

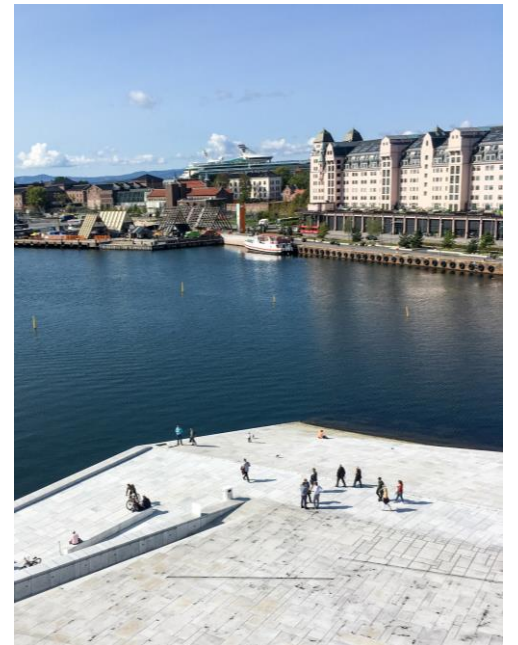


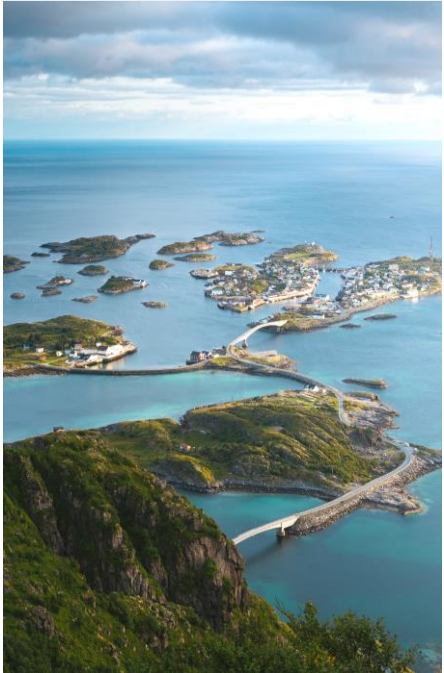
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# Norway's competitiveness in the energy transition

JANUARY 2021





Setting the scene

# We have established a quantitative ranking to indicate Norway's competitive position in the energy transition

## Rapid assessment based on established frameworks

BCG has conducted a 3-week study for NHO with the ambition to quantitatively rank select countries' competitive position in the energy transition, building on existing frameworks from World Economic Forum (WEF) and the European Union (EU)

## Quantitative ranking and qualitative assessment of competitiveness

The purpose of the 'temperature gauge' and qualitative assessment is to identify sources of competitiveness as a host nation for growth in industries related to the energy transition, focusing on value chains with export potential. We seek to identify patterns of what the nations that succeed do well and where the rest can improve

## Interview with leading companies in Norway's energy transition

The 'temperature gauge' and qualitative assessment is complemented by interviews with leading companies in Norway in order to identify opportunities for growth in the energy transition, as well as requirements to succeed with the growth to create jobs and export opportunities

Source: BCG-NHO study of Norway's competitiveness in the energy transition

# Temperature gauge of Norway's competitive position in the green transition builds on a transparent framework



## Norway's competitive position

Framework builds on WEFs<sup>1</sup> and EUs<sup>2</sup> frameworks - adjusted to the purpose of the green transition



Human capital

Access to relevant competencies, labor, and supply chain



Market & capital

General market conditions and access to capital and demand market



Policy framework & incentives

Political facilitation of legislation, support schemes and priorities



Natural resources & infrastructure

Local resource availability and access to relevant infrastructure



Technology & innovation

Access to relevant tech, R&D investments and pace of innovation

Dimension Description

1. World Economic Forum: Global Competitiveness Index, Sustainable Competitiveness Index 2. EU Regional Competitiveness Index  
Source: BCG-NHO study of Norway's competitiveness in the energy transition

# Relevant indicators are identified for each dimension in the framework



Human capital



Market & capital



Policy framework & incentives



Natural resources & infrastructure



Technology & innovation

Dimension

- PISA Math and Science score
- Science/Technology graduates
- Employees in energy and green tech. companies<sup>1</sup>
- Research publications
- Skilled working immigrants

- Ease of doing business
- Labor cost
- Company tax-rate
- State of cluster development
- VC<sup>2</sup> investments
- Investments in renewable capacity
- Size of relevant end markets

- Institutional trust
- Regulatory stability
- Environmentally related taxes, incl. CO<sub>2</sub> pricing
- CO<sub>2</sub> reduction target
- Subsidies (RES<sup>3</sup>, Bioenergy, Hydrogen)
- Green stimulus as part of COVID recovery
- Financial support schemes renewables
- Support schemes transportation and heating/cooling

- Capacity of relevant resources; natural gas, wind, solar, hydropower
- Share of electricity from renewable energy
- Growth in renewable share of electricity
- Electricity capacity surplus (export) from renewable sources
- Transport infrastructure
- Electricity infrastructure

- Environmentally related public and private R&D spend
- Environmentally related patents
- Global digital competitiveness ranking
- Labor productivity

Indicators

1. Leveraging NACE (Statistical Classification of Economic Activities in the European Community) 2. Venture Capital 3. Renewable Energy Systems  
Source: BCG-NHO study of Norway's competitiveness in the energy transition

# Norway's competitive position is evaluated in a "European championship", then further compared against selected global peers

