industry and transport sectors

## HYDROGEN AS A FUEL IN HEATING:

Polenergia – **Nowa Sarzyna** – hydrogen as a zero-emission fuel in gas turbines

## PRODUCTION OF ELECTROLYSER:

Grupa Lotos/ AGH University of Science and Technology/ The Institute of Power Engineering – **Vetni** – construction of a pilot installation of a solid oxide electrolyser (SOE)

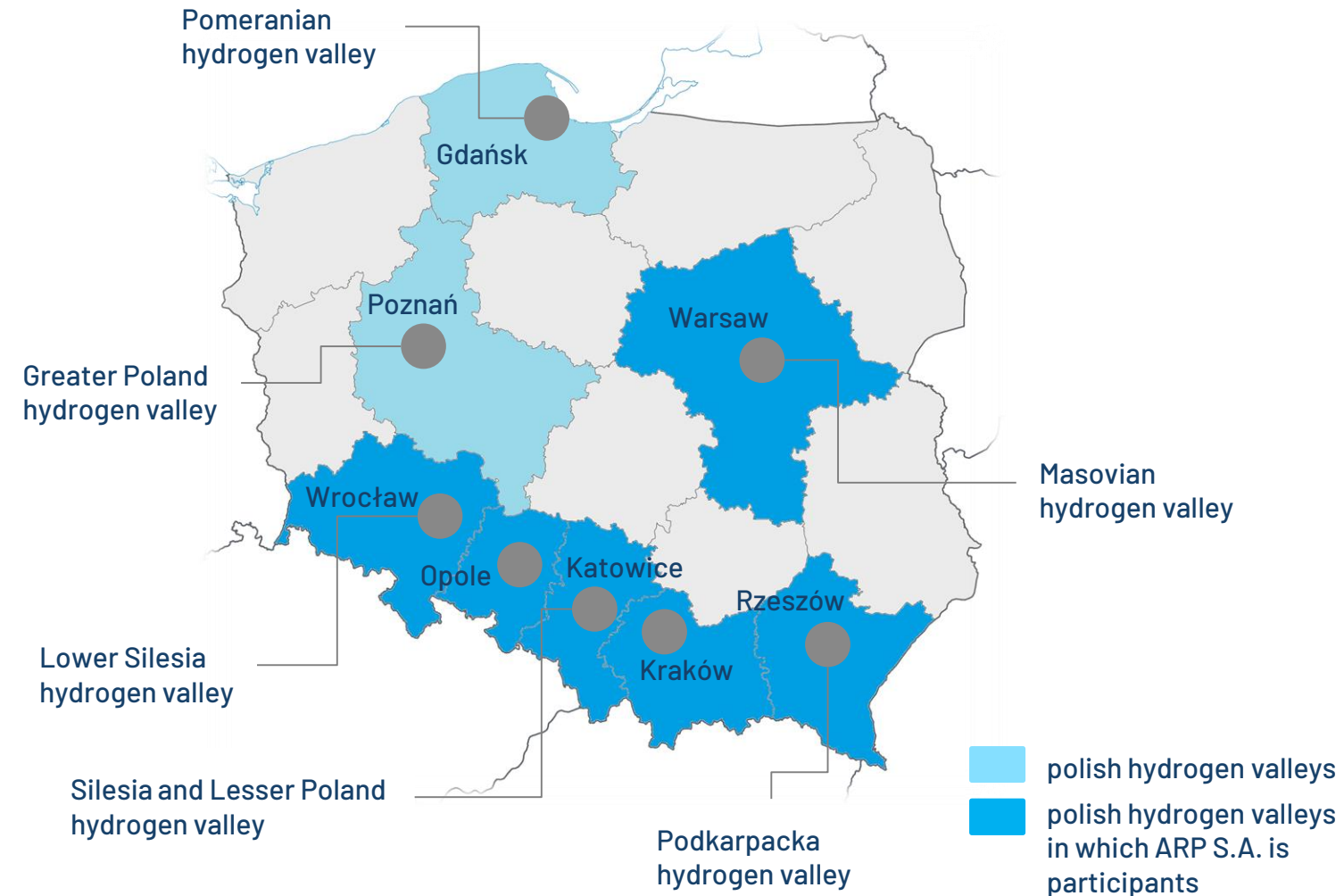
## PRODUCTION OF GREEN HYDROGEN:

