

The Potential of Methane Pyrolysis in Korea's Hydrogen Economy

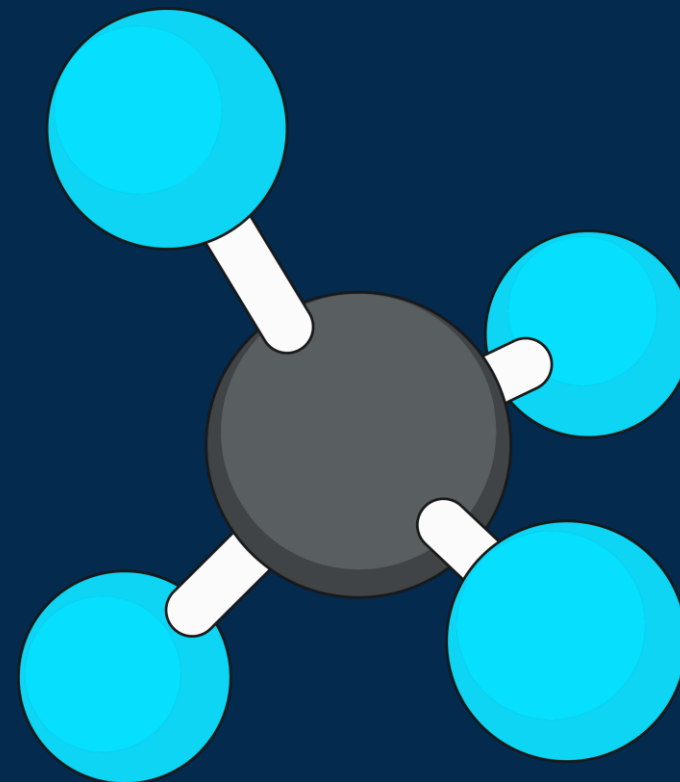
– Pohang International Hydrogen & Fuel Cell Forum 2026 –

29 September 2026

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Hydrogen in Korea's energy transition

Korea's energy dilemma: resource constraints and growing demand

> 90%

Energy import
dependency

8.6%

Renewables share in
power generation
– the lowest among IEA
countries

x 2

Growth in electricity demand
from the semiconductor
and data centre sectors
between 2023 and 2030

39%

Industrial share of total
final energy consumption
– among the highest in
advanced economies

Korea needs energy solutions that can address energy security, growing demand and industrial decarbonisation at the same time.

Sources: Korea Energy Agency, EG-TIPS, based on KEEI Energy Statistics Monthly, IEA Energy Policy Review Korea 2025

Hydrogen has great potential – but significant challenges remain



Carbon intensity



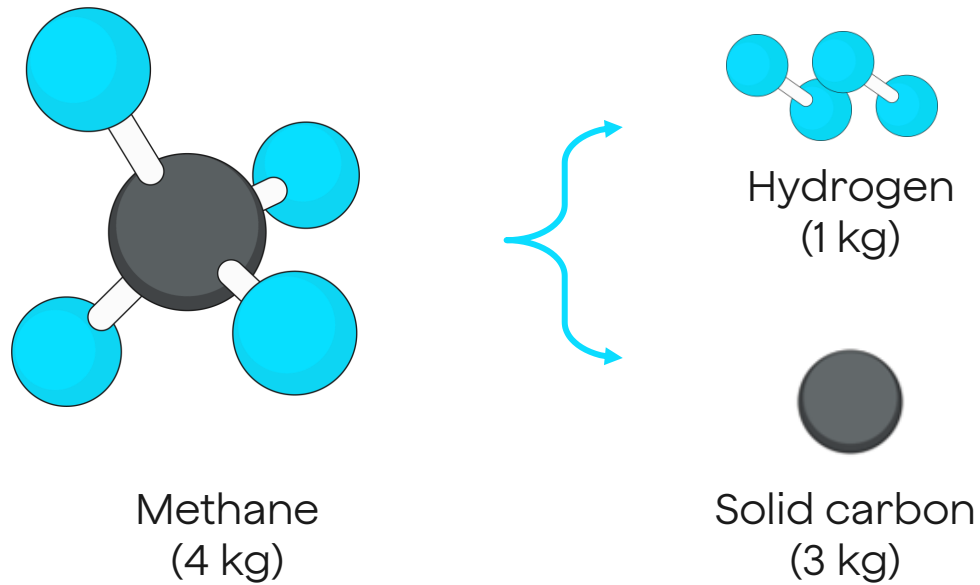
Infrastructure development



Cost competitiveness

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Methane pyrolysis offers a promising pathway to low-carbon hydrogen