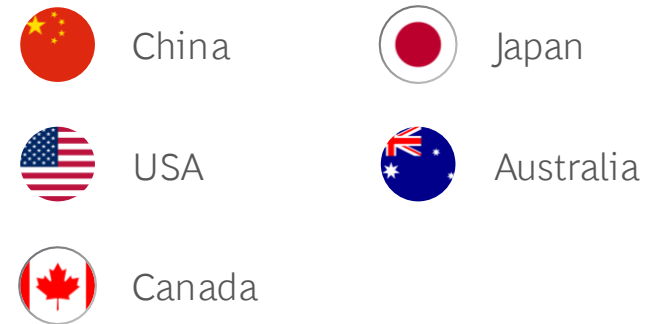
## Temperature gauge of Norway's European competitiveness

10 European peers serve as benchmark to assess Norway's competitiveness in the energy transition



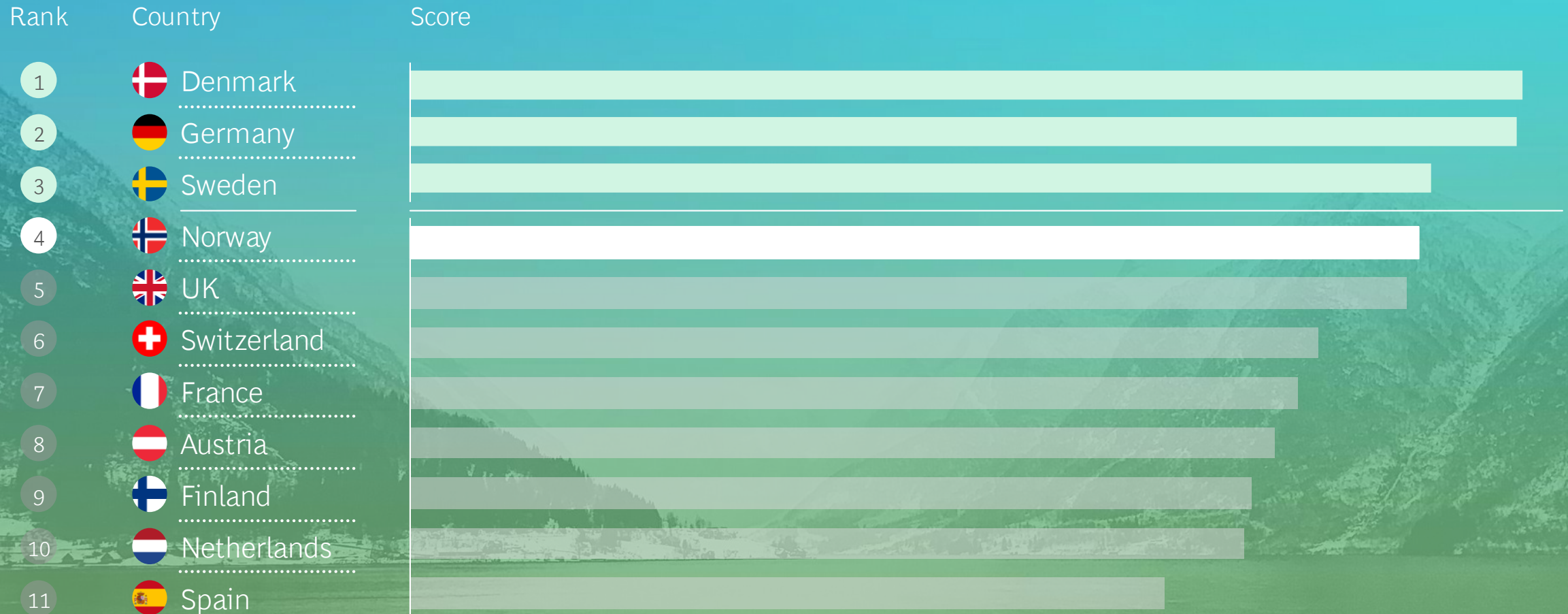
## Temperature gauge of Europe's competitiveness in the world

Selected global peers relevant to assess performance of Europe in a global context<sup>1</sup>

