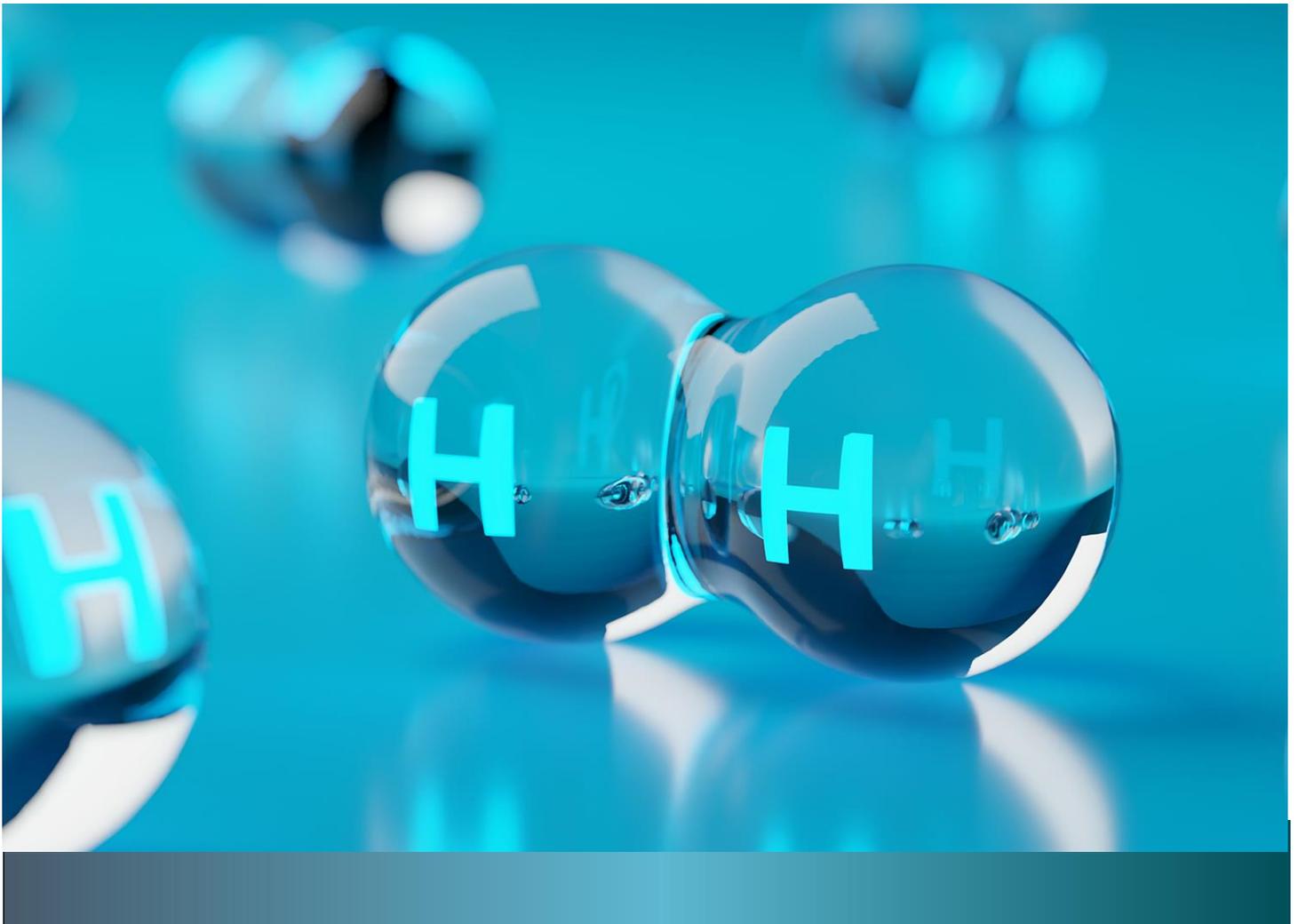


CORNWALL INSIGHT

CREATING CLARITY

# A year of progress: Low-carbon Hydrogen Policy Index findings

April 2024





*The role of low-carbon hydrogen in achieving our net zero targets has been a hot topic of conversation in recent years, both within industry circles and in mainstream media. As the discussion continues to build, Cornwall Insight has developed the Low-carbon Hydrogen Policy (LCHP) Index to interrogate the policy and strategy frameworks presented, by countries who have branded themselves as potential leaders in the new hydrogen economy. Thus, this index maps jurisdictions according to the strength of their policy commitments and progress towards their strategies for supporting the development of low-carbon hydrogen. The index is driven by a range of factors, including the detail of published hydrogen strategies and the extent of hydrogen targets. This report exclusively looks at policy related to low-carbon hydrogen, meaning both ‘green’ electrolytic hydrogen produced using renewable electricity and ‘blue’ fossil fuel-derived