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Natural Hydrogen Future energy & resources

Detailed summary of the Royal Society briefing

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READING GUIDE

Inside the report

Geological foundations, commercial potential and the evidence gaps.

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OVERVIEW

Overview

The Royal Society's June 2025 policy briefing examines whether naturally occurring hydrogen could become a useful low-carbon energy resource. Its central finding is conditional: hydrogen is generated in the Earth's crust and can accumulate underground, but the location, size, recoverability and cost of commercial resources remain poorly established.

The report brings together geoscience, engineering, environmental assessment, market development and policy. It treats the discovery of hydrogen as the beginning of an investigation, not proof of a viable energy project. Commercial significance depends on a connected system: generation, migration, retention, sustained production and an accessible customer.

A promising resource, with substantial unresolved questions

Two well-established generation mechanisms receive particular attention: reactions between water and iron-bearing rocks, and radiolysis, in which natural radioactivity splits water molecules. Suitable rock types are widespread. Whether they yield recoverable accumulations depends on water availability, geological history, permeability, trapping and the processes that consume hydrogen.

The briefing identifies local and regional industrial markets as a potentially favourable starting point. Mines and other concentrated users may coincide with hydrogen-generating geology, limiting the need for expensive long-distance transport. This is a development possibility, not evidence that any particular mine or region already has an economic hydrogen resource.

How to read this summary

This document follows the findings and qualifications of the 2025 briefing. Project status, cost estimates and policy descriptions are presented as reported then, not as a September 2026 market update. It is a NorthLight-prepared summary of the Royal Society's work, not a Royal Society publication or an assessment of NorthLight's assets.

Source: Royal Society (2025), executive summary, pp. 4–7; conclusions, pp. 58–59.

01 / SCOPE & CONTEXT

What the briefing covers

Hydrogen is already an important industrial input, particularly in refining and the production of ammonia and methanol. The briefing considers natural hydrogen as an additional supply route that might support decarbonisation, rather than assuming that all future hydrogen demand must be met by manufacturing it from electricity or fossil fuels.

Natural hydrogen is not the same as stimulated hydrogen

The report defines natural hydrogen as molecular hydrogen already occurring in rocks and soils through geochemical or biological processes without human intervention. Its main subject is hydrogen that can be located and extracted. It distinguishes this from deliberately injecting fluids or stimulating reactions to generate additional hydrogen, sometimes described as stimulated geologic hydrogen.

This distinction matters when interpreting resource estimates, environmental impacts and technology claims. A proposed process that creates hydrogen underground is not equivalent to finding an existing accumulation, and a combined estimate for natural and stimulated hydrogen is not an estimate for natural hydrogen alone.

A global assessment with a UK policy focus

The evidence spans continental shields, sedimentary basins, ophiolites and other geological settings worldwide. For the UK, the briefing identifies plausible source rocks but finds insufficient information to determine whether significant deposits exist. It reports no coordinated nationwide exploration or comprehensive occurrence database at the time of writing.

Historic drilling does not resolve that gap: hydrogen was often not routinely measured or reported. The report therefore distinguishes an absence of observations from evidence of geological absence. More informative prospectivity assessments combine rock chemistry, structures, possible reservoirs and seals with properly collected gas measurements.

The evidence date matters

The briefing is a June 2025 synthesis. References to producing fields, exploration programmes and licensing arrangements describe that evidence base; they should not be read as a current inventory of the industry.

Source: Introduction, pp. 8–11 and 18–21; section 3.2, p. 37.

02 / GEOLOGICAL FOUNDATIONS

How natural hydrogen forms

The briefing centres on two established mechanisms. Both require water, but they obtain the energy for hydrogen generation in different ways. Their existence is well supported; their contribution to a specific recoverable resource still requires site-level investigation.

Water-rock reactions and serpentinisation

Water reacts with reduced iron in minerals, producing hydrogen as iron is oxidised. Serpentinisation is a prominent example involving hydration of ultramafic rocks containing minerals such as olivine and pyroxene. Mafic rocks and other iron-rich formations may also contribute, although their yields and reaction pathways differ.