- Grupa Orlen – **Green Hydrogen** – hydrogen production (0.5 GW to 2030) using renewable energy sources and municipal waste processing, 100 hydrogen refueling stations to 2030
- Grupa LOTOS – „**Green H2**” – hydrogen production using offshore energy, oraz „**PURE H2**” – sale of very high purity hydrogen
- ZE PAK JSC – production of hydrogen using energy produced by burning biomass in a power plant

## HYDROGEN AS A FUEL IN TRANSPORT:

- Alstom – **Coradia iLint** – hydrogen train
- Pesa Bydgoszcz – **Gama** (model SM42 6Dn) – hydrogen locomotive
- Solaris – **Urbino 12 hydrogen** – hydrogen bus
- Autosan – **Sancity 12LFH** – hydrogen bus

# Polish hydrogen valleys



The Polish hydrogen strategy defines the assumption of regional hydrogen valleys.

- Regional specialization
- Focused on one hydrogen leader
- IDA JSC as a technology broker
- European and national projects involvement



# Polish energy industry



# Polish energy mix

## Electricity generation by energy carrier in Polish energy mix currently and by 2040

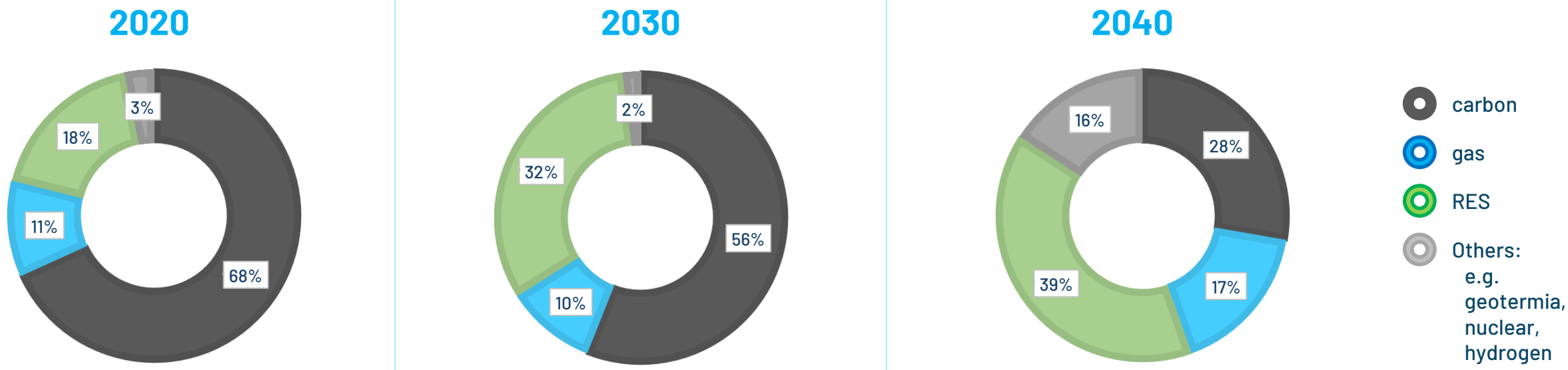
Electricity production in 2020 amounted to 158.0 TWh, while consumption was 161.3 TWh

Results:

- in a 3.6% y/y reduction in production
- in a 2.6% y/y reduction in consumption

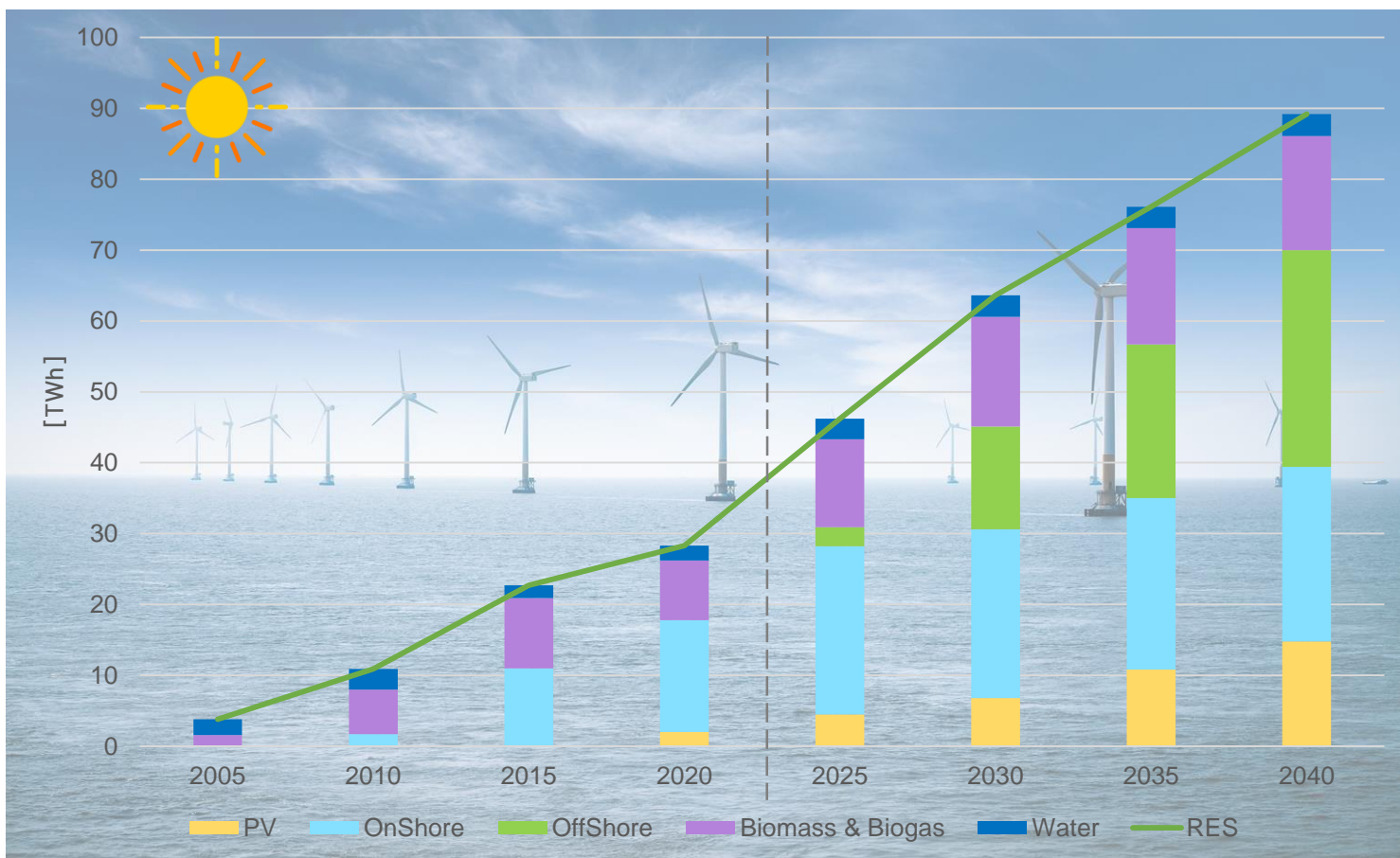
A very important element of the national policy of reducing CO<sub>2</sub> emissions the development of offshore wind energy and nuclear energy power Plants in Poland