hydrogen with carbon capture use and storage (CCUS). For the purposes of this report, any references to ‘hydrogen’ should be understood as green or blue hydrogen unless stated otherwise. For nations with separate policies at the state, provincial or jurisdictional level (such as the US or Canada) the LCHP Index will only consider policy at the national or federal level.*

## A year of progress

Since publishing the previous iteration of the LCHP Index in April 2023, the global hydrogen market has continued to grow and develop as both national governments and industry stakeholders have sought to expand the role of hydrogen in their decarbonisation plans.

This increased interest in hydrogen can be seen clearly with the International Energy Agency (IEA) noting that 2023 was a major year for low-carbon hydrogen project announcements, and the latest estimates suggesting that worldwide production could reach 38Mt by 2030.<sup>1</sup> While not on the scale needed to completely

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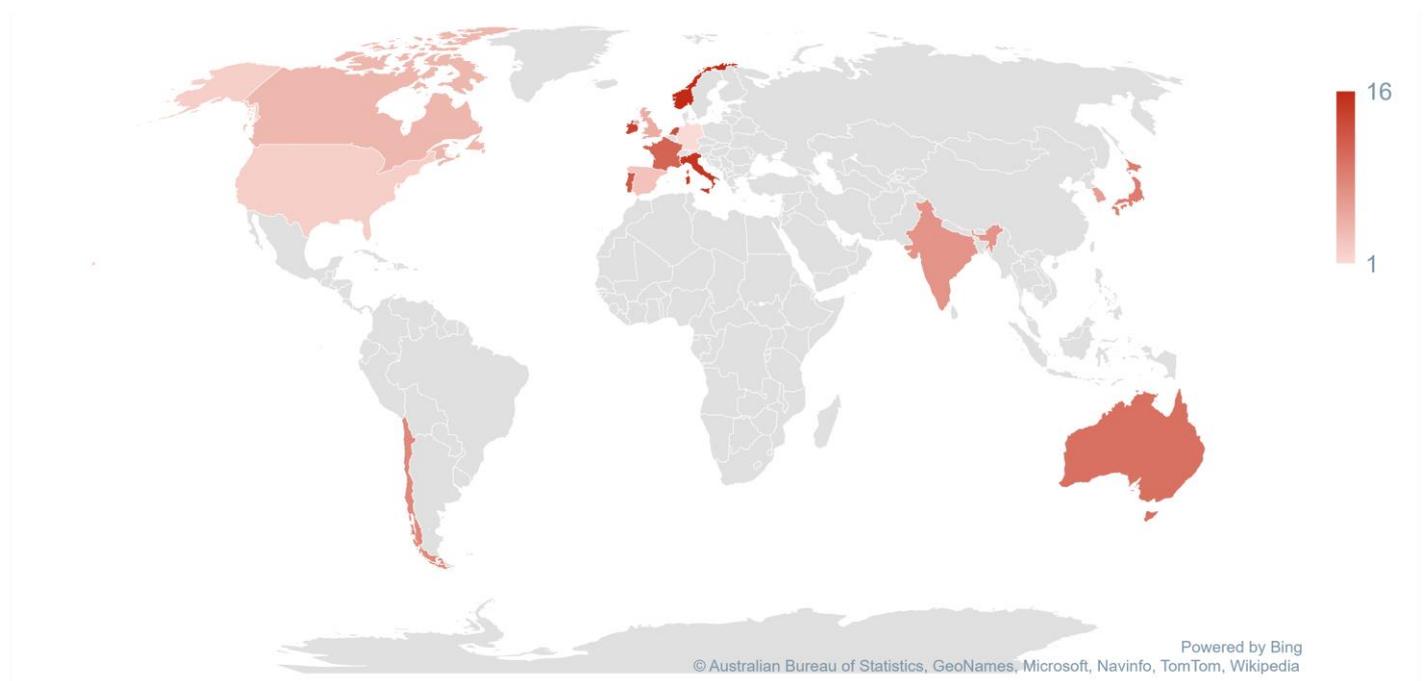
<sup>1</sup> [IEA](#)

