Hydrogen: investment need to 2050

2021-2050 annual average investment	Share of total low-carbon investments
$80 bn	2%

Investment needs

2050 targets

Increase hydrogen production 5–7 times to 500–800 million tonnes for final energy use, ~85% of which is green hydrogen.

Investment needs

Hydrogen production: $40bn p.a.: green hydrogen supply, retrofit grey hydrogen facilities.

Transport and storage: $40bn p.a.: refueling stations, pipelines, import/export terminals, storage facilities.

+ Investments in clean electricity generation for green hydrogen of around $390bn a year – see Power sector.

Investment milestones

$2bn/year today → $80bn/year by 2030 → $120bn/year by 2040

Where?

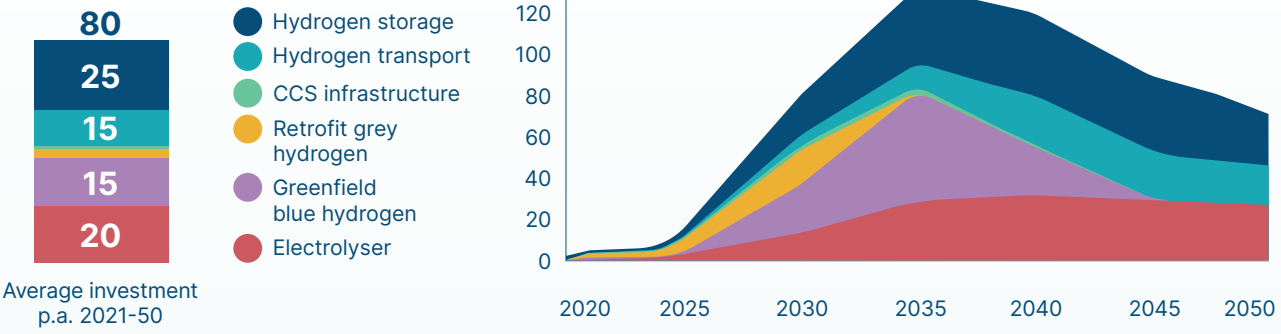
High-income countries will dominate investments this decade as production scales up; many middle- and low-income countries are likely to be key low-cost green hydrogen locations in the long-term (e.g., Morocco, Namibia and Chile have access to cheap, large-scale renewable generation).

Gross or net?[1]

In general, hydrogen investment can be considered additional to what would otherwise occur, driven by decarbonisation objectives.

Global annual investment

$ billion per annum



Average investment p.a. 2021-50

Outlook to 2030

- As natural gas prices have increased, green hydrogen is becoming cost-competitive with its fossil alternative - investments in green hydrogen production are becoming increasingly attractive and bankable.
- Hydrogen production incentives such as the $3/kg incentive in the US Inflation Reduction Act, increase bankability.
- 680 large-scale project proposals worth $240 billion have been put forward, but only about 10% ($22 billion) have reached final investment decision (FID).
- Early investments are still limited and face high risks due to uncertainty around offtake and the necessary transport and storage infrastructure.
- Demand is lagging supply.

2030 target

- 50 Mt clean hydrogen production
- $80 billion investment
- x40 scale up

Sources: BNEF (2022), *Energy Transition Investments*; Hydrogen Council (2022), *Hydrogen Insights 2022*.
1 The ETC's investment estimates differ in approach by sector. Gross investment refers to the total investment required under a 1.5°C net-zero pathway, regardless of how much investment would have occurred anyway. Net investment is the incremental investment required compared to a business-as-usual scenario.
Note: All figures are in US dollars.

Hydrogen: how to mobilise finance

Required real economy policies

	Challenges	Real economy policies needed	Priority policy
Create a clear strategic vision	• Lack of certainty of future demand for offtake resulting in "chicken and egg" problem. • Difficulties identifying early demand opportunities.	• National and regional hydrogen strategies, including targets for production based on sector transition **strategies**, to give certainty to investors and clarity on sequencing of uptake across sectors. + • **Targets** for zero-carbon electricity in 2030 and beyond to ensure sufficient supply for green hydrogen. • **Bans** on new greenfield grey hydrogen.	
Address the "green premium" challenge	• Green premium for green hydrogen (although falling due to current high gas prices). • High-upfront investment costs in infrastructure – high cost of capital is a barrier for investors. • Lack of clarity on business model for public transport and storage infrastructure.	• Bridge green premiums with financial incentives, including **contracts for difference** and **tax credits** for both green and blue hydrogen (e.g., US Inflation Reduction Act). + • **Green procurement** for hydrogen derived products (e.g., fertiliser). • Implement **fuel mandates** (e.g., Sustainable Aviation Fuel in aviation). • **Carbon pricing** (across regions and with wide sector coverage).	
Reduce downside risks	• Uncertainty of returns while demand is scaling up across sectors (e.g., "chicken and egg" problem).	• Sector-specific **contracts for difference** for hydrogen use. + • Support development of **hydrogen clusters** which offer certainty of demand. • Support **demonstration projects** for storage (e.g., R&D subsidies) to accelerate technology scale up.	
Remove supply bottlenecks	• Need for extensive supporting infrastructure (e.g., transport and storage)and renewable electricity capacity to be in place. • Lack of consistent, coherent regulatory framework to develop infrastructure. • Lengthy permitting procedures. • Lack of clarity on international standards on hydrogen production and use.	• Centralised, international **infrastructure planning** to design cross-border hydrogen networks where required (pipelines, shipping routes). + • Streamline **planning and permitting** processes for renewable power generation + hydrogen infrastructure. • Strategic **geological siting** for hydrogen storage locations (e.g., salt caverns). • Develop clean hydrogen & **products certification** schemes. • Cooperate on international hydrogen and ammonia **safety standards**. • Set clear national standards on hydrogen **purity** for different end-uses.	

What obstacles cannot be fully addressed by real economy policies?

Some additional action required

- **Further de-risking required:** even with well-designed real economy policy, new technologies that have not reached scale yet can struggle to secure financing.
- **Additional support required to scale up key infrastructure:** investment in hydrogen production sometimes relies on sufficient transport and storage infrastructure being in place.

Additional actions required

Public investment banks

- Investments and/or access to low-cost finance to develop industrial clusters, transport and storage infrastructure and end-use applications.
- De-risking (e.g., guarantees) to mobilise private capital.

Financial institutions

- Develop expert teams and capabilities in evaluating hydrogen projects (e.g., risks and market opportunities) to increase lending.
- Technology specific investment funds to help pool expertise and aggregate capital.
- Offer products that hedge against future carbon risk (e.g., for retrofitting grey hydrogen).