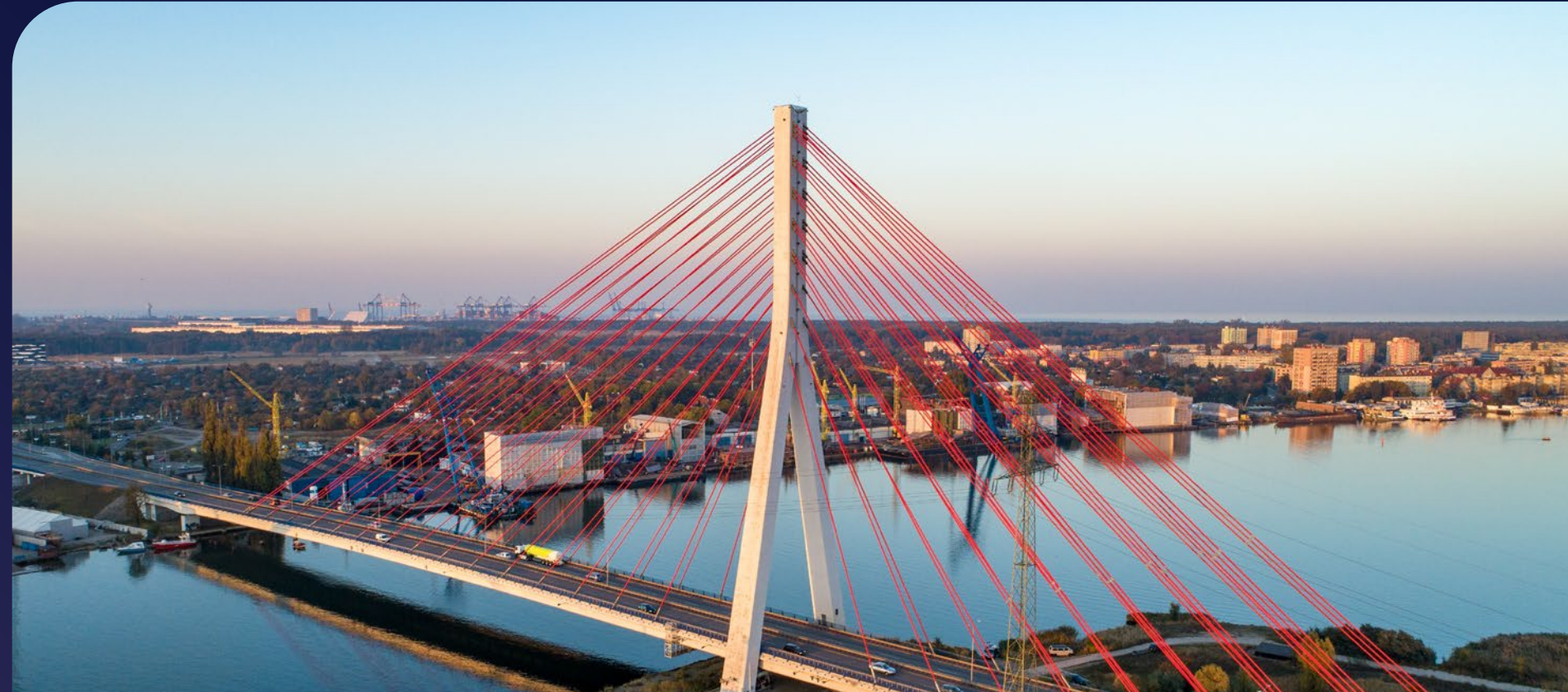


ORLEN Group Hydrogen Strategy 2030

FEBRUARY 2022



Our aspirations



The ORLEN Group Strategy 2030 seeks to build a sustainable portfolio of businesses. Hydrogen is part of the plan to invest in the future