decarbonise existing hydrogen demand – which stood at around 95Mt in 2023 – this would represent a significant increase from 2023 where only 665t (0.7%) of all hydrogen production came from low-carbon sources.<sup>2</sup> In order to realise this potential, however, it is imperative that governments work faster to provide industry with the building blocks and investment certainty needed to progress projects. Of particular importance here is the development of market regulation and support schemes, outlining plans for infrastructure and projecting future demand.

## Country rankings

In an effort to more accurately reflect the growing desire to develop low carbon hydrogen across the globe, two new countries have been added to this iteration of the LCHP Index. Following the publication of its National Clean Hydrogen Strategy and Roadmap<sup>3</sup> in June 2023, the US has been added to the Index. India has also been added following publication of its Green Hydrogen Mission in January 2023.<sup>4</sup>

**Figure 1 – LCHP Index heatmap**



**Figure 2 – LCHP Index scores and rankings**

	Score	Ranking	Absolute change	Relative change (compared to April 2023 Index) *
Germany	8.70	1	0	0
United States	8.60	2	N/A	N/A
Spain	7.50	3	0	+1
Canada	7.30	4	+3	+4

<sup>2</sup> [IEA](#)

<sup>3</sup> [Department of Energy](#)

<sup>4</sup> [Ministry of New and Renewable Energy](#)

United Kingdom	7.20	5	0	+1
South Korea	6.71	6	-4	-3
India	6.70	7	N/A	N/A
Japan	6.60	8	-4	-2
Chile	6.50	9	-1	+1
Australia	6.40	10	0	+2
France	5.80	11	-5	-3
Portugal	5.70	12	-1	+1
Netherlands	5.40	13	-4	-2
Ireland	5.30	14	0	+2
Italy	4.90	15	-2	0
Norway	3.50	16	-4	-2

All countries ranked on the LCHP Index are allocated a score out of ten across a list of differently weighted indicators, outlined below. These are then combined and calculated to give a final score, upon which rankings are determined.

\*Absolute change refers to the overall change in ranking while relative change tracks the change in ranking since the previous iteration of the index, without the inclusion of the US and India

## Germany

Germany has retained the top spot on the LCHP Index as the government has updated and enhanced its future hydrogen plans while also allocating additional funding to hydrogen projects across the country.

In July 2023, Germany updated its National Hydrogen Strategy.<sup>5</sup> Among the key announcements were the formal commitment to achieving 10GW of low-carbon hydrogen capacity by 2030; developing a 1,800km hydrogen pipeline network by 2027-28; creating a hydrogen certification scheme; and clarifying plans for hydrogen uses in industry. While Germany previously had a firm commitment to developing only electrolytic renewably-derived hydrogen, the updated strategy also considers the use of other types of low-carbon hydrogen – including fossil fuel or waste derived with CCUS, or biogas derived – in the market ramp up phase.

