

Year in Review

2022

Green hydrogen moves to centre stage

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GH2 Year in Review

Welcome to the first annual review from the Green Hydrogen Organisation (GH2). To all of you who have contributed to the development of good practices and provided leadership, who have participated in our activities and, crucially, funded our activities, we are forever indebted.

GH2 has established itself as the only global non-profit organisation focused on the rapid and sustainable scale up of the green hydrogen economy. While instigated by enlightened industry players, GH2 sets itself apart through its commitment to partnership between governments, industry and civil society.

With this short publication, we provide an overview of highlights, trends and policy challenges for green hydrogen. We detail how GH2 has influenced the development of the green hydrogen sector and our key activities over the last 12 months. Our audited accounts, board meeting minutes and more complete reporting is available at www.gh2.org.



Jonas Moberg
CEO, Green Hydrogen Organisation

Policy progress: blue hydrogen is no longer seen as a bridge to green.

A year ago, it was a commonly held view that blue hydrogen production was likely to reach significant scale ahead of green hydrogen because green hydrogen was decades away. The acceleration of the energy transition and the growth of the green hydrogen industry shows that we don't need blue to get to green. We will see large amounts of green hydrogen production by 2030. It is always hard to establish causality and identify attribution to a change of policy, still we hold that GH2 has contributed significantly to the growing global focus on sustainable green hydrogen.

Through the rapid development and launch of the Green Hydrogen Standard, GH2 has defined green hydrogen and green ammonia. When the Standard was launched, few spoke about the need for the large-scale renewable energy and the green hydrogen economy to be built with absolute respect for wider environmental, social and governance standards. Today, such references are commonplace, even if words and commitments have yet to translate into practice. When the Standard was launched and we introduced the SDG requirements, few spoke about the need to ensure an equitable transition, resulting in jobs and prosperity locally. Today, these themes are being recognised as essential in developing the industry's social license.

A thick, teal-colored wavy line that starts from the top right, curves down and left, then curves back up and right, creating a large, open loop that frames the text on the left side of the slide.

“The Green Hydrogen Standard provides certainty and transparency to investors and other stakeholders that green hydrogen is exactly that: hydrogen made with renewable electricity which conforms to the highest standards on emissions, ESG and the sustainable development goals.”

--- GH2 Chair and former Australian Prime Minister **Malcolm Turnbull**

For hydrogen to fulfil its promise to address climate change and decarbonise key sectors of our economy like steel and shipping, it must be produced in ways that are aligned with our climate goals. Unfortunately, standards being adopted around the world risk validating hydrogen produced with unacceptably high emissions. When the International Energy Agency, IRENA and the UN High Level Champions prepared their Breakthrough Agenda Report 2022, they referred to low carbon hydrogen without a clear definition.

When the final report was published it stated: “While this report does not define a specific carbon intensity limit for low-carbon and renewable hydrogen, both of these production routes will need to achieve verifiable low carbon intensities that trend towards near zero by 2030.” GH2 played a significant role behind this statement. Much work is ahead of us in holding governments and companies to account so that only 1.5 degree aligned hydrogen is lent credibility and receives policy support.

In the last year there has been clear progress by governments which have made investment in large-scale renewable energy and the green hydrogen economy more viable and which have overcome first mover disadvantages. Most notable is of course the Inflation Reduction Act in the US. There is growing awareness

that **multilateral development banks** need to significantly step up and support developing countries and emerging economies seeking to host the green hydrogen economy. These development banks must provide hosting governments with the financial resources required to attract investment. Through GH2’s programme on development finance for green hydrogen we have brought banks together, shared examples of how it can be done and developed good practices. Using the Nouakchott Message, we must now focus on concrete funds, co-funding feasibility studies and paving the way for long-term concessionary and blended finance arrangements.

The Green Hydrogen Standard’s one kilo CO₂e per kilo H₂ threshold caught imagination and has influenced governments, notably India and Egypt. Piloting the standard has been slow, in part because projects take time to develop. GH2 did well to add an ammonia protocol and we are making reasonably good progress towards the standard covering the whole life-cycle.

A standard is only useful to customers if it addresses all emissions, from the generation of the energy to the use of it. We have been reasonably good at focusing on water and addressing how the Standard will align with regulatory requirements such as the European Union's rules. Our efforts with the Green Hydrogen Standard are only just getting started. There are many important issues, such as how to measure leakage, which need to be addressed.