Hydrogen output is not controlled by iron content alone. Temperature, mineral composition, secondary minerals, accessible reactive surfaces and water circulation all affect the result. The report discusses high modelled yields around 300°C as well as evidence of production below 100°C, widening the range of potentially relevant crustal environments.

Radiolysis

Radiation released by the natural decay of uranium, thorium and potassium splits water molecules. The resulting hydrogen yield depends on radionuclide abundance, water-filled pore and fracture space, and the time over which production and preservation occur. Long-lived, relatively isolated geological systems can accumulate products over very long periods.

Element	Role in hydrogen generation
 Rock composition	Controls the availability of reactive iron and naturally occurring radioactive elements.
 Water availability	Enables both mechanisms; the history of water access matters as much as its presence today.
 Fractures and permeability	Influence fluid access, reaction progress and whether hydrogen remains trapped or escapes.
 Time and preservation	Determine whether slow generation can build an appreciable inventory.

Hydrogen generation is therefore a geological process, not by itself a production forecast. A source rock can generate hydrogen without creating an accessible accumulation.

Source: Sections 1.2–1.4, pp. 22–26.

03 / GEOLOGICAL FOUNDATIONS

From source rock to reservoir

A hydrogen resource requires more than a productive source. The report describes a system in which generated hydrogen must move into, and survive within, a setting from which it can be extracted. Source rocks and reservoir rocks need not be the same age or composition.

	Element	Function within the system
	Source	Generates hydrogen through water-rock reactions, radiolysis or other processes.
	Migration pathway	Allows hydrogen-bearing water or free gas to move through fractures, faults or permeable strata.
	Reservoir	Provides connected space in which hydrogen can accumulate and potentially flow to a well.
	Trap and seal	Restrict escape through geological geometry and low-permeability barriers.
	Preservation	Limits biological consumption, chemical transformation and physical leakage.

Neither too closed nor too open

Very low-permeability rocks can preserve gases for hundreds of millions to billions of years, but may be difficult to produce from. Open fracture systems can improve water access and gas movement, yet also allow hydrogen to escape as rapidly as it is generated. The most useful settings must balance retention with deliverability.

Sedimentary basins above hydrogen-generating crystalline basement are one setting of interest. Faults and permeable units may connect the basement to reservoirs, while suitable overlying seals allow gas to accumulate. This remains a geological hypothesis to test at each location, not a universal model.

What noble gases add

Helium and other noble gases can help distinguish sources and quantify transport processes. Their chemistry and isotopic composition provide constraints on crustal versus mantle inputs and on diffusion or fluid movement. Hydrogen-to-helium relationships can be informative, but hydrogen's biological and chemical reactivity makes it less conservative than helium.

Source: Sections 1.2 and 1.4–1.5, pp. 22–28; chapter 2, pp. 30–35.

04 / EVIDENCE & UNCERTAINTY

What the resource estimates mean

The briefing separates the rate at which hydrogen is generated or released from the amount stored underground. Neither is automatically equivalent to a recoverable resource. Recoverability also depends on depth, concentration, flow, access, technology, cost and market conditions.

	Evidence	What it establishes—and what it does not
	Concentration	The proportion of hydrogen in a sample. A high percentage does not establish the volume of a reservoir.
	Flux	An amount moving or escaping per unit time. Surface leakage is not a direct measure of stored inventory.
	Accumulation	Hydrogen retained underground. Its presence does not prove that extraction will be commercially viable.
	Reserves	Quantities supported by technical and commercial evaluation, not simply theoretical generation potential.

A more constrained reading of global flux

Box 2 reviews continental geological flux estimates and reports less than 0.74 million tonnes of hydrogen per year excluding volcanic gas flux, or less than 1.74 million tonnes per year including it. These are the briefing's synthesis of flux estimates—not forecasts of annual commercial supply or estimates of total trapped hydrogen.