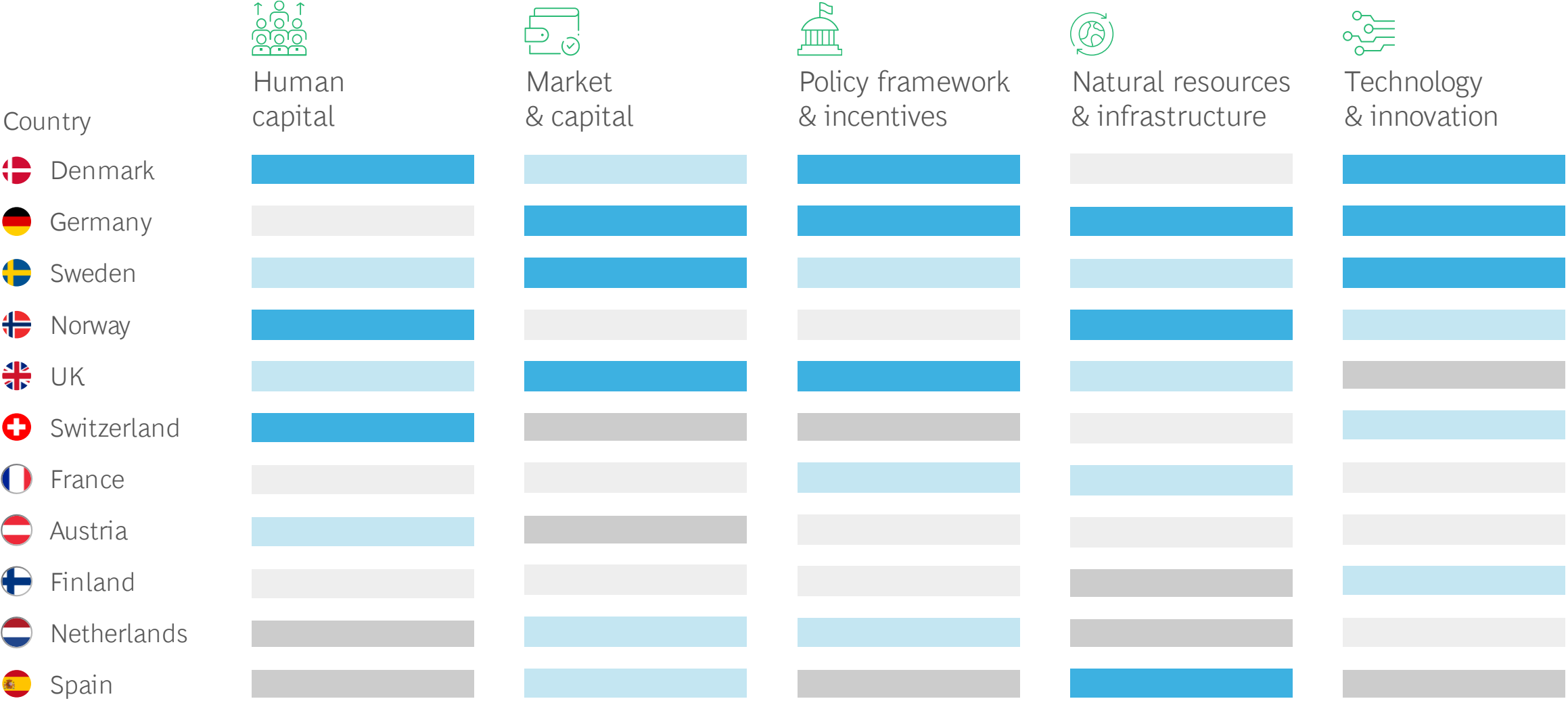


1. Initial quantitative assessment of global peers using same framework as for European temperature gauge  
Note: Peer European countries selected based on top quartile of Environmental Performance Index (EPI) ranking. Luxembourg excluded based on size. Global peers selected based on size of economy, population and EPI ranking  
Source: Environmental Performance Index 2020; BCG-NHO study of Norway's competitiveness in the energy transition

# Denmark with highest competitiveness score in Europe; Norway just outside the podium



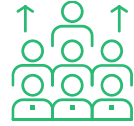
# Top scoring European nations with strengths across dimensions



Source: BCG-NHO study of Norway's competitiveness in the energy transition

# Norway has a solid starting point...

Norway with  
strong fundamentals



Highly skilled future energy workforce with high share of tech students in universities and a large petroleum sector



Solid market foundations with stable system, reasonable tax levels and a sizable industry sector which may serve as home market



CO<sub>2</sub> reduction targets in line with those of EU, key policies and support schemes in place



Substantial access to natural resources such as hydropower and natural gas, in addition to well-established transport and electricity infrastructure



Solid level of R&D efforts and high readiness to adopt and explore digital technologies



# ... but we should learn from the best in order to further boost green competitiveness

## Winners are able to connect strengths in a holistic and long-term strategy




### Characteristics of winning nations:

- Holistic and long-term strategy, combining strengths from all five dimensions
- Consistent communication of ambition and strategy to all stakeholders
- Partner across government and business community
- Ensure accountability for progress

## Norway can advance position in the new energy economy

- Norway has strong fundamentals with an advantage in access to natural resources and human capital
- Looking to the winners, we see potential for Norway to improve competitiveness by setting a clear direction for the energy transition, define a holistic strategy connecting all strengths and partner across government and businesses



# Denmark able to combine strengths in a holistic approach

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Relevant learnings  
from Denmark



## Set ambitious target and communicate consistent direction

- Target of 70% CO<sub>2</sub> reduction clearly and consistently communicated, with focus on long-term competitiveness, wealth and job creation
- Target codified in law and Energy minister held accountable for progress



## Partner across government and business community

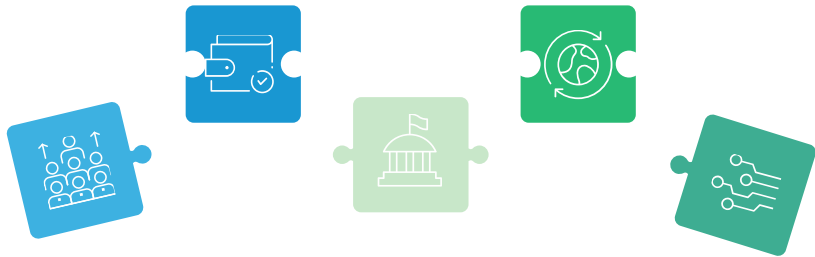
- Government established partnership with representatives across business community to ensure alignment and progress on green priorities
- Responsibility delegated from government to business community; branch representatives identified relevant measures, prioritized across and defined policy and support needs