Germany has also allocated significant additional funding to hydrogen projects across the country in 2023 and early 2024. Namely, in February 2024 the European Commission (EC) gave the go-ahead for funding 24 hydrogen Important Projects of Common European Interest (IPCEI) across Germany, for which the federal government and länder have earmarked €4.6bn (~£3.9bn) for production, transport, and storage of green hydrogen.<sup>6</sup> Also in February 2024, Germany committed €3.53bn (~£3bn) to support the import of green hydrogen from 2027-36.<sup>7</sup> Further announcements are expected to be forthcoming throughout the year as Germany became the first Member State to participate in the European Hydrogen Bank's (EHB's) 'auction as a service' scheme.<sup>8</sup> Here, Member States can allocate State Aid funding to hydrogen projects eligible for but unable to secure contracts under EHB auctions.

<sup>5</sup> [Bundesministerium für Wirtschaft und Klimaschutz](#)

<sup>6</sup> [Bundesministerium für Wirtschaft und Klimaschutz](#)

<sup>7</sup> [Bundesministerium für Wirtschaft und Klimaschutz](#)

<sup>8</sup> [European Commission](#)



The government has also been working to develop its €4bn (~£3.4bn) Climate Protection Contracts scheme to help enable German industry to decarbonise.<sup>9</sup> Eligible industries will either receive funding from the state or pay back to the state depending on whether the actual costs of decarbonising production processes are above or below 'relevant market prices'. While this is not a hydrogen subsidy per se, it is likely to reduce the cost of decarbonising via hydrogen, particularly for large industrial users. At the same time, Germany is also developing a subsidy scheme for hydrogen power plants through the Power Station Strategy (PSS).<sup>10</sup> Through a tendering and auction process, the government aims to support the development of natural gas fired power plants on the condition that they are converted to use hydrogen in the period between 2035 and 2040. It must be noted, however, that these plans have been scaled back significantly due to a reduction in climate funding across Germany, with the PSS now aiming to support 10GW capacity, down from its initial target of 25GW.

## **United States**

Following the introduction of its National Clean Hydrogen Strategy and Roadmap in June 2023, the US has been added to the LCHP Index. Given the extent of the measures included in the strategy and the levels of government funding committed, the US has earned second place on the LCHP Index.

The US has made strong commitments to developing its low-carbon hydrogen economy since June 2023 and has set out a series of robust targets across key sectors from 2022-36. Most importantly, the US aims to produce at least 10mt (million tonnes) of low-carbon hydrogen per year by 2030 with the potential to produce more, depending on market conditions. Following this, production would scale up to 20mt/yr by 2040, reaching 50mt/yr in 2050. This is the single largest target of any country ranked on the LCHP Index. The US is also targeting a significant cost reduction for hydrogen production, with a goal to reach \$1/kg (~£0.80) in the period 2029-36.

In order to develop new technologies efficiently and at scale, the US is also planning to set up regional clean hydrogen hubs (H2Hubs). These will be funded by \$7bn (~£5.6bn) from the Bipartisan Infrastructure Law – with an additional \$1bn (~£800mn) from the Office of Clean Energy Demonstrations<sup>11</sup> – and will, according to the government, “be a central driver in helping communities across the country benefit from clean energy investments, good-paying jobs, and improved energy security.”<sup>12</sup>

Alongside the National Strategy, the US implemented the Inflation Reduction Act in August 2022, which extends around \$369bn (~£290bn) in tax credits, grants, and loans to support clean energy technologies over a period of ten years.<sup>13</sup> The Clean Hydrogen Production Tax Credit is of particular importance here as eligible low-carbon hydrogen producers can receive price support between \$0.60-3.00/kg (~£0.50-2.40) (depending on carbon intensity).<sup>14</sup> In addition, projects can also apply for a 30% investment credit under the Advanced Energy Project Credit and can ‘stack’ their production support with either the Renewable Energy Production Tax Credit or Zero-emission Nuclear Tax Credit.

## **Spain**

Spain has made significant strides to develop its low-carbon hydrogen plans over the past year and has, due to addition of the US, retained its third place position. Most significantly, Spain has increased its hydrogen capacity targets by 175% and has announced funding for its first hydrogen electrolyser support scheme.