- No direct CO₂ emissions from the reaction
- Solid carbon as a co-product
- Known as “**Turquoise**” hydrogen

Korea's clean hydrogen portfolio



Carbon intensity



Key infrastructure



Cost outlook



Suitability for Korea

H₂

Domestic
electrolysis
(Renewables / Nuclear)

Very low

Renewables /
Nuclear power

High today

Medium-high

H₂

Domestic
reforming + CCS

Low-medium

CCS

Medium

Medium
as CCS infrastructure
is still developing

H₂

Import

Low

Import chain

Uncertain

High,
but with greater dependence
on external suppliers

H₂

**Domestic
methane pyrolysis**

Low

**Existing gas
supply network**

**Potentially
competitive**

Potentially high

Hycamite

– from catalyst innovation to industrial decarbonisation

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Hycamite is advancing methane pyrolysis technology

Hycamite TCD Technologies Oy develops **thermo-catalytic methane-splitting technology**



- The proprietary **catalyst platform** is the foundation of Hycamite's technology
- Founded **in 2020**, based on 20+ years of research at the University of Oulu in Finland



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Located in Kokkola Industrial Park, Finland



Hycamite at a glance

Key facts and figures highlighting Hycamite's progress to date:



23,000+ hours

cumulative
operating hours for
the pilot reactor
over 5 years



2,000 tonnes

per year of hydrogen
production capacity
at Europe's largest
methane pyrolysis
plant



20+

patent applications;
1 patent granted



56

employees,
including 6 PhD
holders



> €60 million

in total capital raised
from strategic and
financial investors



Hycamite technology enables scalable, cost-competitive hydrogen production

Hycamite's proprietary **catalyst platform** is at the core of its technological advantage, enabling:

- Lower reaction temperature, requiring only **13%** of the energy used in green hydrogen production
- Industrial-scale production: **~50,000 tonnes** of hydrogen annually per commercial plant
- **Controllable** carbon properties