Business logic of the ORLEN Strategy 2030



Maximising performance



Strategic development



Investing in the future

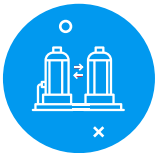
Key business segments and areas



Upstream



Fuel retail



Refining



Energy/gas distribution



Petrochemicals



Renewable power



Gas-fired power



Non-fuel retail



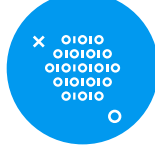
New mobility



Recycling



Hydrogen



R&D&I and digital transformation

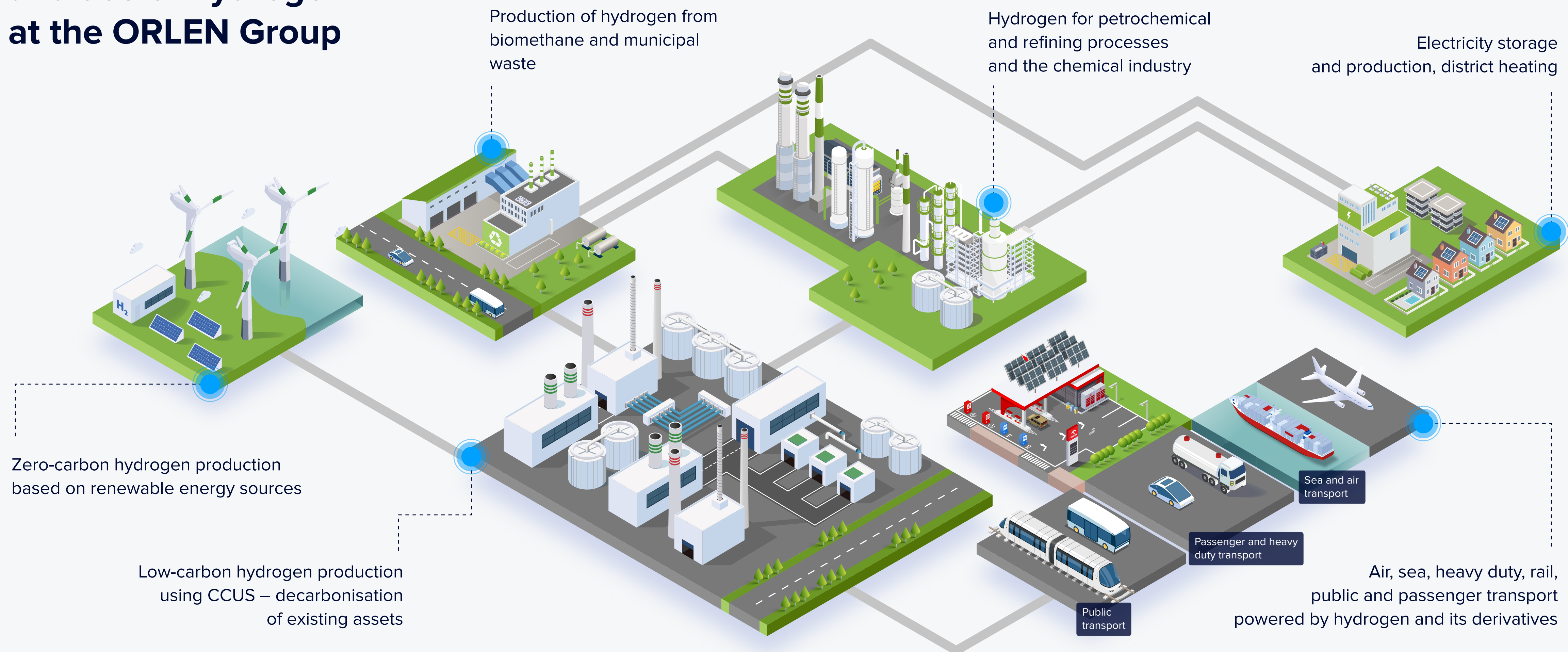
Share in total investment

~35-45%

~45-55%

~5-10%

Vision for the production and use of hydrogen at the ORLEN Group



Hydrogen strategy aims to establish the ORLEN Group as a leader of the hydrogen market in Central Europe

Key indicators for the ORLEN Group in 2030



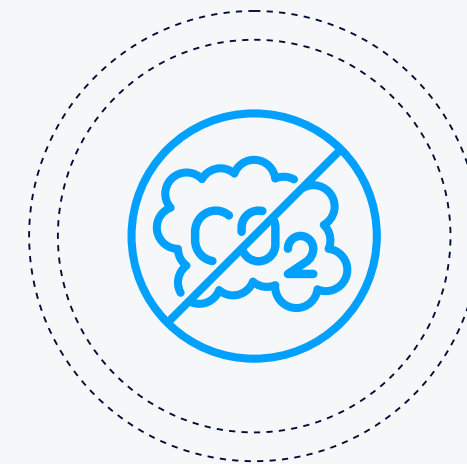
540 MW

of new low- and zero-carbon hydrogen capacity, including from water electrolysis powered by renewables and municipal waste. With the ambition to achieve 1 GW in the long term 2030+