The authors question much larger totals where different categories overlap, source environments are unlikely to allow commercial accumulation, or speculative deep-Earth inputs are included. Hydrogen bound within minerals should not be confused with free molecular hydrogen available for extraction.

Accumulation could still be significant

Even modest generation sustained over geological time may build a substantial inventory where trapping and preservation are effective. The briefing therefore does not dismiss the resource. It argues that global extrapolations cannot substitute for measured field size, producibility and economically recoverable quantities.

Source: Introduction, p. 15; sections 1.5 and Box 2, pp. 27–29.

Interpreting exploration evidence

Maps of known hydrogen occurrences show where hydrogen has been found and reported. They do not necessarily show where it is most abundant. Uneven sampling, historical exploration priorities and missing hydrogen analyses create strong biases in the available record.

Surface measurements are clues, not confirmation

Hydrogen seeps, springs and soil-gas anomalies may help direct investigation, but they can be disconnected from a deeper commercial accumulation. Near-surface microbes can generate hydrogen; drilling and corrosion can also introduce misleading signals. Conversely, microbial consumption can remove hydrogen before it reaches the surface, masking a deeper source.

Soil-gas concentrations can change over short periods with weather, biological activity and sampling disturbance. Measurement protocols, calibration, repeat observations and understanding the surrounding gas mixture are therefore important to interpreting a result. A concentration should not be converted into a flux without a defensible transport model.

Multiple lines of evidence

The report places value on combining hydrogen measurements with geology, structural interpretation and co-occurring gases. Helium and noble-gas isotopes can help discriminate between deep crustal fluids and shallow or atmospheric influences. No single proxy is presented as proof of a commercial resource.

Prospectivity is different from discovery

Predictive maps can integrate possible source rocks, migration routes, reservoirs and seals. They are useful for organising exploration, but assumptions about transport distance and geological connectivity need testing. Areas without reported hydrogen should not automatically be ruled out, and favourable geology should not automatically be counted as a discovery.

Ultimately, investigation must progress from an occurrence to evidence about the subsurface system: where the hydrogen comes from, whether it is retained, what volumes may be present, and how it behaves during sustained testing.

Source: Introduction, pp. 18–21; section 1.1, p. 22; sections 2.1 and Box 3, pp. 32–33.

Migration, consumption and loss

Hydrogen can travel as free gas or dissolved in water. It can move with flowing fluids through permeable strata and fractures, or diffuse along concentration gradients. Low-permeability layers may reduce bulk fluid flow while still allowing some diffusion over time.

Biological consumption

Hydrogen is an energy source for numerous microbial communities, from deep saline environments to shallow groundwater and soils. Microorganisms can consume it through several metabolic pathways. Near the surface, oxygenated environments also support biological oxidation of hydrogen.

The rate of consumption depends on the setting, available nutrients, temperature, water access and the organisms present. Laboratory measurements do not yet provide a comprehensive basis for predicting losses at field scale. Some isolated deep systems retain hydrogen because microbial activity is constrained, not because microbes are universally absent.

Chemical and physical losses

Non-biological reactions can consume hydrogen or transform it into other compounds. Dissolution, adsorption and reactions with minerals affect its distribution, while advection and diffusion can move it out of a prospective accumulation. These processes may also change fluid chemistry, porosity and flow pathways.

Why this matters for exploration and operation

An accumulation reflects the balance between generation, inflow, retention and loss. The presence of hydrogen at one time does not establish the rate at which it can be withdrawn. Similarly, long-term preservation is not evidence that production can be replenished at the same rate as extraction.

Extraction or other subsurface activities may alter this balance by changing pressure, water movement and access to nutrients. The briefing identifies effects on microbial communities, groundwater chemistry and infrastructure as areas requiring further study and monitoring. It does not claim those effects are uniform across sites.

Source: Section 1.4, pp. 26–27; chapter 2, pp. 30–35.

07 / EXTRACTION & OPERATIONS

Turning a discovery into a product

The briefing identifies three central requirements for a commercial project: production rates that justify infrastructure, hydrogen purity suited to a paying market, and recoverable quantities supported by sufficiently reliable technical and commercial evidence.