- in 2035, offshore can generate 21.7 TWh
- in 2035, nuclear capacity can generate 20 TWh



# Renewable Energy Sources in Poland

## Production of electricity from RES



- Production from renewable energy sources accounted for 17.9% in 2020 and increased by 5.4 percentage points since 2014.
- In 2020, the most important carriers in this group were wind energy and biomass and biogas. Solar energy has the smallest share, but is characterized by the highest growth dynamics:
  - 273,8% increase in 2019 in compare to 2018
  - 255,7% increase in 2020 in compare to 2019
- The use of renewable energy technologies in heat generation will increase and the usage of alternative fuels in transport will increase, also through the development of electromobility and hydro-mobility.
- In 2030, REZ share in electricity generation may reach 32%, and in 2040 - 40% (90 TWh).
- Changing the energy mix allows for the reduction of as much as 45% of CO<sub>2</sub> emissions in 2040 compared to 1990.

# Electromobility in Europe

## In 2020 in Europe:

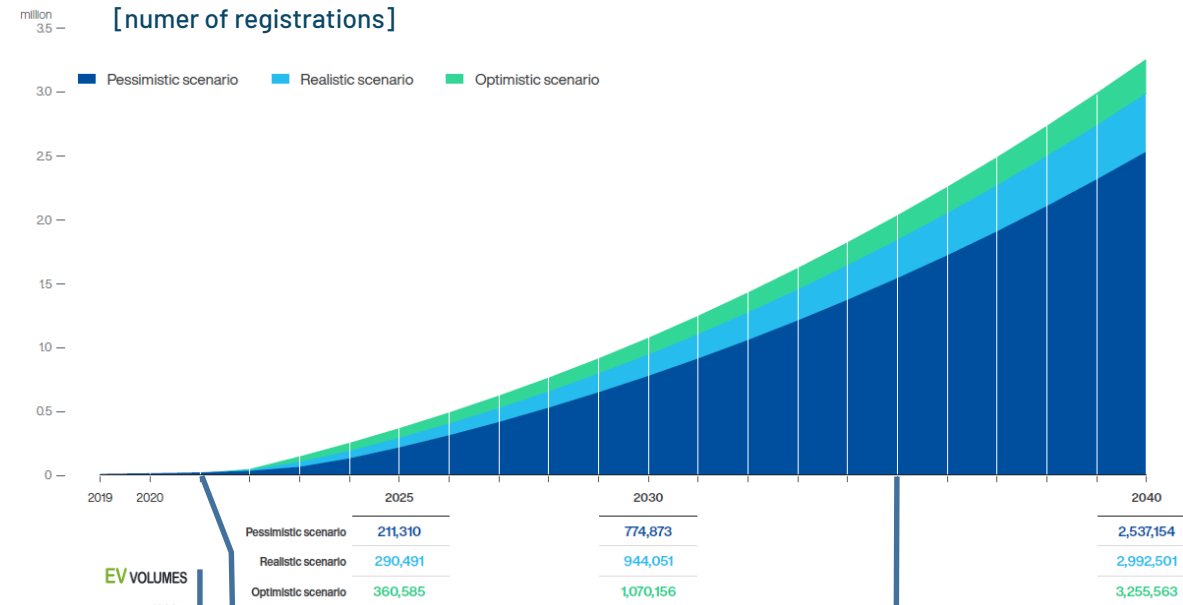
- sales of battery electric vehicles doubled versus 2019 to exceed **half a million units**
- the fleet of **hydrogen vehicles** is also growing - their registrations went up by **55 %** to 749 units
- the share of hydrogen, electric (or electrically charged), hybrids and auto-gas powered vehicles accounted for **one-fourth of the market**

The European Commission assumes that the fleet of **zero-emission cars and commercial vehicles** will account for **30 million units by 2030**, while the truck fleet will compromise of **80 thousand HDVs**.