~50%

of hydrogen produced by the ORLEN Group to be low- or zero-carbon, with an ambition of ~80% in the long term 2030+



1.6

m tonnes

tonnes less of CO₂ emissions from hydrogen production in 2030, with up to 3m tonnes less in the long term 2030+



19

kt H₂ / year

per year of automotive grade hydrogen



>100

hydrogen refuelling stations with necessary logistics infrastructure in Poland, the Czech Republic and Slovakia

Hydrogen potential



Energy transition is reshaping our external environment

Technology advances



Growing cost-effectiveness of renewables



Low-carbon transport and industrial sector decarbonisation



Circular economy with a focus on recycling technologies

Regulations



Ambitious reduction targets for greenhouse gas emissions



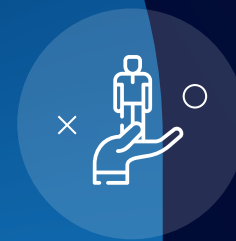
New Green Deal, Fit for 55 package



Ongoing regulatory support



Environmental concerns

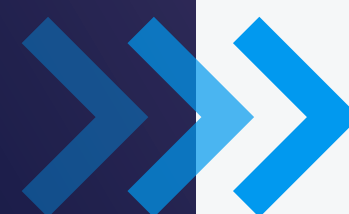


Evolving expectations from providers of goods and services



Proactive and increasingly conscious consumers

Strategies and roadmaps are vital in areas requiring long-term planning



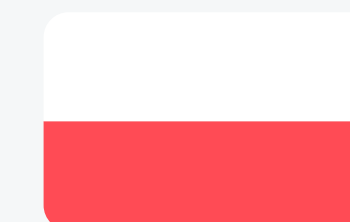
Ambitious goals for developing a hydrogen economy, supported by public and private funding, are included in both the EU Hydrogen Strategy and Poland Hydrogen Strategy*.



40 GW capacity

Strategies and roadmaps are vital in areas requiring long-term planning in electrolyzers powered by renewables that can produce up to 10m tonnes of green hydrogen in the EU.

A major factor is a demand-side policy creating new sales markets, particularly in industry and transport.



2 GW capacity

in facilities producing hydrogen and its derivatives from low-carbon sources, processes and technologies, including electrolysis units.

The primary goal is to create and advance a competitive hydrogen industry to achieve climate neutrality.

* Poland Hydrogen Strategy 2030 with an Outlook to 2040.