What the early examples establish

At the report's publication, Bourakébougou in Mali was the only cited location where natural hydrogen was being used commercially, supplying local energy needs. It demonstrates that natural hydrogen can be extracted and used. Its scale and incomplete public reservoir data limit what can be inferred about other projects.

The reported absence of pressure decline in Mali is not treated as proof of continuous, commercially renewable generation. Low withdrawal rates or supply from a deeper accumulation could also explain that behaviour. Elsewhere, significant mine outgassing demonstrates hydrogen movement, but is not equivalent to a developed production reservoir.

Adapting established extraction methods

Exploration wells, reservoir testing, production wells and surface processing are expected to draw on oil and gas practice. Hydrogen nevertheless requires attention to materials, seals, well integrity, corrosion, gas handling and leak detection. Existing expertise provides a starting point, rather than eliminating hydrogen-specific engineering work.

Purity determines processing requirements

Produced gas may include nitrogen, methane, carbon dioxide, helium or other constituents. Separation, purification and possibly compression or storage are needed to meet the intended use. The report identifies pressure-swing adsorption and membranes among relevant purification methods. Fuel-cell uses can have demanding purity requirements.

The complete product therefore depends on both subsurface performance and surface treatment. A favourable well result alone does not establish a reliable, specification-compliant supply to the customer.

Source: Introduction, p. 15; sections 3.1–3.3, pp. 36–38.

Cost: from the well to the customer

The briefing's conclusion on cost is explicit: natural hydrogen's actual commercial cost remains unproven because it has not been produced and sold at large scale. Published estimates depend strongly on assumptions about the reservoir, gas composition, infrastructure and delivery route.

Estimates are not observed industry averages

The report cites published natural-hydrogen cost estimates spanning approximately US\$0.3–10 per kilogram. It also discusses much lower aspirations or company-reported figures. The broad range signals uncertainty; it is not a demonstrated price range that can be applied to any discovery.

	Factor	Why it affects delivered cost
	Well performance	Depth, drilling success, well count and sustained flow determine how much infrastructure is needed per unit of output.
	Gas composition	Hydrogen concentration and contaminants determine separation, purification and waste-handling requirements.
	Customer location	Distance and available infrastructure influence compression, transport, storage and distribution costs.
	Operating requirements	Energy, water, maintenance, monitoring and safe materials handling add to extraction costs.
	Scale and utilisation	The volume sold and the use of installed capacity affect the cost recovered from each kilogram.

Compare the same point in the value chain

A wellhead estimate is not directly comparable with a delivered price. The briefing argues that comparisons should include purification, transport, storage and delivery to the end-user, using consistent boundaries. Cheap extraction can be offset by expensive handling or transport.

High-purity hydrogen produced near a customer could have advantages because the molecule does not need to be manufactured using large electricity inputs. Those advantages remain conditional on a sufficiently productive resource and the complete project economics.

Source: Sections 3.3–3.4, pp. 38–39; sections 4.1–4.2, pp. 43–47. Cost range: Table 2, p. 44.

Environmental performance

The briefing regards low lifecycle emissions as a plausible advantage of natural hydrogen, especially for high-purity resources. It does not equate “natural” with zero emissions. Assessment must cover exploration, drilling, construction, extraction, processing, transport and the handling of co-produced gases.

A lifecycle view

Infrastructure and operational energy have an embodied footprint. Purification requirements depend on the incoming gas mixture and the specification of the product. Water use, land disturbance and waste management can vary substantially with location and project design. Low unit impacts also depend on the quantity produced over the infrastructure’s useful life.

Methane or carbon dioxide in the produced stream can change both the carbon balance and the cost of treatment. The report’s expectation that some natural-hydrogen projects could match or improve on renewable-electrolysis emissions should therefore be read as a qualified finding, not a universal performance guarantee.