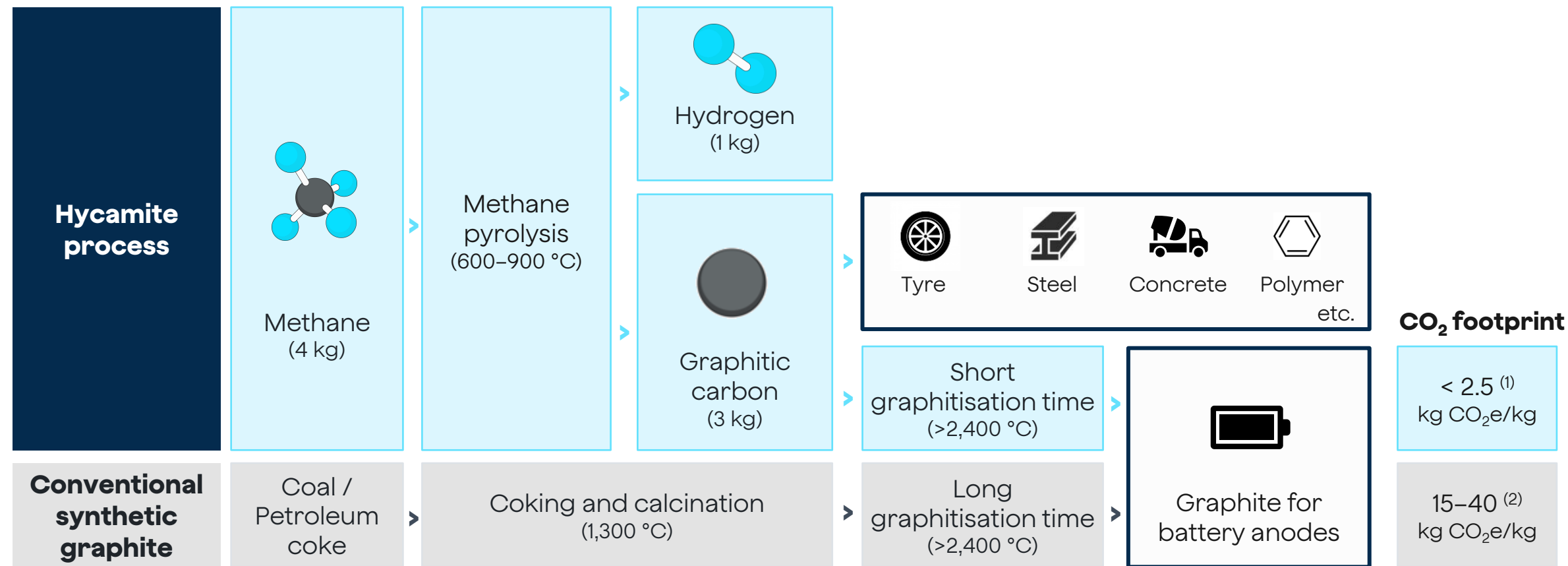


Hycamite Decomposition Plant

(2,000 tonnes per year of hydrogen production capacity, at Kokkola, Finland)

Hycamite’s diverse carbon products, including sustainable graphite

Hycamite’s graphitic carbon has a highly ordered structure, enabling **diverse applications**, and requiring less processing to reach **battery-grade graphite**



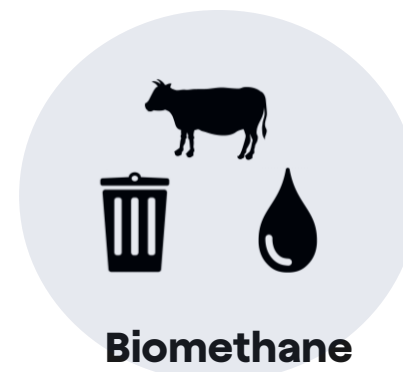
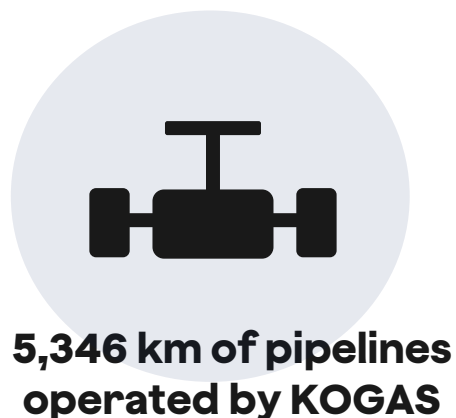
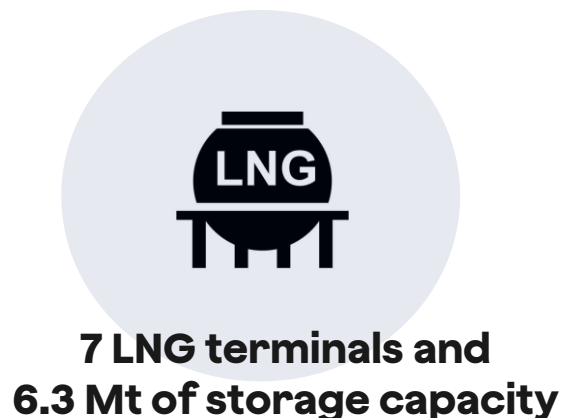
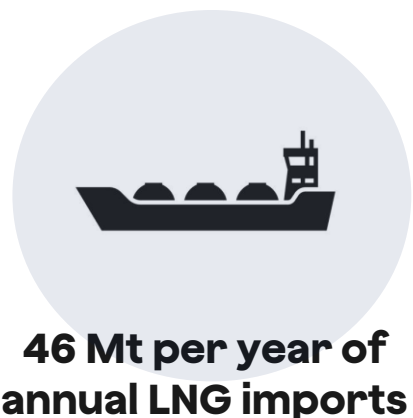
(1) Estimated based on a life cycle assessment of graphitic carbon using Finnish grid electricity and Hycamite’s internal calculations; pending third-party verification.
(2) Robinson et al. (2025) and the life cycle assessment (LCA) literature summarized therein

Why methane pyrolysis is well suited to Korea

Korea has the infrastructure to supply methane at scale

Korea is already a large, mature LNG market –
with import, storage and gas pipeline assets in place