## Take a holistic and long-term view of priority areas

- Government with long-term and consistent focus on developing wind power and increase country's energy efficiency (30+ years)
- Significant subsidies support early phase of long-term profitable plans
- Applied measures target all relevant stakeholders; suppliers, consumers and stimulation of new business
- Investments in fundamentals to strengthen competitiveness within priority areas, e.g. investments in new university courses on wind technology

# Norway needs to connect strengths and set clear direction to succeed



## Strong fundamentals serve as a solid basis...

Strong overall score, combined with an advantage in access to natural resources and human capital, serve as a solid fundament for the energy transition and is necessary to compete with the top nations in Europe and globally

However, a strong fundament alone is not sufficient to create a sustainable competitive advantage

Source: BCG-NHO study of Norway's competitiveness in the energy transition



## ...but need to connect strengths across dimensions and set direction

Norway has been an energy nation for decades with a strong position in oil & gas and hydropower. If we are to continue this energy journey in the future, we need to adapt and think differently in order to succeed with the green energy transition.

There is a clear sense of urgency, as other nations are now creating significant momentum. Norwegian businesses are ready, but there is a lack of a holistic and united approach across private and public sectors in order to focus on the right opportunities.

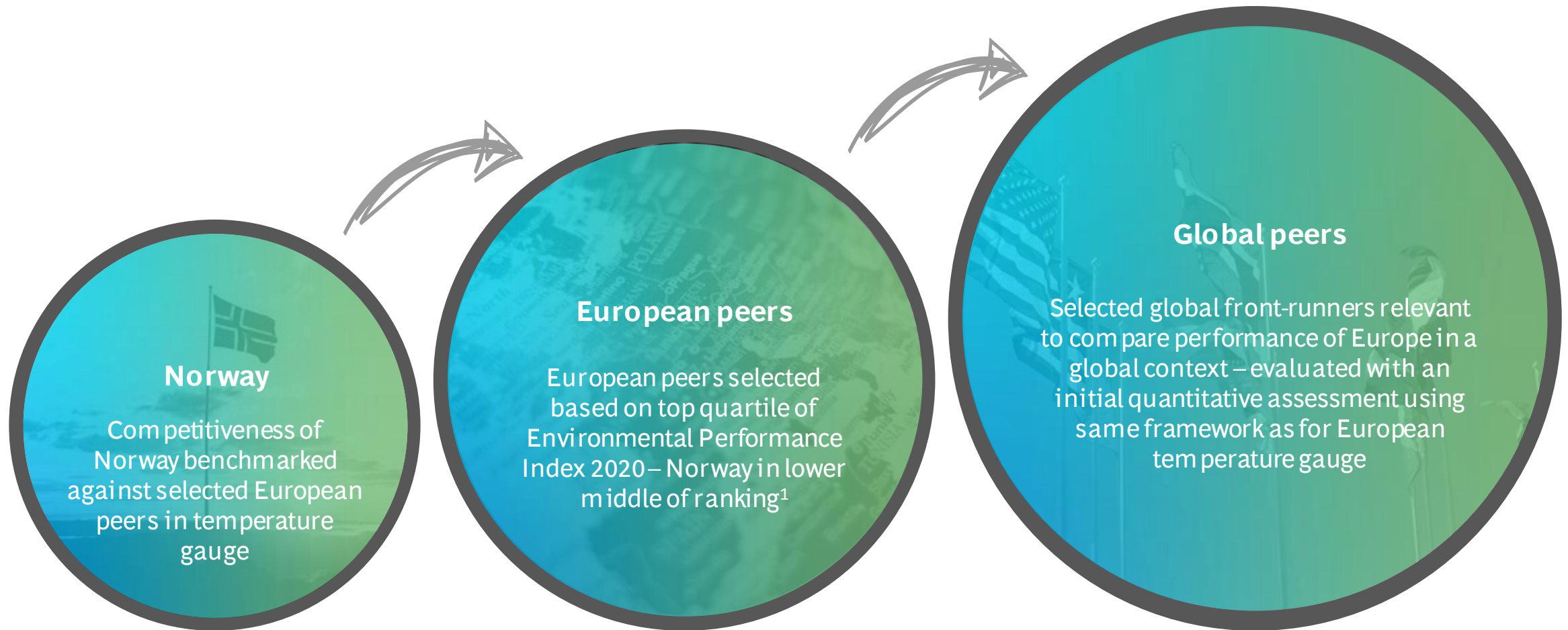
Norway needs to set out a clear and consistent direction for the energy transition, create a holistic strategy connecting strengths across all dimensions, partner across public-private, and ensure accountability for progress towards goals. This is a transformation, where the solution cannot be found in one single company or one single institution. Only by joining forces – across disciplines and traditional boundaries – can we continue to create export opportunities, wealth and jobs in the renewable energy sector.