Hydrogen leakage has an indirect climate effect

Hydrogen is not itself a direct greenhouse gas, but atmospheric leakage can influence methane lifetime and other climate-relevant chemistry. The briefing cites a range of roughly 4.3–12 for 100-year global warming potential: one kilogram released could have the warming effect of approximately 4.3–12 kilograms of carbon dioxide over that period, under the cited assessments.

Subsurface and local impacts also matter

Changes in hydrogen availability can affect microbial activity and groundwater chemistry. Outcomes depend on the environment: some reactions may impair water quality or create corrosive gases, while others may remove contaminants. The report identifies significant gaps in field-scale understanding.

Monitoring and reporting are therefore part of establishing environmental performance, not simply a final compliance step. The briefing calls for credible baseline information, leak detection, containment and consistent lifecycle boundaries as the sector develops.

Source: Sections 2.1–2.2, pp. 33–35; section 3.5, pp. 40–41.

Where the first markets may emerge

The report suggests that the earliest useful markets may be local or regional, particularly where the resource is close to existing demand. This would reduce the need to establish an extensive hydrogen transport system before production begins.

	Market	Model described in the briefing
	Local and off-grid use	Supply nearby communities, isolated infrastructure or individual industrial users, where imported energy can be costly.
	Regional industrial hubs	Connect a productive resource with concentrated users, reducing transport distances and sharing infrastructure.
	National or international supply	Integrate sufficiently large, competitive resources with wider pipelines, storage and trade networks as they develop.

Why the mining sector receives attention

Mining activity is often concentrated in the same mafic, ultramafic and iron-bearing geological settings that can generate hydrogen. The briefing highlights corridors in Ontario and Quebec, alongside Western Australia and other regions, as examples of geological and industrial co-location.

Some of these industrial areas are remote from urban power systems. A usable nearby resource could support local power generation and reduce the burden of energy transport. The reasoning is about the coincidence of prospective geology and demand; it does not establish a hydrogen reserve or a quantified saving for any named mine.

Demand must match supply

Different customers require different volumes, purity, reliability and infrastructure. The briefing contrasts relatively modest observed flows with the much larger annual requirements of a typical ammonia plant. A resource can have local value without being large enough to supply a major commodity-scale hydrogen market.

Larger networks remain a possible later route. Their viability depends on discoveries at sufficient scale, competitive delivered costs and the availability of transport, storage and customers.

Source: Sections 4.2.1–4.2.2, pp. 45–47; scale comparison, section 3.1, p. 36.

Transport and storage change the equation

Hydrogen's low volumetric energy density makes moving it a central commercial challenge. The briefing compares transport options and emphasises that the best route depends on distance, throughput, infrastructure utilisation and market maturity.

	Route	Main trade-off discussed
	Compressed gas by road	Can serve relatively small volumes and shorter distances without an extensive pipeline system, but carries compression and delivery costs.
	Liquid hydrogen	Increases the amount carried in a given volume, while requiring energy-intensive liquefaction and cryogenic handling.
	Dedicated pipelines	May offer lower unit delivery costs at sufficient scale and utilisation, but require substantial investment and suitable materials.
	Chemical carriers	Ammonia or other derivatives can support long-distance trade; conversion and any reconversion add cost and energy losses.

Transport studies are scenario-dependent

The briefing cites modelling of delivery in Alberta and broader analyses of hydrogen transport. Their results vary with station size, route length and assumptions about shared transmission infrastructure. They illustrate why logistics can dominate economics, rather than providing a universal tariff for natural hydrogen.

Existing infrastructure is not automatically suitable

Hydrogen behaves differently from natural gas in pipelines and equipment. Material compatibility, leakage, pressure, compression and energy throughput must be assessed. Reusing infrastructure may be possible in some settings, but cannot be assumed simply because a gas network is nearby.

Implications for market development

A local user can avoid part of the transport and conversion chain. Conversely, a large distant market may justify infrastructure only if the resource and demand are sufficiently secure. Storage and reliable delivery also matter where production and consumption do not match over time.