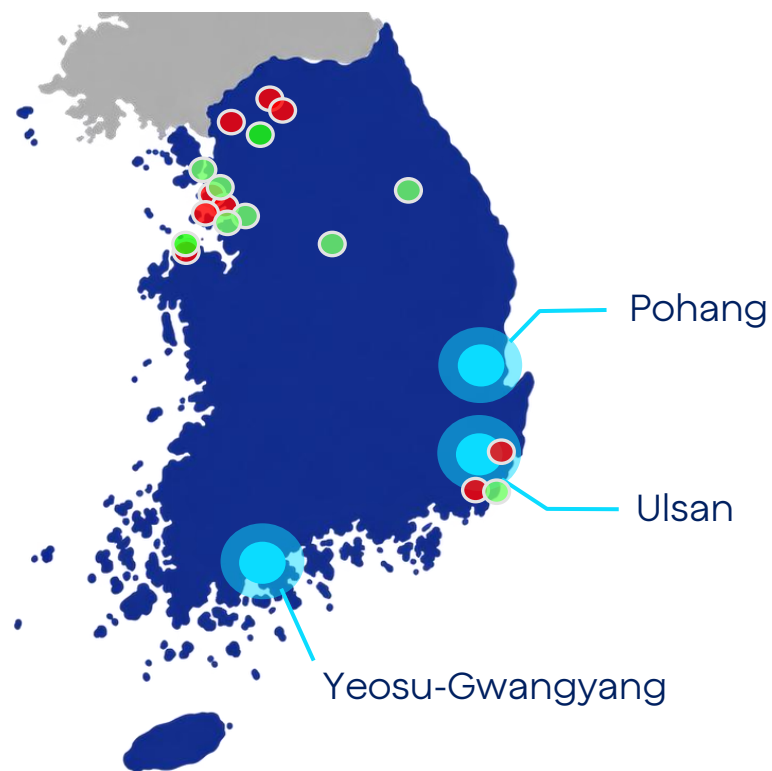
Potential integration with Korea's
growing biomethane supply



**Methane pyrolysis can leverage existing LNG and gas infrastructure
without requiring a new feedstock supply chain.**

Sources: IEA, Natural Gas Supply Security in Korea (2024), based on KEEI; IEEFA, South Korea's LNG Overbuild (2023), based on MOTIE and company disclosures; KOGAS (2025).

Korea has multiple potential markets for hydrogen



Industrial clusters – concentrated demand

Major industrial clusters provide concentrated hydrogen demand



Fuel cells – existing platform

The world's largest installed capacity of stationary fuel cells, exceeding 1 GW

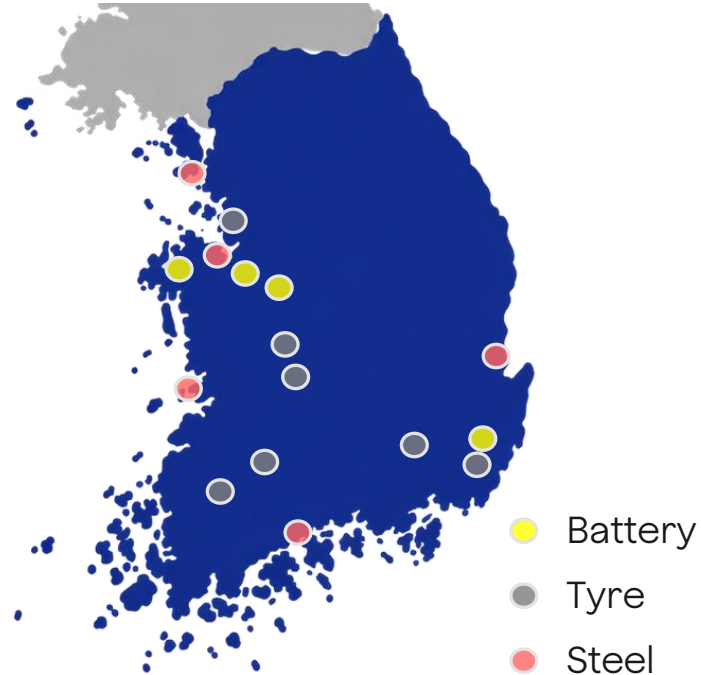


Gas power generation – pathway to scale

Gas-fired power generation could unlock large-scale hydrogen demand through hydrogen co-firing

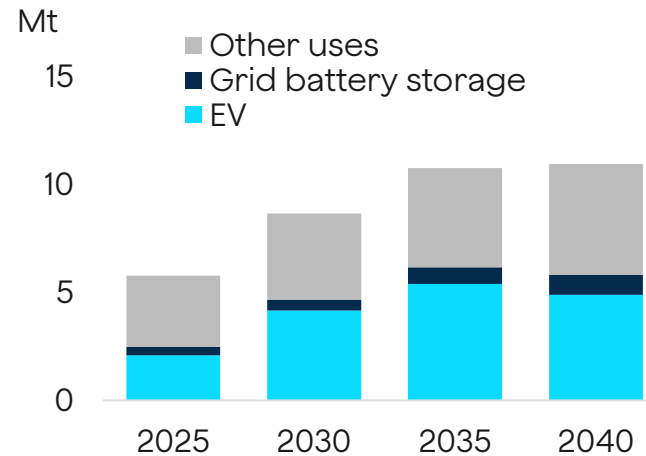
Korea's existing industrial and energy infrastructure provides multiple opportunities to create and expand hydrogen demand.