In July 2023, Spain submitted its Draft Energy and Climate Plan to the EC for feedback and approval.<sup>15</sup> Among many other commitments, the Spanish Government significantly increased its hydrogen capacity targets from 4GW to 11GW by 2030. This appears to be more in line with the Spanish Government’s expectations for

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<sup>9</sup> [European Commission](#)

<sup>10</sup> [Bundesministerium für Wirtschaft und Klimaschutz](#)

<sup>11</sup> [Office of Clean Energy Demonstrations](#)

<sup>12</sup> [Office of Clean Energy Demonstrations](#)

<sup>13</sup> [Congress.gov](#)

<sup>14</sup> [Office of Energy Efficiency & Renewable Energy](#)

<sup>15</sup> [European Commission](#)



hydrogen development across the country as it had previously commented on major potential and enthusiasm for developing green hydrogen projects in Spain, with the expectation that the country would exceed its 4GW target by a large margin.

To support developers in reaching this new target, the Spanish Government finalised the first call of its hydrogen incentive programme for large electrolysis demonstrators and innovative renewable hydrogen production projects in June 2023.<sup>16</sup> Stemming from 2021's Recovery and Resilience Plan and funded with €100mn (~£85.7mn) through the NextGenerationEU scheme, successful applicants can receive a non-refundable subsidy for 25-60% of the 'eligible costs' to develop and manufacture large electrolyzers or for the "real and effective integration of a large electrolyser in an industrial context."

## Canada

Canada has undergone the most significant change on the LCHP Index, rising three positions to third place. This comes after the government announced further details of its planned Investment Tax Credits for clean energy technologies, including hydrogen, in December 2023.<sup>17</sup> The proposed Clean Hydrogen Investment Tax Credit will reimburse developers between 15-40% – depending on carbon intensity – of their taxes on eligible expenses incurred for blue and green hydrogen projects. The scheme will run until 2034 with an estimated budget of CAD\$17.7bn (~£10.4bn) over 12 years. Alongside this, the government is also continuing to consider the introduction of a contracts for difference-style subsidy to support hydrogen production.

The Canadian Government has also continued to develop future partnerships to facilitate the export of clean hydrogen. For instance, in March 2024, the Canadian and German Governments signed a Memorandum of Understanding to establish a "first-of-its-kind bilateral program" to implement a transatlantic hydrogen corridor.<sup>18</sup> Among other things, this will accelerate commercial-scale trade between Canada and Germany and secure early access to the German market for Canadian hydrogen producers. Germany will also designate Canada as a priority market for procuring hydrogen. As Germany is positioning itself to be Europe's largest hydrogen consumer, this agreement gives Canada access to a major offtake market.

## United Kingdom

Due to the addition of the US, the UK has remained in fifth place on the LCHP Index, however, its relative position on the Index has improved. In the previous iteration of the Index, it was noted that the UK needed to deliver more clarity on low-carbon hydrogen policy if it were to remain among the frontrunners in the race to develop this emerging sector. While some gaps remain, the government has made significant progress to deliver this clarity over the past year.

As part of its continued efforts to inform the market, the UK has published several hydrogen roadmaps over the past year, highlighting key government commitments and laying out plans for the future of the sector. In its latest Hydrogen Net Zero Investment Roadmap, published in February 2024, the government highlighted the growing investment opportunities for hydrogen in the UK as well as the increased pipeline of potential projects which grew from 20GW (in April 2023) to an estimated 27GW by 2037.<sup>19</sup> Alongside this, the government produced its updated 2035 roadmap, noting key milestones such as the launch of Hydrogen Allocation Round (HAR) 3 and the final design of transport and storage business models in 2025. Many of these updates stemmed from the government's December 2023 hydrogen announcements – most of which are covered in the Hydrogen Strategy Delivery Update – where the future of hydrogen business models, subsidy support, demand estimates, and hydrogen standards were clarified, among other things.<sup>20</sup> Also in December 2023, the government published Version 3 of the Low Carbon Hydrogen Standard.<sup>21</sup>

<sup>16</sup> [\*Instituto para la Diversificación y Ahorro de la Energía\*](#)

<sup>17</sup> [\*Office of the Parliamentary Budget Officer\*](#)