Deep dive

# Global peers & technology domains

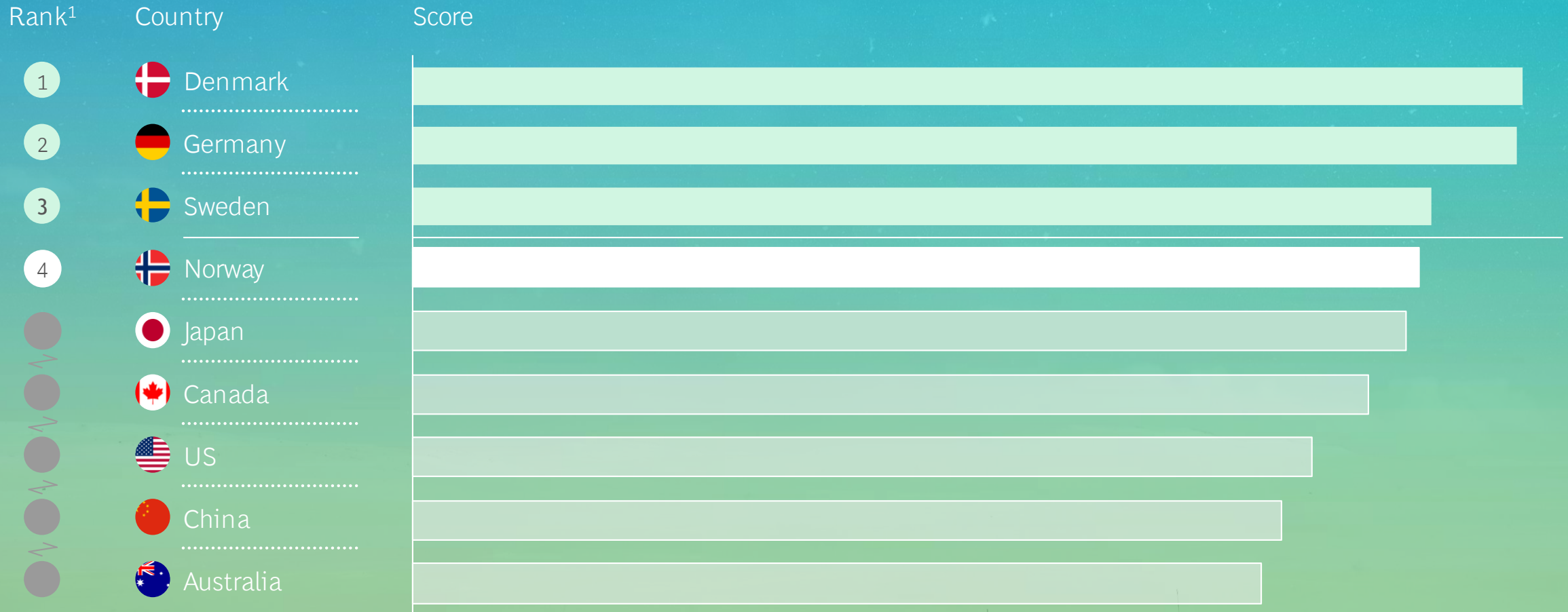


# Global peers | Temperature gauge ranks Norway vs. European peers, while global assessment compares Europe to global front-runners



1. Norway ranked 8th in EPI ranking with three of selected peers on lower ranks. The index measures how close countries are to established environmental policy targets and is thus not directly comparable to the temperature gauge  
Source: BCG-NHO study of Norway's competitiveness in the energy transition

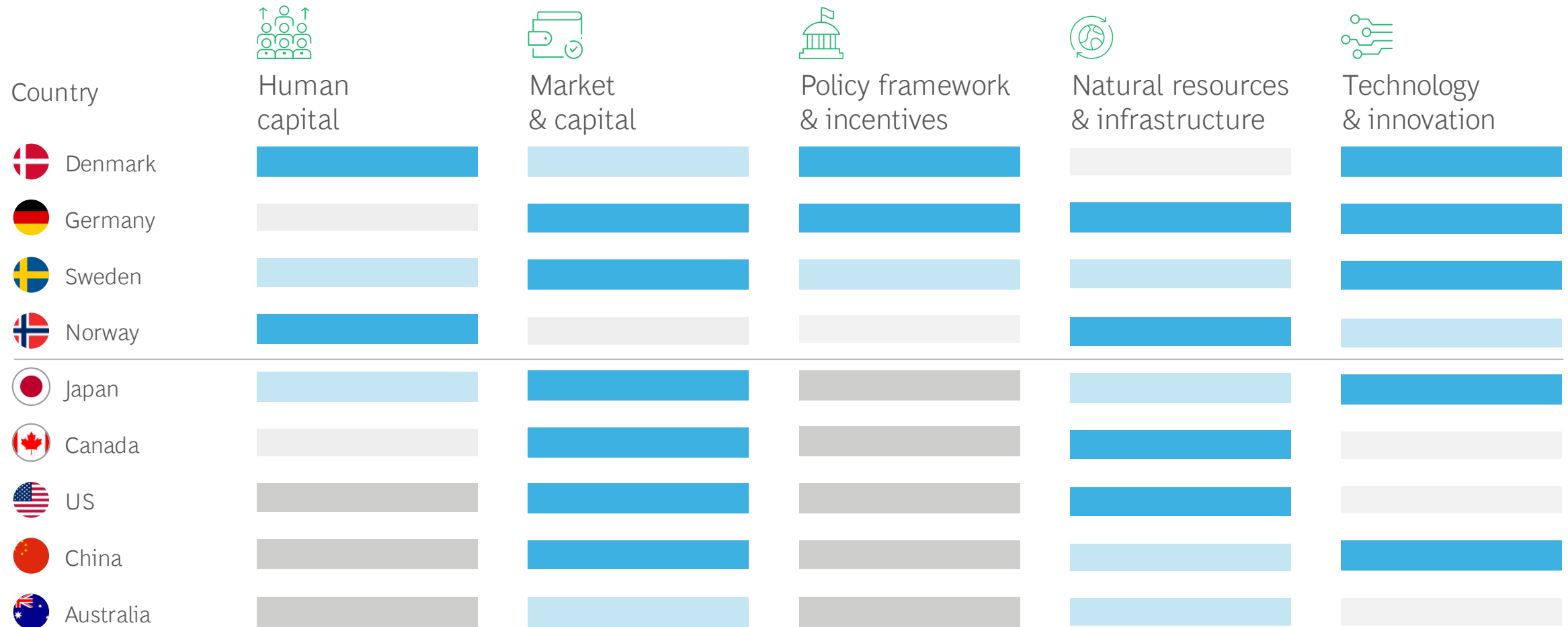
# Selected global peers score behind Norway on sum of fundamental dimensions – Japan closest to the European podium