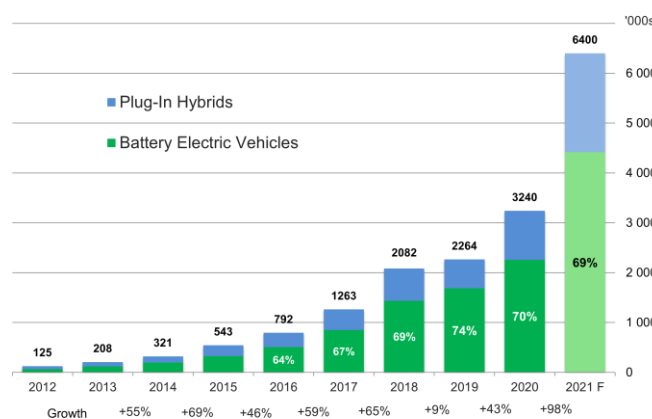
The EU is now home to nearly 225,000 charging stations, or 750 % more than in 2014.

The European Commission **plans to install 3.5 million charging stations by 2030** - but ACEA estimates that in order to reduce emissions by 50%, we need to build at least **6 million charging stations by 2030** and more than **1.7 thousand hydrogen refuelling stations**

## Development of battery-electric vehicle (including hydrogen-electric)



GLOBAL PLUG-IN VEHICLE SALES



EV sales trending towards 6,4 million units for 2021 on the world.

Europe has over 0,5 million

## Fit for 55

**Reduction of passenger car emissions by 55% by 2030 compared to 2021 and by 100% by 2035**

# Automotive components export

In 2020, automotive components sold abroad from Poland were worth **EUR 20.8 billion**

Germany remains the most important destination for Polish automotive components exports worth **EUR 6.6 billion** in 2020

