

The logo for the company 'wood', consisting of the word 'wood' in a lowercase, white, sans-serif font. The background of the entire slide is a dark blue, abstract image with glowing, particle-like elements and light trails, suggesting a futuristic or scientific theme.

wood.

A Wood viewpoint:

The future of hydrogen production through steam methane reforming

Unlocking the potential of blue hydrogen

There is a common misconception that steam methane reforming (SMR) technology is dated and does not stack up economically or provide high carbon capture rates when compared with other hydrogen production technologies. It is important to scrutinise and challenge these myths to understand what technology best suits an organisation's project requirements.

Shaping the future

As the demand for energy increases and the need to address climate change becomes more prevalent, the political, industrial and societal expectation to reduce emissions is greater than ever.

Has hydrogen's time finally come? There is a need for a clean and abundant energy vector to meet this requirement and reducing the carbon intensity of existing and future hydrogen (H₂) production presents an attractive solution.

With governments and industry increasing their investment in H₂ production, and the vast opportunities to repurpose existing energy infrastructure, the global H₂ market is poised to grow rapidly with an estimated investment of around \$50 billion through 2030¹. However, producing low-carbon H₂ at scale is now the key challenge facing the industry.

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 ¹ [Hydrogen-Insights-July-2021-Executive-summary.pdf \(hydrogencouncil.com\)](https://www.hydrogencouncil.com/wp-content/uploads/2021/07/Hydrogen-Insights-July-2021-Executive-summary.pdf)

Producing hydrogen

The complexity of the hydrogen opportunity varies significantly from region to region depending on the local natural resources and existing infrastructure.

Grey H₂, which currently accounts for most of the H₂ gas produced today, is primarily generated via steam reforming of natural gas. This process, which produces and releases carbon dioxide (CO₂) as a by-product into the atmosphere, is contributing to greenhouse gasses and is counter to the clean fuel goal.

Similarly, blue H₂ is also produced using natural gas feedstock. The industry uses the terminology "blue" H₂ as a solution for lower-carbon intensity production as the CO₂ emissions generated are captured and stored instead of emitted into the environment – a more sustainable process to support decarbonisation targets driving the global energy transition. With the demand for H₂ increasing, the production of blue H₂ is expected to grow to a capacity of 3.3m metric tonnes per year by 2028².

There is significant potential for mega-scale hub developments for blue H₂, with capacities greater than 500,000 Nm³/hr, particularly in North America. This region has ample feedstock availability, carbon storage potential and a healthy existing infrastructure base available to leverage. SMR has often been dismissed for these mega-scale applications due to the process being perceived as old technology and unable to scale. This has yielded a market bias that there is no future for SMR, however, developments and innovation in SMR present a viable solution for blue H₂ production.

With respect to broad economic solutions to clean H₂ production, there are practical challenges for H₂ distribution and efficient supply to end-users, which will require both large scale and more distributed H₂ production. Such conditions are where innovative blue H₂ solutions based on SMR will remain the go-to technology.

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metric tonnes per year by 2028².

² [Cost-logistics-offer-blue-hydrogen-market-advantages-over-green-alternative \(www.spglobal.com/commodityinsights/en\)](https://www.spglobal.com/commodityinsights/en)

Technology

SMR is the most scalable and readily available technology in the market today, and it is estimated that over 95% of the world's hydrogen is currently produced via SMR³.

An emerging alternative technology for mega-scale production, is through autothermal reforming (ATR), however this has little proven commercial experience in blue H₂ production applications⁴. ATR differs from SMR in the way that the heat is supplied to the reforming reactions, and unlike SMR, this process requires the introduction of oxygen (O₂) into the process from an air separation unit (ASU). The ASU is a large power consumer and therefore its carbon footprint is dependent on the proportion of renewable grid power. Where a project's available grid power has a high carbon intensity, the overall carbon intensity of H₂ produced via ATR will be higher than SMR⁵. Additional investment will be required in renewable power generation for ATR to achieve its promise of lower carbon intensity.