The report's emphasis is on the complete supply chain: the value of a geological occurrence depends partly on how the hydrogen can reach a useful application.

Source: Section 4.2.2, pp. 46–51, including transport comparisons in Figures 7–8 and Table 3.

Financing an emerging industry

Natural hydrogen faces both exploration risk and the challenges of creating a new supply chain. Capital must support work before the size and economics of the resource are known, while later investment depends on evidence of deliverability and a credible market.

	Stage	Financing issue described in the report
	Research and exploration	Fund better detection, subsurface understanding and early tests while the probability and size of discoveries remain uncertain.
	Appraisal and demonstration	Establish whether an occurrence can become a sustained, specification-compliant supply with measurable costs and impacts.
	Infrastructure development	Commit capital to production, purification, transport and storage with confidence in the resource and customer demand.
	Operation and expansion	Support longer-term financing as performance, sales and operating risks become better understood.

Different risks call for different forms of capital

The briefing discusses technology-focused venture capital, exploration funding, infrastructure and energy equity, offtake arrangements, project finance and credit. These are possible components of an evolving financing system, not evidence that all routes are presently available to early-stage projects.

Policy can support evidence and demand

Research and demonstration funding can reduce technical uncertainty. Demand mechanisms discussed include advance market commitments, buyer coordination, contracts for difference and approaches used in renewable power markets. Their relevance depends on the form of hydrogen supply and the market being served.

The report also raises the possibility that upfront support for exploration could be more useful in some cases than support focused only on later operating revenues. This reflects the particular challenge of discovering a geological resource before a production business exists.

Information quality is a commercial input

As reliable field data accumulate, cost, environmental and social assessments can improve. Financing and industry development therefore depend on transparent evidence as well as the availability of capital.

Source: Sections 5.1–5.2, pp. 52–53; section 3.1, pp. 36–37.

Regulation and the UK context

The briefing describes a developing regulatory landscape in which some jurisdictions were adapting existing subsurface-resource frameworks, while others had not yet established a clear route for natural hydrogen. These descriptions reflect the report's 2025 position, not current legal guidance.

Exploration rights are only part of approval

A licence to investigate a resource does not replace requirements for land access, drilling approval, environmental assessment, water protection or operational safety. The report also identifies a need for clear treatment of hydrogen within energy-resource legislation and coordination across the supply chain.

Examples include recognition of hydrogen within South Australian resource regulation, French exploration permitting, and approaches taken by some Canadian provinces using existing arrangements associated with helium or oil and gas. The briefing does not present one uniform international licensing model.

Resource reporting and carbon standards

Consistent resource and reserve definitions are important for investment and public communication. The report notes that principles of the Petroleum Resources Management System can be extended to gaseous substances including hydrogen. This is a reporting framework, not a conversion of an occurrence into certified reserves.

Low-carbon qualification likewise depends on measured or defensibly assessed emissions, not a colour label or geological origin alone. Gas composition, purification, energy supply and leakage affect the outcome. Policy alignment should address environmental performance across the chain.

What the UK still needed to establish

The briefing found that the UK lacked sufficient data to determine the extent of natural hydrogen resources and a fully established hydrogen-specific licensing framework. Potentially relevant geological settings justify investigation, but neither the regulatory route nor commercial prospectivity should be presumed from that alone.

The report connects progress to better geological evidence, clearer responsibilities, proportionate environmental safeguards and early engagement with affected communities.

Source: Introduction, pp. 19–21; sections 4.1 and 5.2–5.3, pp. 42–43 and 53–55.

Communities and social acceptance

Technical feasibility and a low-carbon objective do not automatically establish public acceptance. The briefing treats community participation, transparency and the distribution of benefits as central to development, particularly while natural hydrogen remains unfamiliar to many people.

	Principle	Approach discussed in the briefing
	Early participation	Engage affected communities before decisions are settled, and maintain dialogue through development and operation.
	Transparent evidence	Share understandable information on safety, environmental effects and progress, supported by independent assessment where appropriate.
	Tangible local benefits	Consider local consumption, community shareholding, royalties or revenue-sharing arrangements.