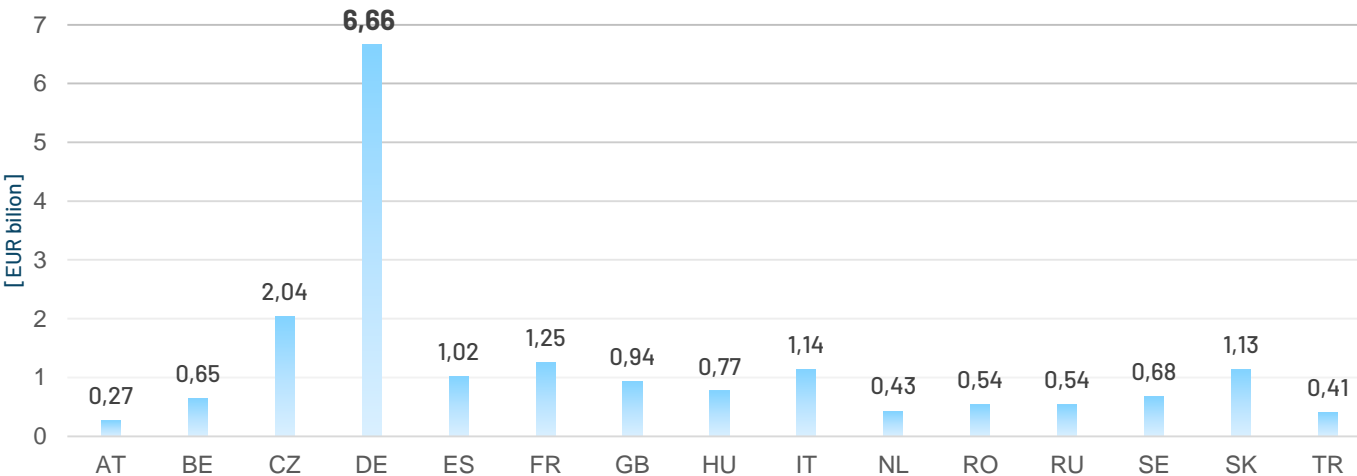


All of major european car makers located their subsidiary plants in Poland

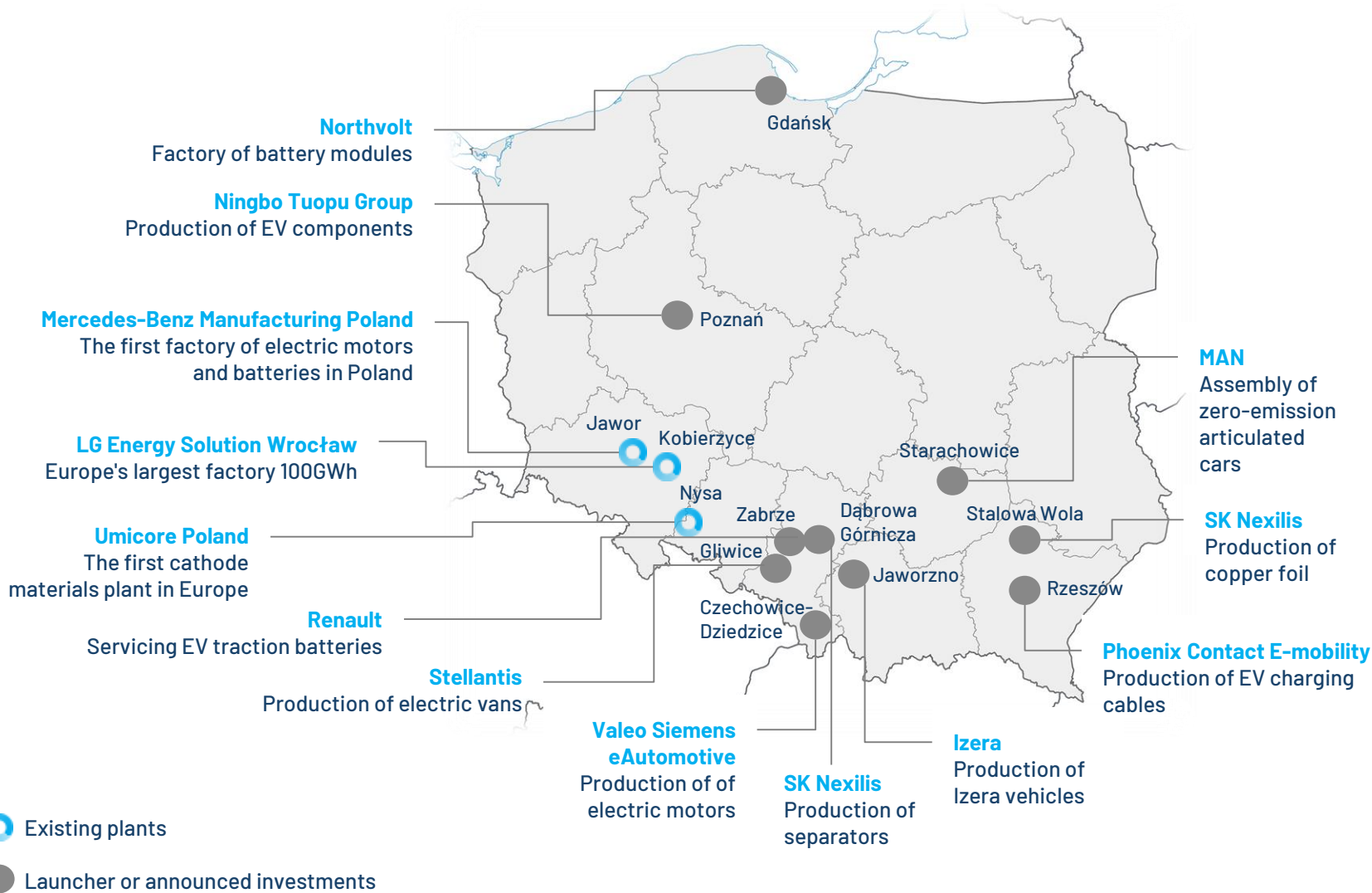


In 2020 the first time in 12 years value of automotive components export was more than in the Czech Republic, and at the same time more than in any other CEE country

Key destinations of Polish exports of components, parts and accessories in 2020



# Production of parts for electric cars



For many years Poland has been one of the most important recipients of foreign direct investment (FDI) in Central and Eastern Europe.