Ambitious reduction targets for greenhouse gas emissions

New Green Deal, Fit for 55 package

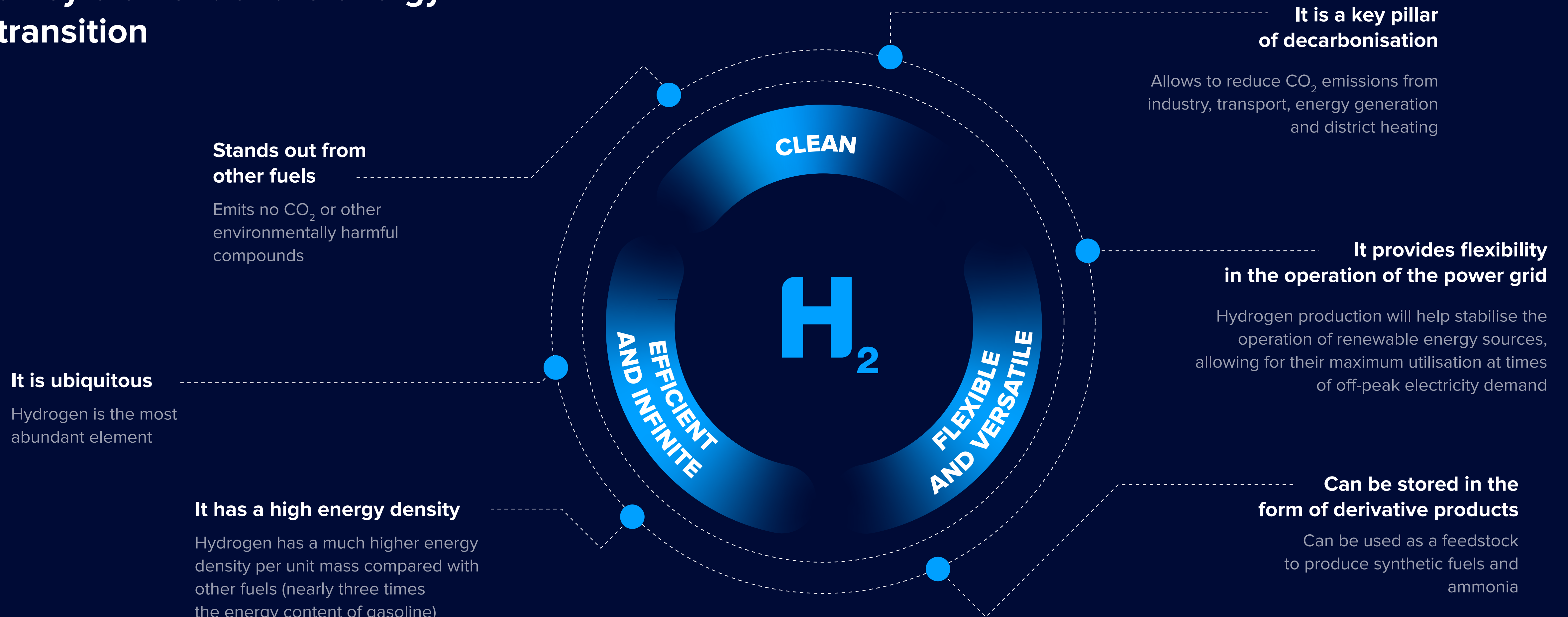
Ongoing regulatory support



Regulations



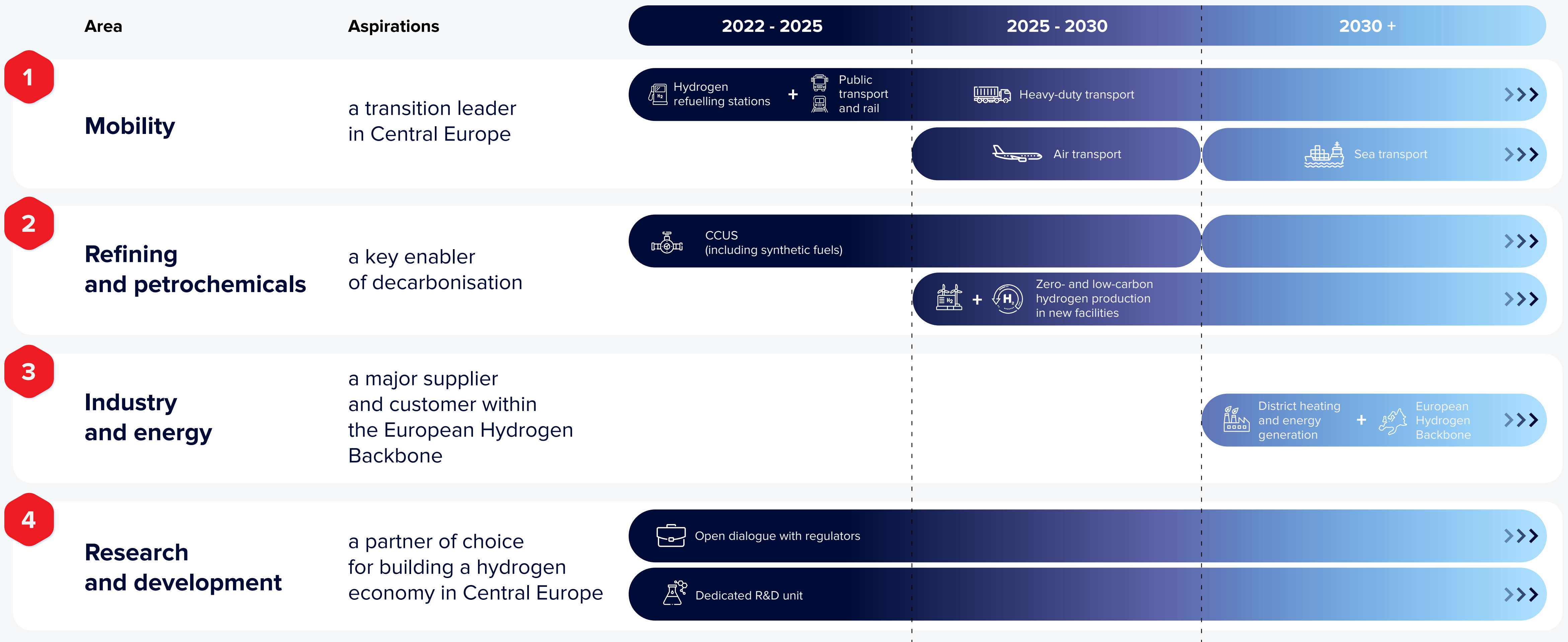
Hydrogen is now considered a key element of the energy transition