1. Rank in European championship. Selected global peers incorporated according to their scores  
Source: BCG-NHO study of Norway's competitiveness in the energy transition



# Selected global peers are strong in market and natural resources, but lagging on policy and human capital



Note: Quartiles based on European peer group  
 Source: BCG-NHO study of Norway's competitiveness in the energy transition

# Technology domains | Ten domains cover all green growth areas – six domains prioritized in analysis for Norway

## Large-scale renewables

Expansion of current renewable activities, as well as adoption of new production methods

*E.g. hydropower, on- and offshore wind power, solar, geothermal*

## CCUS (Carbon capture, utilization & storage)

Capturing CO<sub>2</sub> from stationary emitters and transporting it for storage or utilization

*Example utilization: Fabrics, plastics, concrete, biofuel, etc.*

## Power system optimization

New technology to optimize balance between demand and supply to avoid expansion of grid network

*E.g. demand flexibility, B2B/B2C energy systems, etc.*

## Hydrogen-related energy sources

Production, distribution or consumption of hydrogen as an energy source or input factor

*E.g. small- & large-scale hydrogen production, ammonia, etc.*

## Energy storage

Technologies, methods and business models for storage of large amounts of energy

*E.g. centralized battery storage, pumped hydropower*

## Electricity based transportation

Charging services and infrastructure, as well as new business concepts and platforms, including Power to X

*E.g. charging infrastructure, fleet charging, car pooling, etc.*



## Small-scale/distributed renewables

Installation, operation, distribution and development of business models and platforms for small scale resources



## Biobased energy sources

Production and distribution of emerging or unconventional sources of energy



## Heat generation

Production and distribution of heat, as well as energy sources or systems for heat production

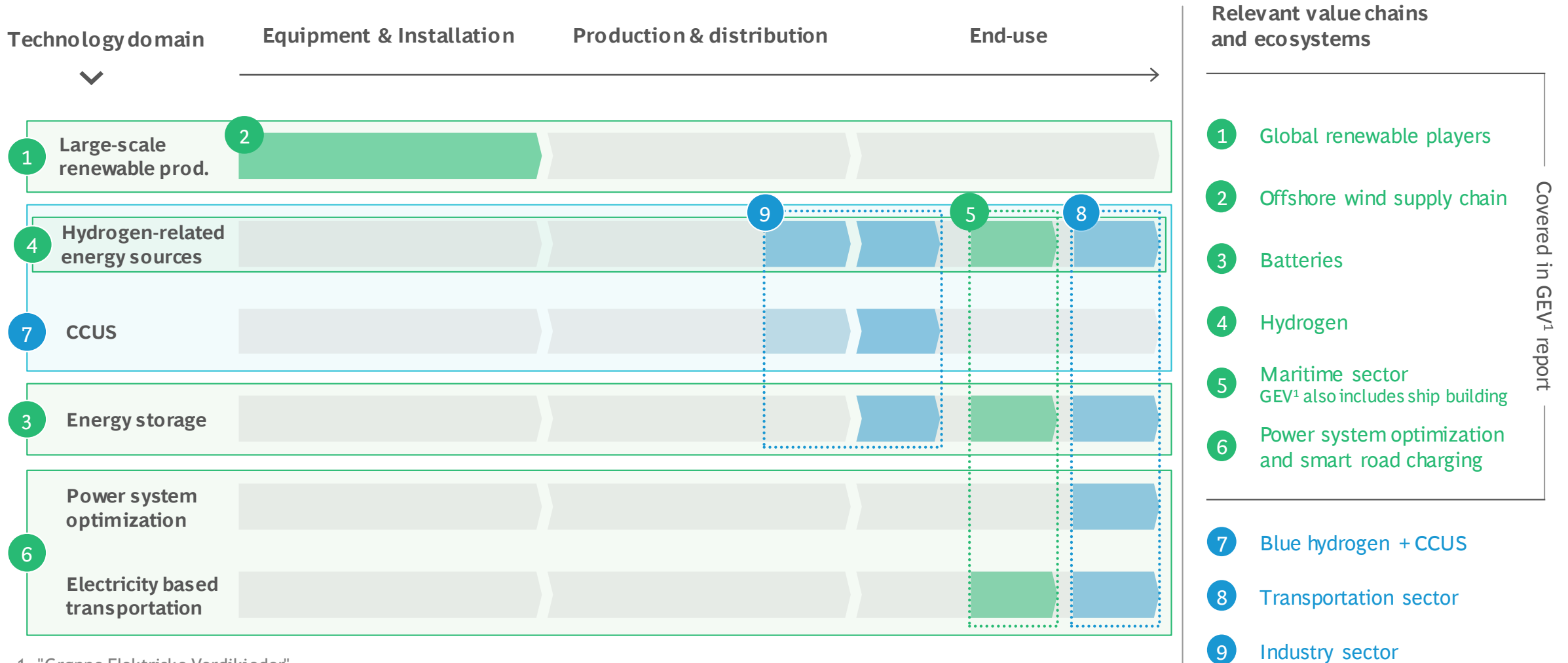


## Energy efficiency

Methods of reducing energy consumption by using less energy to attain the same amount of useful output