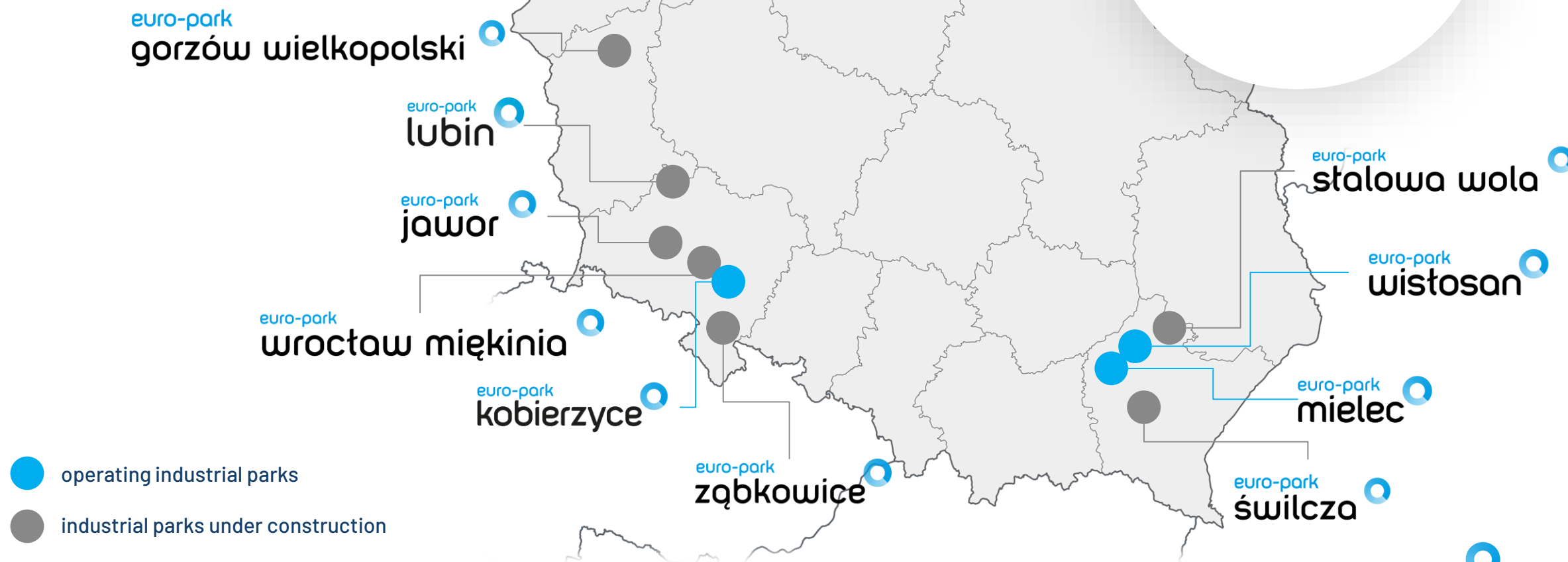
The inflow of foreign capital in the automotive industry in 2019 was the highest in the history of data published by the NBP - **EUR 1.2 billion**, compared to EUR 641 million a year earlier.

In Poland, **10 investments** related to the e-mobility market were launched or announced in 2021

# Investment Areas of IDA JSC



IDA investment parks will be prepared with necessary infrastructure tailored to the needs of investors





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