Progress is being made by governments which are developing and learning from each other how to create the wider enabling environment for the green hydrogen economy. Our work supporting the governments which make up the Africa Green Hydrogen Alliance is an example. Within **Good Green Hydrogen Contracting – for People and Planet**, our collaboration with the seven law firms has been successful. Guidance has been widely used, webinars popular and good practices are being established and made available as a public good. Transactions costs and the time it takes to develop projects is being brought down. Our upcoming work on financial modelling and on good legislative practice should be relevant for the growing number of governments with ambitious plans for the energy transition and the green hydrogen economy.

During its first full year of existence, GH2 has worked hard across platforms to engage a wide set of stakeholders. There is a clear need for governments and the private sector to engage civil

society, particularly in developing countries and emerging economies. The energy transition has to be just, and trust must be earned for the renewable and green hydrogen economy. The civil society roundtable on green hydrogen is a start, though we have much to do.

Launching the Planning for Climate Commission to speed up fair permitting was a good call by GH2. We mention it often and the message resonates well with governments. It needs to start to deliver knowledge products and the message needs to be amplified.

And, of course, we work closely with leading companies. We have co-founded the Global Renewables Alliance, together with the Global Wind Energy Council and other organisations along the renewable energy supply chain.

It is only by working faster and focusing together that we will be able to deliver on time.

Jonas Moberg

CEO, Green Hydrogen Organisation

26 May 2023

In 2022, our Swiss foundation was registered. We created our own systems for book-keeping, and human resource management and developed procedures and codes of conduct.

In 2022, the Board met four times, including in-person in Barcelona. The Management Committee was created, with Malcolm as its chair, and with Todd Clewett, Nienke Homan and Jonas Moberg as members. The audited accounts and further information are available at www.gh2.org



GH2 4th Board Meeting
Barcelona, Spain, 16 May 2022

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“Green hydrogen is, in a way, the sleeping giant of the energy transition, and I believe will have a bigger impact on tackling climate change than any other technology. GH2 has been established to tell this story and coordinate a dramatic acceleration of the green hydrogen sector. Every responsible business should be backing this effort. We have the technology at our fingertips. With determination, cooperation, and the leadership of GH2 and its members we can transition away from fossil fuels way faster than most people realise.”

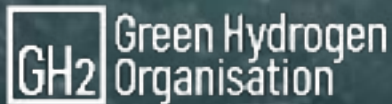
--- founding chairman of Fortescue Metals Group and the Munderoo Foundation **Andrew Forrest**

Green Hydrogen Standard



- Launched May 2022: 1kg threshold together with ESG and SDG requirements
- DNV engaged for company testing
- **Rapid Assessment Tool** being rolled out
- **Ammonia protocol** adopted
- **Green Hydrogen Standard Committee** established with working groups on:
 - **transportation, storage & distribution** of green hydrogen and derivatives
 - **Synthetic Methane (eNG), Green Methanol** (and possibly SAF)
 - on **water** resource management
 - on **fugitive** hydrogen emissions.
 - on **data standards** to address renewable electricity certification (including additionality, time matching and bidding zones)