Our strategy



Hydrogen economy: our strategy



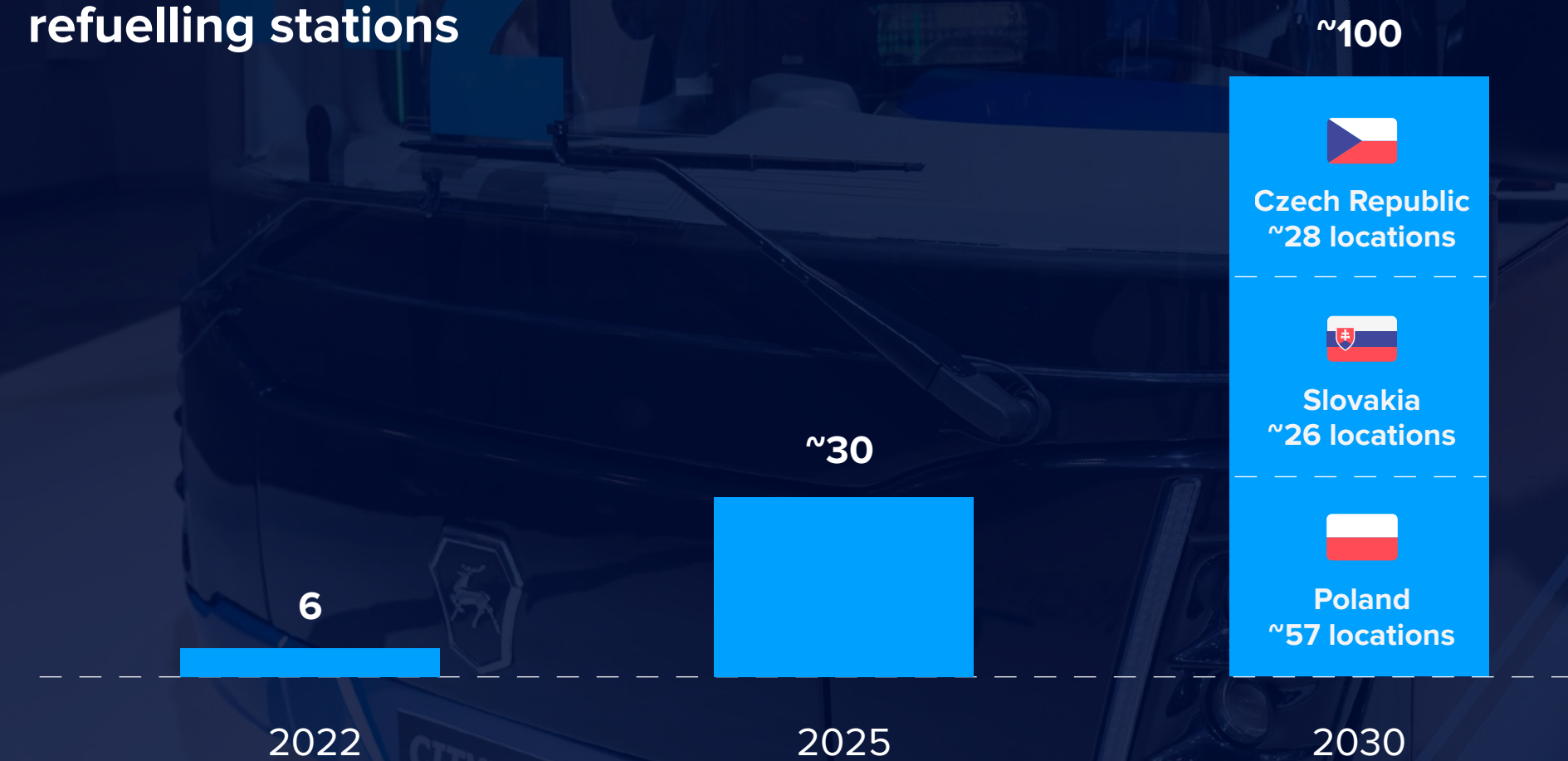
1 **Mobility** – hydrogen as a fuel for public and rail transport, and in the long term – also for heavy-duty, air and sea transport

Aspirations:

Leader in advancing hydrogen mobility in Central Europe, actively supporting decarbonisation of transport.