<sup>18</sup> [\*Natural Resources Canada\*](#)

<sup>19</sup> [\*HM Government\*](#)

<sup>20</sup> [\*Department for Energy Security and Net Zero \(DESNZ\)\*](#)

<sup>21</sup> [\*DESNZ\*](#)



The results of HAR1 were also published in December 2024, announcing 11 successful projects to contribute 125MW – from an initial target of 250MW – of low-carbon hydrogen capacity by 2025.<sup>22</sup> With support under HAR1, projects will receive a strike price of £241/MWh – supported by £2bn funding through the Hydrogen Production Business Model – over a period of 15 years. Alongside this, the government outlined the timelines for future HAR auctions, with the next taking place in late 2024 and aiming to secure 875MW capacity, subject to value for money.<sup>23</sup>

At the same time, however, the government is yet to gather sufficient evidence to inform imminent hydrogen policy decisions, such as the use of hydrogen in domestic heating in 2026. As such, some industry stakeholders have urged that the government accelerates its research in this space and comes to a clear conclusion. Otherwise, it is felt that progress towards installation of alternative low-carbon domestic heating could stagnate due to uncertainty around the future uses of hydrogen.

## **India**

In January 2023, India published its Green Hydrogen Mission, outlining the country's future plans to develop expansive green hydrogen infrastructure for the purposes of decarbonising existing hydrogen supply and selling on emerging export markets.

India sets its Mission out in two phases covering the periods of 2023-26 and 2026-30. In the first phase, India intends to focus on creating demand for green hydrogen by increasing domestic electrolyser manufacturing capacity and developing a range of incentives to encourage the indigenisation of the hydrogen value chain. In the second phase, the Indian Government expects that the cost of producing green hydrogen will have fallen sufficiently to allow for an accelerated growth in production volumes. Depending on wider market conditions, commercial-scale green hydrogen projects in steelmaking, shipping, and mobility may be undertaken. If successful, India expects to produce 5mt of green hydrogen per year by 2030, with the potential for this to reach 10mt/yr if there is sufficient growth in export markets.

To encourage investment in green hydrogen and improve its ability to compete with conventional fossil fuel derived hydrogen, India will also introduce subsidy support for electrolyser manufacturing and green hydrogen production with an initial budget of ₹17,490 crore (~£1.65bn) until 2029-30. Details of the production incentive were released in January 2024, outlining a subsidy of ₹50/kg (~£0.50) in the first year, falling to ₹40/kg (~£0.40) then ₹30/kg (~£0.30) over the course of the three year support.<sup>24</sup> While this is a step in the right direction, industry players find this to be insufficient to encourage the levels of investment needed to reach the country's ambitious targets.

## **Ireland**

Ireland has remained in fourteenth place on the index due to the addition of both the US and India. However, its relative position on the Index has improved following the publication of its first National Hydrogen Strategy in July 2023.<sup>25</sup>

While Ireland's overall hydrogen capacity targets have not changed with the introduction of the National Hydrogen Strategy, the plans for the wider hydrogen market have been clarified. The strategy outlines timelines for methods of hydrogen production, storage, transport, and end uses from 2023 until 2050 and sets out a series of actions until 2030. Among these actions are developing commercial business models and delivering a roadmap to bring net zero dispatchable power solutions to Ireland by 2030. To ensure that the strategy remains fit for purpose, the Irish Government plans to conduct regular reviews of the strategy and align it with the needs of the hydrogen sector as it develops. Ireland is also expected to release the details of its proposed Hydrogen Innovation fund – to be established from 2023-27 – in 2024.

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<sup>22</sup> [DESNZ](#)

<sup>23</sup> [DESNZ](#)

<sup>24</sup> [Ministry of New and Renewable Energy](#)

<sup>25</sup> [Government of Ireland](#)



## Appendix

All currency conversions within the LCHP index are based on Bank of England exchange rates on 2 April 2024.