Participation is more than information provision

The report discusses structured opportunities such as citizen panels, public hearings and work with local organisations. These allow concerns and priorities to influence the process, rather than treating engagement only as an explanation of decisions already made.

Trust depends on acknowledging uncertainty

Hydrogen projects can raise concerns about health, safety, groundwater, land use and links to existing fossil-fuel industries. Public confidence depends on credible handling of those issues, including clear distinctions between demonstrated benefits and hoped-for outcomes.

Local value and accountability

Using hydrogen near its source may retain economic value within a community and reduce transport requirements. Ownership or revenue-sharing mechanisms can provide other forms of participation. The report presents these as options to consider in context, not a single prescribed agreement.

Its broader conclusion is that social acceptance should develop alongside geology, engineering and finance. An extractive project remains accountable to the people and places affected by it, even where its intended product supports decarbonisation.

Source: Sections 5.4–5.4.3, pp. 55–56; development framework, p. 57.

The report's overall conclusions

A real geological phenomenon; an emerging resource sector

Natural hydrogen is generated and can accumulate underground. Established drilling approaches may provide access to it. Whether it becomes a substantial energy resource depends on finding sufficiently large, productive and accessible accumulations with commercially useful gas composition.

The resource base is not yet adequately quantified

Widespread hydrogen-generating rocks and encouraging occurrences justify further investigation, but do not establish recoverable reserves. The report calls for more exploration and research into volumes, purity, depth, migration, preservation and the sustainability of production.

Local industrial uses may provide an early market

Co-location of prospective geology with concentrated industrial demand can reduce transport costs and infrastructure requirements. Mining regions receive particular attention, but the logic remains conditional on actual discoveries and site-specific development evidence.

Low emissions and competitive costs are possible, not assured

A sufficiently large, high-purity and accessible resource could compete with other hydrogen supply routes. The briefing considers favourable lifecycle emissions plausible, while stressing the effects of gas composition, energy use, processing and leakage. Actual large-scale production costs remain to be demonstrated.

The UK has geological possibilities, not an established resource

The report finds enough theoretical potential to support investigation, but insufficient information to conclude that significant UK deposits exist. Mapping, measurement and a clearer commercial framework would help resolve that uncertainty.

No evidence for an endless accessible mantle supply

Published data do not support claims of an unlimited deep-mantle hydrogen source continuously supplying economically accessible shallow reservoirs. Geological generation and accumulation must not be confused with renewability at commercial withdrawal rates.

Taken together, the briefing supports serious investigation of natural hydrogen while keeping evidence, delivered economics and environmental performance at the centre of assessment.

Source: Executive summary, pp. 4–7; conclusions, pp. 58–59.

APPENDIX / GLOSSARY & SOURCE GUIDE

Source guide and terminology

Term	Meaning in this summary
 Serpentinisation	Hydration of ultramafic minerals; iron oxidation during these reactions can generate hydrogen.
 Radiolysis	Splitting of water by radiation from naturally occurring radioactive elements.
 Advection / diffusion	Transport with flowing fluids / transport driven by concentration gradients.
 Flux / inventory	An amount moving per unit time / an amount stored at a point in time.
 Resource / reserves	Potentially relevant quantities / quantities supported by commercial and technical evaluation.
 Lifecycle assessment	Assessment of impacts across the defined production and delivery chain.

Return to the original report

Source section	Original report pages
 Scope and geology	Introduction, pp. 8–21; chapter 1, pp. 22–29.
 Migration and sinks	Chapter 2, pp. 30–35.
 Production and impacts	Chapter 3, pp. 36–41.
 Markets and transport	Chapter 4, pp. 42–51.
 Commercial framework	Chapter 5, pp. 52–57.
 Conclusions and credits	Conclusions, pp. 58–59; acknowledgements, pp. 62–63; references, pp. 64–71.

[Read the complete Royal Society report \(free PDF\).](#)

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