Solid carbon creates both commercial and strategic opportunities

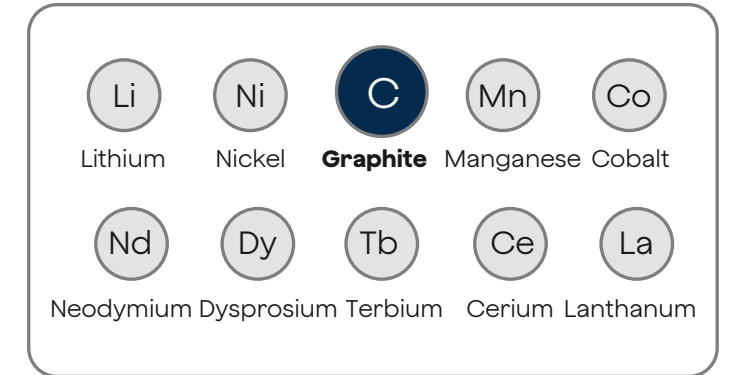


Potential demand for carbon products

Graphite is more than a growth market
– it is a strategic material



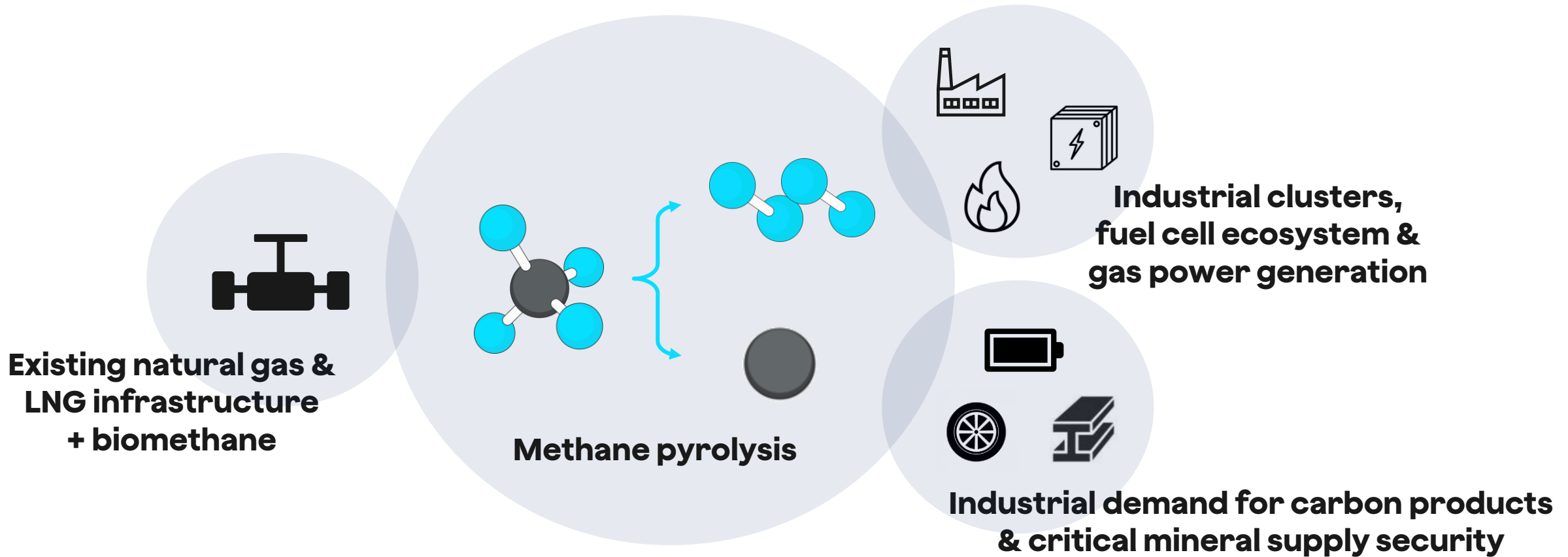
Global graphite demand is expected to grow over the next decade