Currency	Bank of England exchange rate
Australian Dollar	1.9292
Canadian Dollar	1.7062
Euro	1.1637
Indian Rupee	104.7428
Japanese Yen	190.4969
Norwegian Krone	13.6401
South Korean Won	1698.7065
United States Dollar	1.2567



## **Indicators:**

A range of indicators, subject to differing weightings, have been utilised in the production of this index. They are listed as follows without regard to importance or weighted value:

- Detail of national hydrogen strategy
- Timelines for low-carbon hydrogen sector development
- Low-carbon hydrogen capacity, production, and infrastructure targets
- Low-carbon hydrogen storage, transport, and network targets
- Planned review of national hydrogen strategy
- Support mechanisms for low-carbon hydrogen
- Low-carbon hydrogen project pipeline

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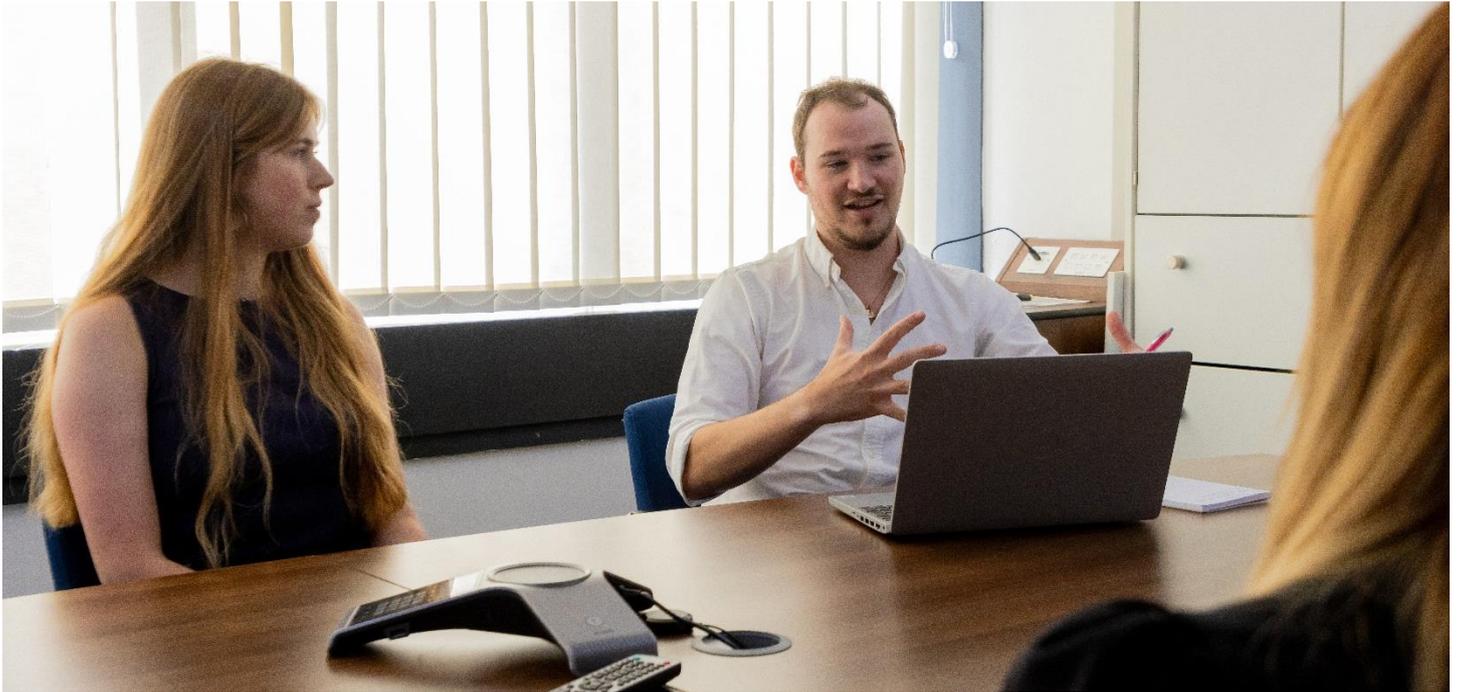
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