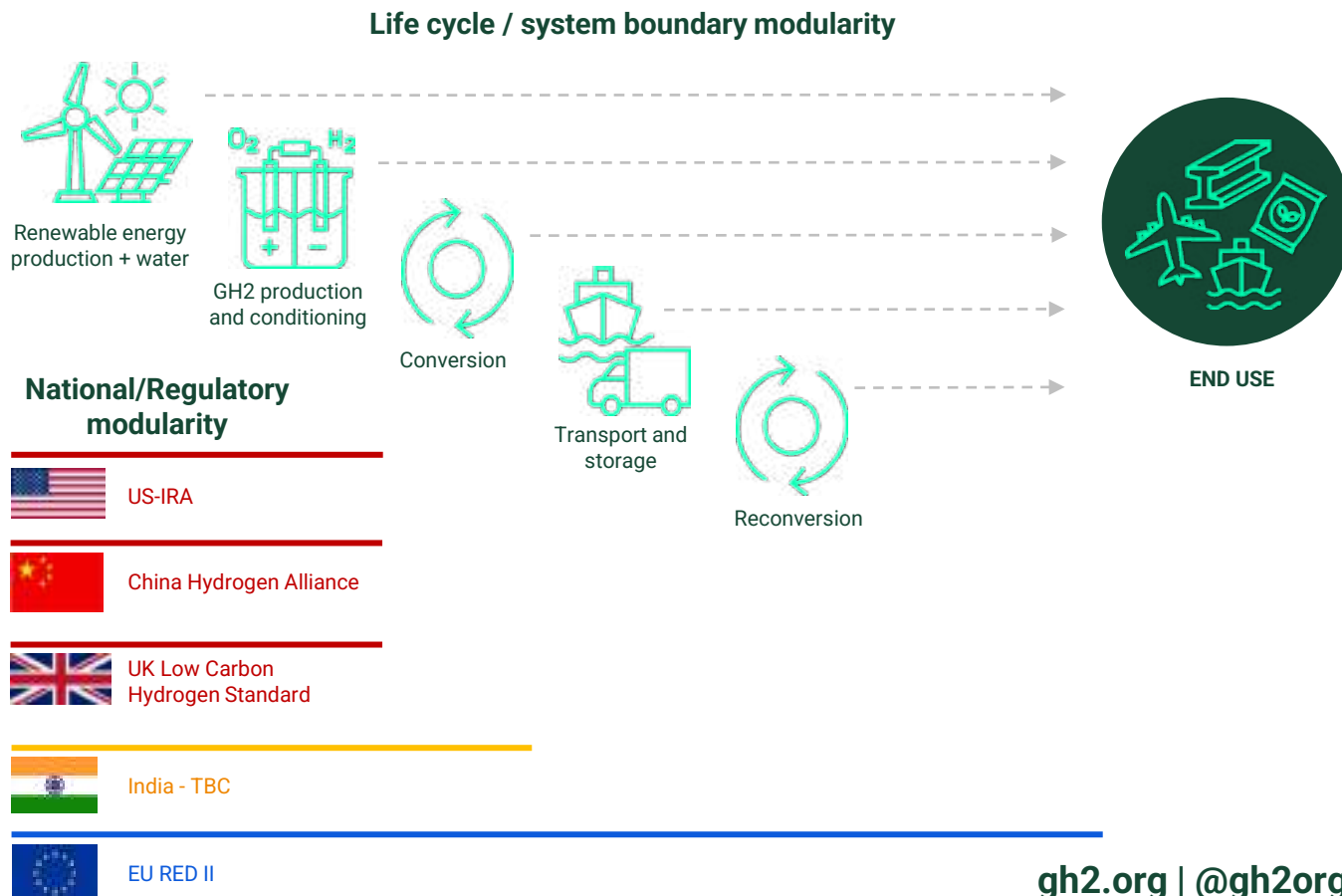




“Any effort to create a standard for hydrogen must be aligned with the need to limit global warming to 1.5 degrees. It must also be flexible enough to cover a wide range of hydrogen products and applications. The Green Hydrogen Standard™ uses a modular approach. This supports interoperability across different jurisdictions, products, and applications. It also increases transparency and accountability, which helps builds trust among producers, consumers, and other stakeholders.”

— Green Hydrogen Standard Director **Sam Bartlett**

Green Hydrogen Standard — modular application





“I congratulate GH2 on launching the Green Hydrogen Standard. This is a very timely and critical first step in building the confidence and transparency needed in the market amongst producers, investors, offtakers and the broader community to kick start the global trade of green hydrogen. If there is any chance of limiting global warming to 1.5 degrees, every industry sector must pull its weight. Green H2 is the true green solution to decarbonising the notoriously hard to abate industry sectors the group operates in. We are on track to produce green hydrogen by Q1 2023, so the future of green hydrogen is now. We encourage governments and key industry players around the world to rally behind the Green Hydrogen Standard.”

--- Chairman/Co-CEO of Korea Zinc **Yun-Beom Choi**

Government and Regional Engagement

Country Portal

- 24 countries with their green hydrogen strategies hosted on the GH2 Country Portal.
- A comprehensive overview of the announced policies, targets and fundings towards the development of green hydrogen outlook.



China's National Strategy Timeline



Engaging third countries on the EU's Delegated Acts

Renewable fuels of non-biological origin

 Principles	 Requirements	 Exemptions/waivers
 Additionality	Renewable asset built no more than 3 years before electrolyser production. No OPEX or CAPEX subsidy received.	Does not apply until 2038 if electrolyser comes into operation before 2028. Some exclusions to subsidy restrictions.
 Time matching	Hourly from 1 January 2030	Monthly until 31 December 2029
 Geographical matching	Same bidding zone or interconnected bidding zone if day-ahead market price is equal or higher.	Equivalent concepts for bidding zones (and curtailment periods) can be used in third countries.