- Market development starting with city buses and railway, through long-haul heavy-duty and passenger transport, to synthetic fuels for air and sea transport.
- Network of publicly accessible hydrogen refuelling stations.
- Leveraging existing assets and building new capacities to produce automotive grade hydrogen for transport.

ORLEN Group hydrogen refuelling stations



2

Refining and petrochemicals – hydrogen as an enabler of decarbonisation. Balanced investment portfolio addressing the needs of existing assets and regulatory challenges

Aspirations:

The hydrogen strategy is both an extension of the ORLEN Group's ambitious decarbonisation plan and a response to the rapidly changing market and regulatory environment.

Implementation of numerous projects addressing key challenges facing the ORLEN Group until 2030:

- Reduction of CO₂ emissions from existing hydrogen production facilities of the ORLEN Group using low-carbon technologies – carbon capture, utilisation and/or storage (CCUS).
- Development of new generation sources based on electrolysis units and renewables.
- Implementation of municipal waste to hydrogen technology.

Production of zero- and low-carbon hydrogen at the Group in 2030.

● Grey hydrogen

● Zero- and low-carbon hydrogen

100%

2021

~50%

~50%

2030

3

Industry and energy generation

– promising areas of focus depending on the scale of development and availability of zero-carbon electricity sources

Aspirations:

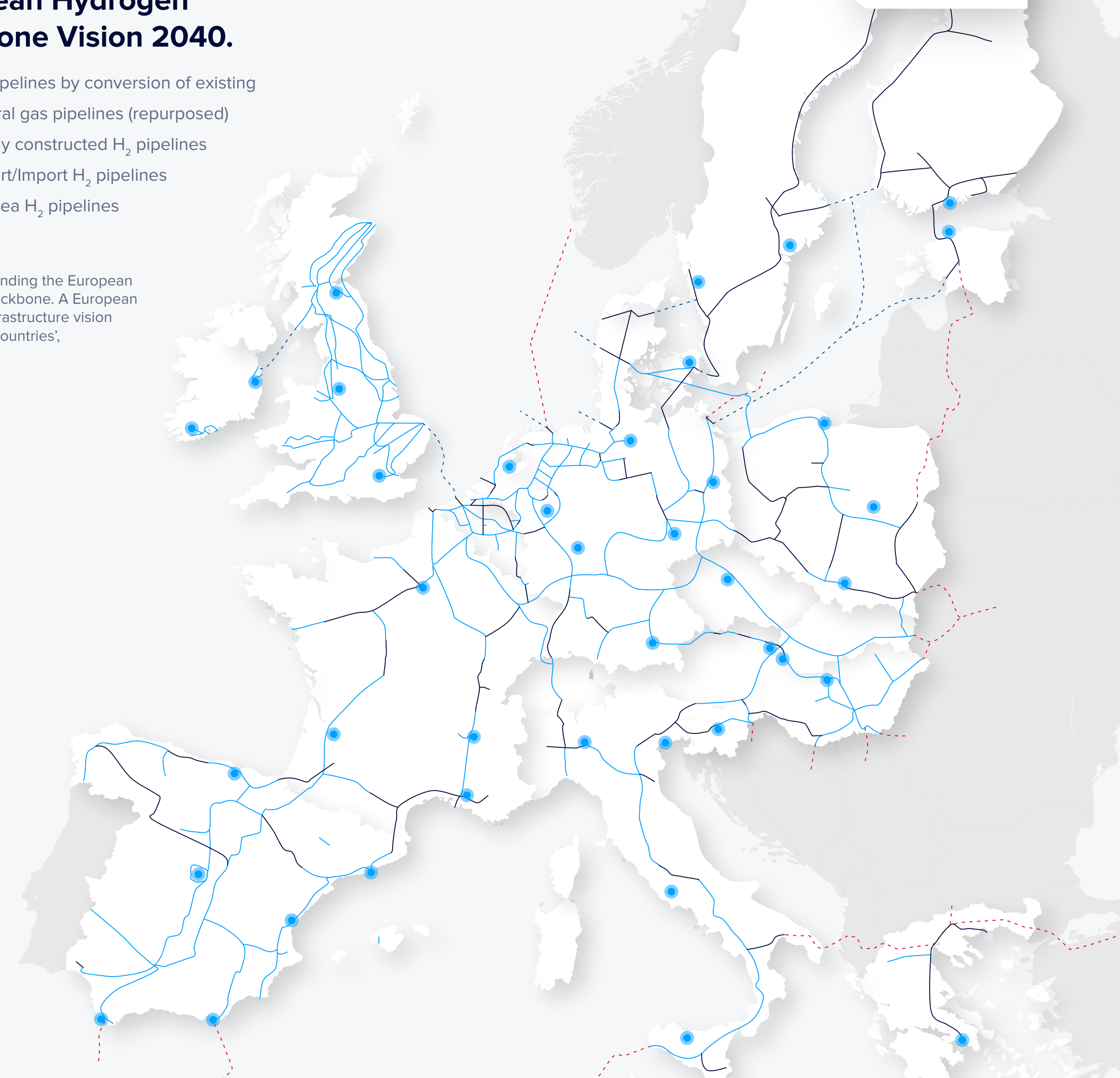
Building a significant position as a supplier and customer to the European Hydrogen Backbone