In regions where future tax credits are calculated on carbon intensity, this will have significant impacts for the best technology selection to maximise the return on clean hydrogen investment.

The next generation of blue SMR solutions will deliver higher efficiency and reduce carbon intensity compared to conventional SMR. This includes the means to support the simplification of carbon capture and future integration of renewable power. Net carbon emissions from a blue SMR solution are comparable to current ATR solutions allowing a competitive advantage for the SMR in terms of efficiency and economics, for many potential applications⁶. However, not all projects are the same and in-depth assessments are required to recommend the most appropriate solution.

95%

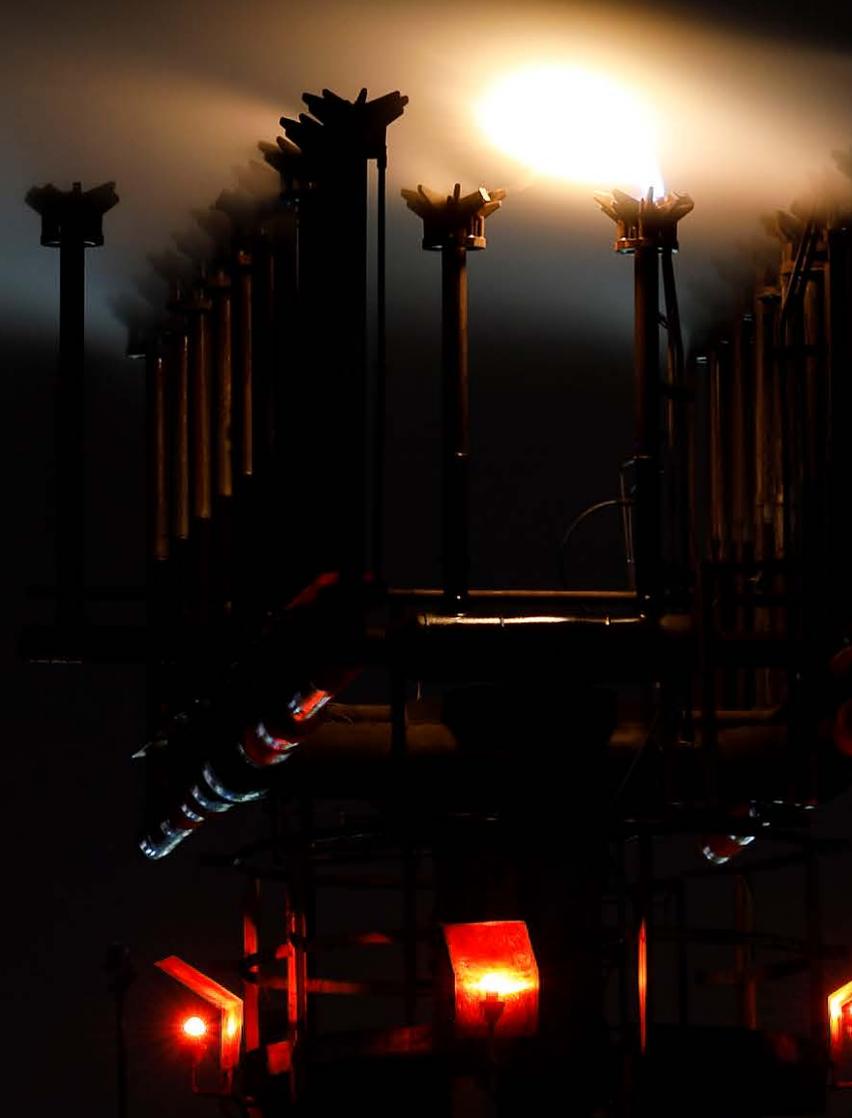
of the world's hydrogen is currently produced via SMR³

³ [Estimating The Carbon Footprint of Hydrogen Production \(forbes.com\)](#)

⁴ [Energy Analysis \(p18\) | netl.doe.gov Comparison of Commercial, State-of-the-Art, Fossil-Based Hydrogen Production Technologies](#)

⁵ [GHG emissions for blue and green hydrogen production routes – Norway versus Netherlands grid power case study | Feasibility Study into Blue Hydrogen | CE Delft](#)

⁶ [CO₂e life cycle emissions for all reforming cases \(p126\) | netl.doe.gov Comparison of Commercial, State-of-the-Art, Fossil-Based Hydrogen Production Technologies](#)



The competitive advantage

For more than 60 years, Wood has supplied H₂ production units based on proven SMR processes.