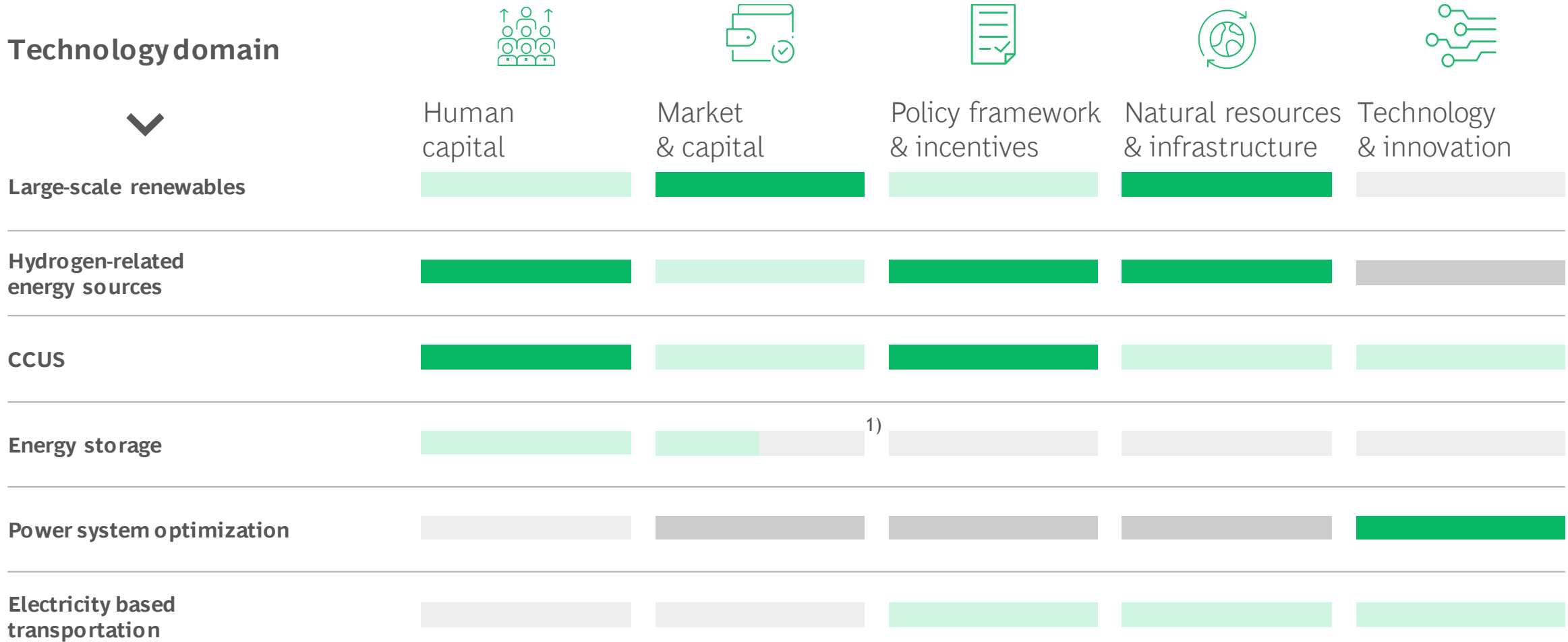
# Relevant ecosystems span across technology domains' value chains



1. "Grønne Elektriske Verdikjeder"

Source: "Grønne Elektriske Verdikjeder" (2020); BCG-NHO study of Norway's competitiveness in the energy transition

# Different strengths are important across technology domains



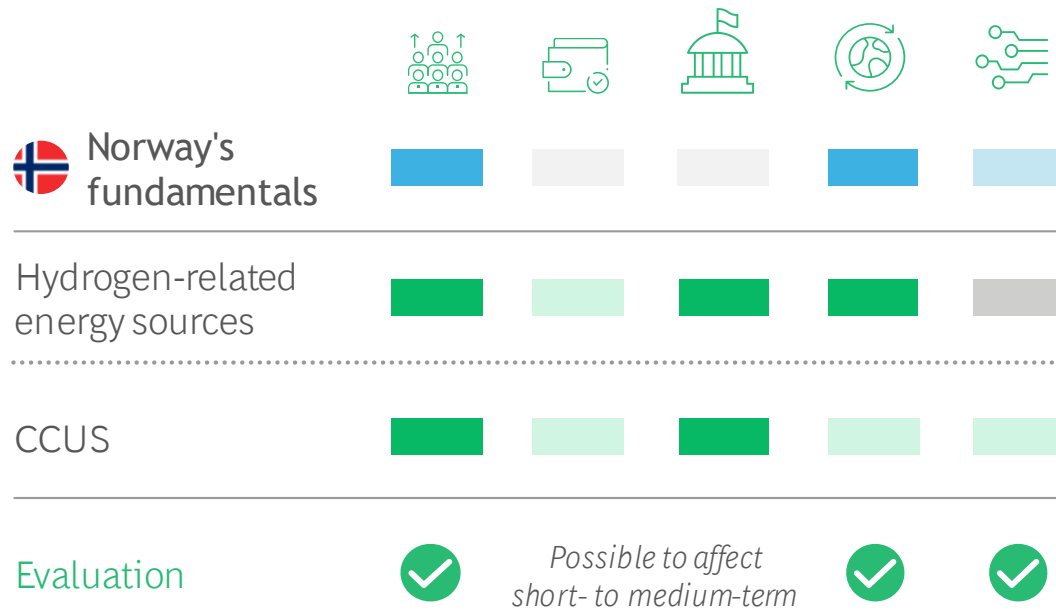
1. Large variance within technology domain  
 Source: BCG-NHO study of Norway's competitiveness in the energy transition