- Industry and export: after 2030 surplus zero- and low-carbon hydrogen could be directed to meet the needs of other industries at home and abroad (e.g. within the framework of the European Hydrogen Backbone).
- District heating and power generation as promising applications of low- and zero-carbon hydrogen.
- Grid stabilisation: large-scale utilisation of hydrogen and/or ammonia for energy storage will be possible after 2030 with wind farms in the Baltic Sea when there is a significant periodic surplus of renewable electricity in the grid.
- New CCGT units planned within the ORLEN Group will be able to co-fire hydrogen.

European Hydrogen Backbone Vision 2040.

- H₂ pipelines by conversion of existing natural gas pipelines (repurposed)
- Newly constructed H₂ pipelines
- - - Export/Import H₂ pipelines
- - - Subsea H₂ pipelines
- City

Source: 'Extending the European Hydrogen Backbone. A European hydrogen infrastructure vision covering 21 countries', April 2021.



4

Research and development – a partner of choice for building a hydrogen economy in Central Europe, focused on innovation and in-house capabilities development

Aspirations:

Advancement of research and development activities actively supporting the potential of the ORLEN Group

- Forging and promoting hydrogen partnerships and the hydrogen ecosystem.
- Building in-house capabilities across the hydrogen value chain.
- Setting up a dedicated hydrogen laboratory at the Research and Development Centre in Płock by 2025 to perform tests and conduct research in test facilities on hydrogen production, quality, purification, storage and transport.
- Taking a leading role in the Mazovian Hydrogen Valley, whose main aim is to implement R&D projects that help drive progress in hydrogen technology.



At the ORLEN Group in 2030

Hydrogen hubs will help supply key sales markets, and hydrogen refuelling stations enable transport on major routes and in major cities

Hydrogen production sources:



Existing sources at plants



Offshore electrolyser powered by renewables



Onshore electrolyser powered by renewables



Conversion of municipal waste into hydrogen



Hydrogen strategy relies on capabilities of the ORLEN Group companies

Energy sources



Leader in developing onshore renewable energy segment for zero-carbon hydrogen production



Key player in offshore wind development in the Baltic Sea



Largest operator of agricultural biogas plants in Poland

Production



Central Europe's first producer of fertilizers based on low- and zero-carbon hydrogen



Central Europe's first refinery relying on low- and zero-carbon hydrogen



European leader in developing municipal waste conversion technologies



Central Europe's first large-scale CCU plant operator

Distribution



Enabler of the Polish hydrogen mobility market. Operator of the largest network of hydrogen refuelling stations and a partner of choice for local governments and companies