Through continuous development and innovation, our new generation of blue SMR technology provides a greater economic and efficient alternative for production needs at large capacities. The primary source of Wood's technology differentiation is through modifying the traditional SMR process allowing the capture of CO₂ from a single process stream rather than two, significantly enhancing cost efficiency.

This innovation drives the technological and economical advances that can and are being made with H₂ production facilities. The new SMR solutions offer the following benefits compared to previous generations.



Versatile application

SMR presents a cost-effective solution for H₂ production and offers owners the choice to switch energy vectors as the end-markets for H₂, liquid H₂, MCH and ammonia develop later this decade. This versatility in application helps operators' phase and de-risk their CAPEX as the market matures.



Improved economics

Reduced operational and capital expenditure through removing the need for costly post-combustion flue gas carbon capture.



Lower energy demand

Reduced carbon footprint by minimising fuel gas consumption and optimising steam production.



Increased efficiency

The simplicity and flexibility of the steam generation to provide zero export steam or produce enough excess steam to support the carbon capture technology process if required.



Lower emissions

Integrated pre-combustion carbon capture, utilisation, and storage (CCUS) allows up to 95% CO₂ emission reduction with potential further reductions through electrification.



Works with existing assets

Unit revamping opportunities to achieve debottlenecking, increase capacity and CAPEX-friendly revamps to extend the life of existing SMR assets in an environment of growing clean hydrogen demand.



Advanced engineering and delivery

Fully modular plant, including our unique Terrace Wall™ furnace support optimised schedule, lower total installed cost and reduced construction time.

Reduced risk

SMR has the longest proven track record of natural gas-based H₂ production technologies in the market.



Focusing on the future

The potential of H₂ as an energy vector has become a key factor in achieving a low-carbon future. The H₂ sector is moving through exceptional growth, finding the right solution to produce low-carbon H₂ while achieving energy demand is critical in realising the potential.

Our technology is applicable for both greenfield and brownfield projects, provides a lower CAPEX and will reduce OPEX for operators whilst simultaneously improving the efficiency of assets and cutting the environmental impact. Blue H₂ via SMR can accelerate the introduction of economically viable H₂ as a low-carbon fuel for heating, transport and industrial processes. Retrofitting existing grey H₂ production units to reduce the carbon intensity will be a near-term focus for the industry.

"Wood's approach provides a step-change in innovations..."

Wood's approach provides a step-change in innovations that are beyond the simple addition of carbon capture to existing units by focusing on more holistic, lower CAPEX solutions that reduce lost production time and do not sacrifice the potential reduction in carbon intensity.

Connect with our experts

If you would like to discuss any of the points raised in this viewpoint in more detail, then please get in touch.



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Wood. Powered by possible

The need for change has never been greater. In our industries, in the way we treat our planet, and in how we live.

To challenge the status quo we must be brave – it's having the courage to forge new answers. We're 40,000 inquisitive minds, on a quest to unlock solutions to the world's most critical challenges, across all of energy and the built environment.

United by our mission to create a sustainable future as the world evolves to a cleaner planet. Our bold spirit drives us to lead the charge, our actions transform challenges into solutions, and our curiosity keeps us pushing, innovating, making the impossible... possible.

Because we understand the time for talk is over. Because the world needs new answers to old challenges. Because at Wood, we are future ready, now.

For further information please go to:

[woodplc.com](https://www.woodplc.com)



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