Graphite is one of Korea's 10 strategic critical minerals

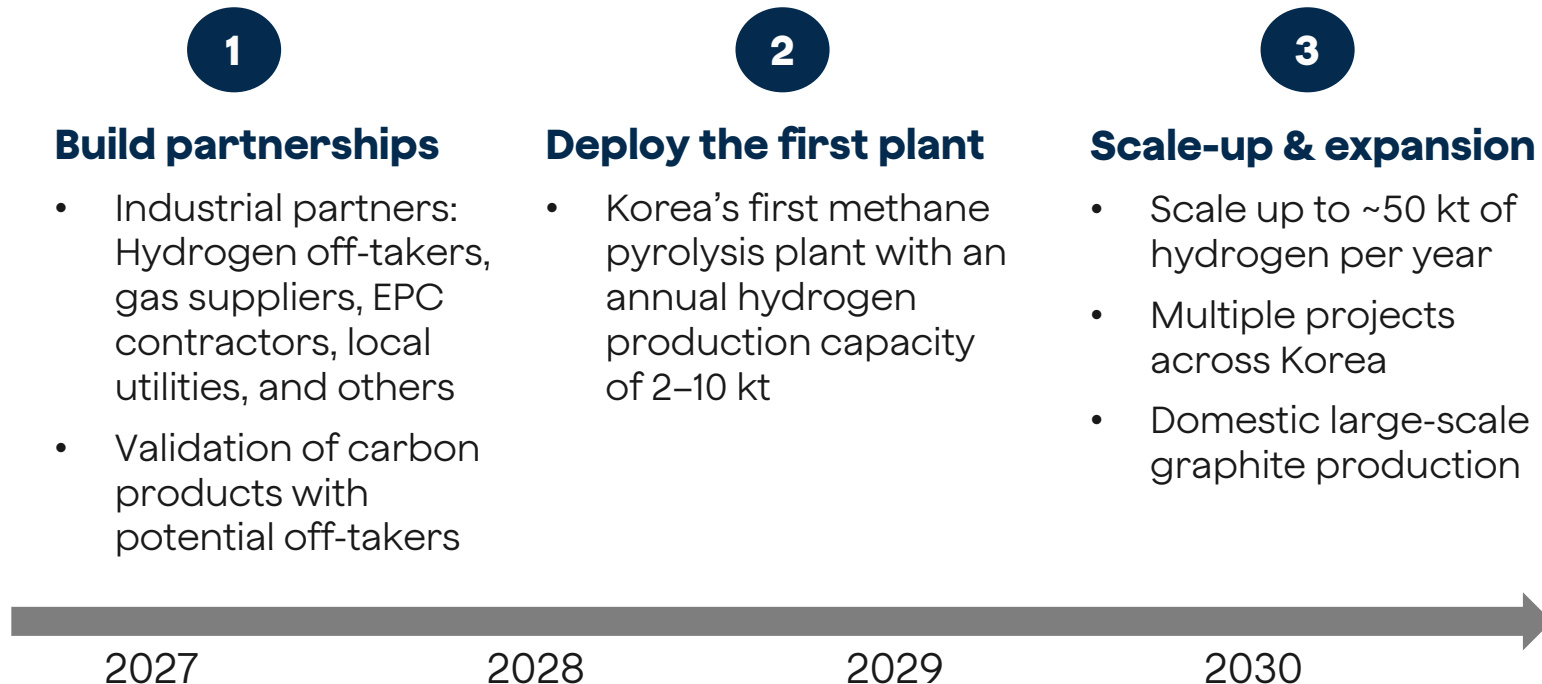
Beyond existing carbon markets, graphite could create strategic value by supporting Korea's growing battery industry and diversifying its supply chain.

Korea already has the key building blocks for methane pyrolysis



Next steps towards commercialisation

A partnership-led path to commercialisation



Policy & regulatory framework

Regulatory treatment of solid carbon

- Requirements for solid carbon utilisation and traceability must be clarified to ensure eligibility for clean hydrogen certification

Policy support & incentives

- Develop support mechanisms that are technology-neutral for hydrogen and reflect the strategic value of solid carbon

Methane pyrolysis for a stronger hydrogen economy in Korea

- Methane pyrolysis can deliver low-carbon hydrogen, leverage existing gas infrastructure, and significantly improve cost competitiveness through revenues from solid carbon products.
- Korea has several clean hydrogen options, but methane pyrolysis is particularly well suited to the country's existing infrastructure and industrial needs.
- The next step is to turn this potential into commercial projects through strong local partnerships. Together, we can build a stronger hydrogen economy.

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