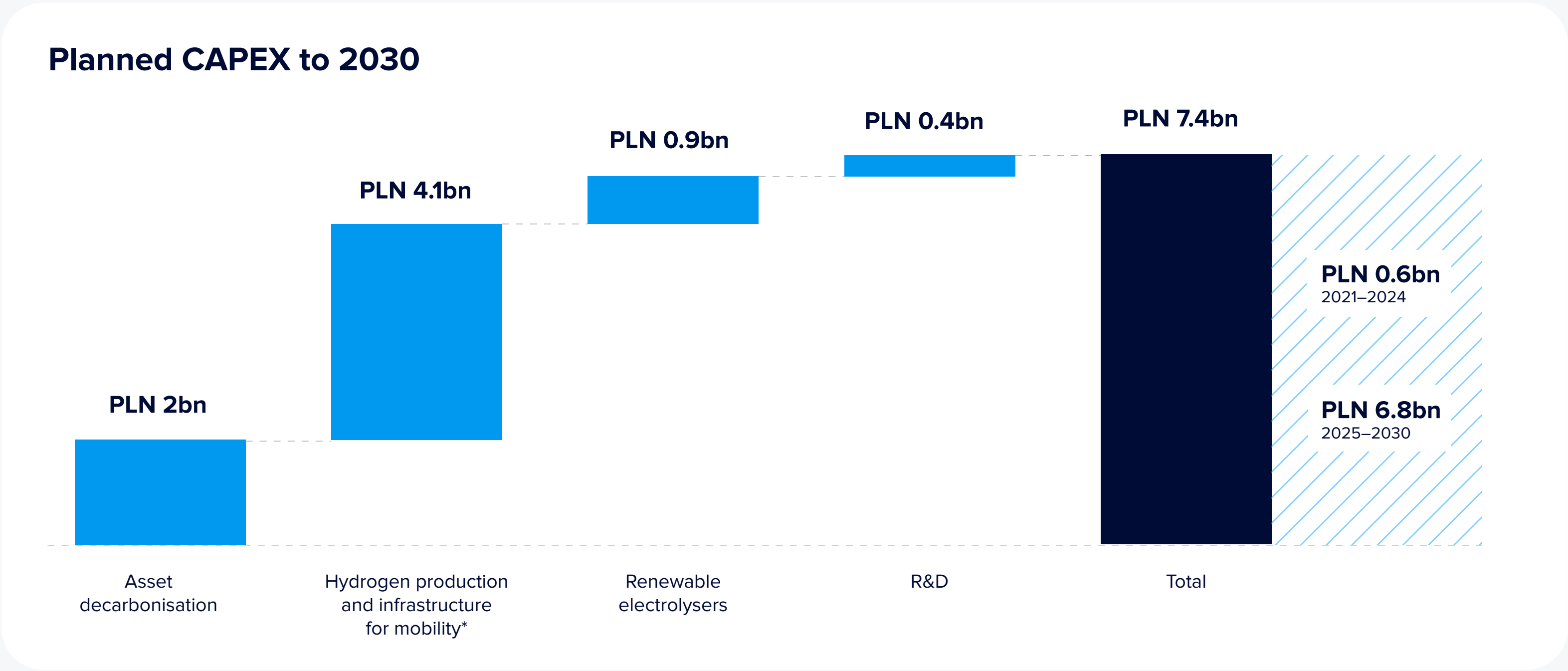
Key player in the Czech and Slovak hydrogen mobility market

Capital expenditure



Planned capital expenditure

PLN 7.4bn with an ambition to increase spending in the long term



* Including: hydrogen production infrastructure; incl. RES-powered electrolyzers, hydrogen production installations using municipal waste, distribution and storage infrastructure for produced hydrogen and the network of FCV charging points

Key goals:

- Focus on cost-efficient decarbonisation of existing hydrogen production assets.
- Build new low- and zero-carbon hydrogen production assets.
- Expand hydrogen refuelling and supply logistics networks.
- Address the challenges of green transformation.
- Use non-repayable funding efficiently.

Majority of key capital projects are scheduled to come online before 2025. Being innovative, comprehensive and cross-border in nature, each project has applied for non-repayable funding to finance 40%–80% of the costs.



Powering the future.
Sustainably.

List of abbreviations, acronyms and units used in the Hydrogen Strategy

Units	Glossary of abbreviations
R&D	Research and development
CAPEX	Capital expenditure
CCGT	Combined Cycle Gas Turbine plants
CCU	Carbon Capture, Utilisation
CCUS	Carbon Capture, Utilisation and Storage
CO ₂	Carbon dioxide
Fit for 55	an EU legislation package aiming to reduce greenhouse gas emissions by 55% compared with 1990 levels
GW	Gigawatt
H ₂	Hydrogen
kt H ₂	Kilotonne of hydrogen
MW	Megawatt
RES	Renewable energy sources
UE	European Union

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