Importance of dimension in technology domain

- High
- High - Medium
- Medium - Low
- Low

# Example | From the assessment of Norway's fundamental strengths, blue hydrogen and CCUS appears an attractive play

Norway's strengths are a good match for blue hydrogen and CCUS

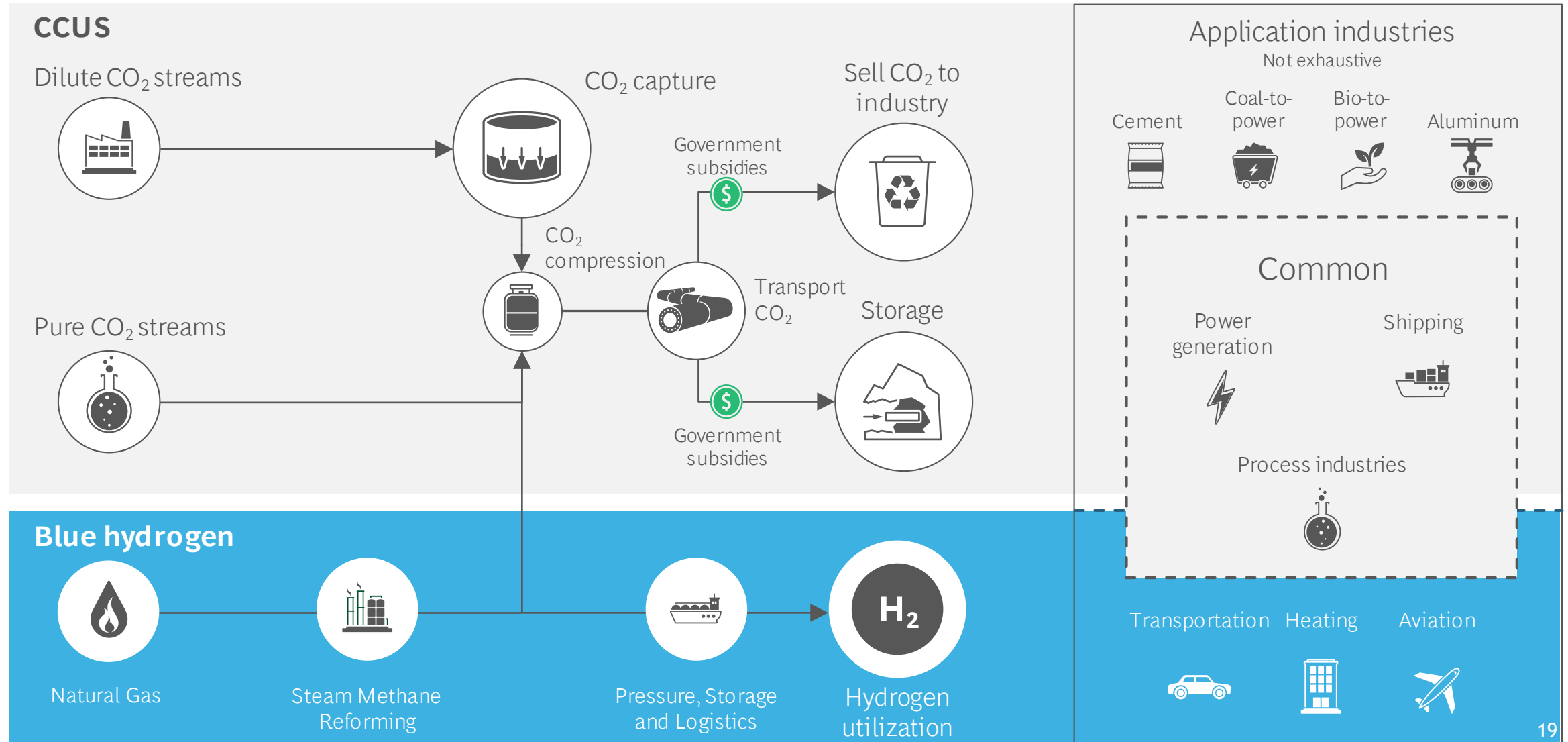


CCUS a necessity for the 2 degrees target, opening the door for blue hydrogen

- Carbon Capture technology deemed a necessary lever to achieve the reduction ambition of the Paris agreement; estimate 14% of the total emissions reduction should come from CCUS
- CCUS is currently the only way to decarbonize some of the world's critical industries, incl. cement, metal production and waste management
- For Norway, CCUS represents an opportunity to decarbonize important industries such as fertilizer production and the maritime sector
- Moreover, with access to efficient CCUS technology Norway can utilize large natural gas reserves to produce profitable blue hydrogen

Strength of dimension relative to peer group: Top quartile (dark blue), Above median (light blue), Below median (grey), Bottom quartile (dark grey)  
 Importance of dimension in technology domain: High (dark green), High - Medium (light green), Medium - Low (grey), Low (dark grey)

# CCUS enables production of blue hydrogen, and technologies with several common application industries



Source: BCG-NHO study of Norway's competitiveness in the energy transition

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