 Carbon intensity	3.38kg CO2e/kg H2 70% greenhouse gas emissions saving compared to fossil fuel comparator. Full life cycle including: upstream emissions, emissions associated with taking electricity from the grid, processing, transport to end-user.
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Letter to Frans Timmermans from Malcolm Turnbull

“I am concerned that the implications for green hydrogen production outside the European Union are not getting the attention they deserve”

--- GH2 Chair and former Australian Prime Minister **Malcolm Turnbull**





AGHA

The Africa Green Hydrogen Alliance

- The Africa Green Hydrogen Alliance member countries: Egypt, Kenya, Mauritania, Morocco, Namibia, and South Africa
- Launched a report setting **out Africa's Green Hydrogen Potential** at COP27, with clear renewable energy, electrolyser and financing targets to realise the African green hydrogen economy.
- The Alliance has achieved remarkable progress since its establishment in May 2022 having had its **first Ministerial Steering Committee** meeting in February 2023 which was chaired by GH2's board member Hon. Kandeh Yumkella.
- AGHA has matured as a **platform for collaboration** between government ministries, project developers and financiers, civil society, and academic institutions as members continuously exchange knowledge and best practices on financing, certification, local content, policy and regulations.



The Africa Green Hydrogen Finance Accelerator Forum
Nouakchott, Mauritania, 13-14 April 2023

- The Alliance members continue to work collaboratively with a range of **strategic partners** such as the African Development Bank (AfDB), African Union Development Agency (AUDA-NEPAD) and United Nations Economic Commission for Africa (UNECA), the team of the UN Climate Change High-Level Champions and the World Bank.
- Expanded engagement with **other countries** such as Ethiopia, Angola, Cameroon, Djibouti, Ghana, Nigeria, Niger, and Tunisia towards supporting the countries in realising their large-scale renewable energy and green hydrogen potential.
- AGHA became a member of the World Bank's Hydrogen 4 Development Partnership with Mauritania and Kenya co-chairing a working group on Socioeconomics and Sustainability for Clean Hydrogen.
- An **AGHA Certification Working Group** led by Egypt, Kenya, and South Africa was set up to facilitate a discussion on possible common principles and approaches to green hydrogen standards and certification for African green hydrogen producers.



Hon Malcolm Turnbull, Chair GH2, Mauritania's Minister of Finance Isselmou Ould Mohamed M'Bady, Mauritania's Minister of Economic Affairs, Ousmane Mamoudou Kane and Hon Kevin Rudd, Australia's ambassador to the US, at GH2's Development Finance Roundtable, Washington DC, 14 April 2023

India national & regional

- GH2 is gaining traction in India with support from regional governments, civil society, and the private sector. GH2 India has been actively engaging stakeholders through roundtables, webinars and knowledge projects on the development of green hydrogen standards, contracting practices and financing of green hydrogen projects.
- GH2 India has secured strategic partnerships with 5 key state governments (Tamil Nadu, Kerala, Karnataka, Uttar Pradesh, Rajasthan) in India to facilitate the adoption and alignment of their ambitious green hydrogen policies with international good practices.



Meeting with Indian G20 Sherpa, Amitabh Kant
New Delhi, India, 22 March 2023

China

- GH2 has initiated a partnership with the Daxing International Hydrogen Energy Demonstration Zone to advance ambitious green hydrogen policies and standards in China.
- GH2 China is collaborating with green hydrogen investors and project developers in China. We are engaging companies in the process of testing early-stage green hydrogen projects against the global Green Hydrogen Standard and contributing to national public and private sector processes on the development of certification frameworks in China.

Members of the board



Mr Lei Zhang
Founder and CEO –
Envision Group



Prof Yu Gan
CEO –
Nordic Asia Green
Industry Center (NAGIC)



Special Envoy Xie Zhenhua addressing the Green Hydrogen Global Assembly and Exhibition 2022
Barcelona, Spain, 17-18 May 2022

Development Finance Achievements

- The **Roundtable of Development Finance Institutions for Green Hydrogen** was created, for the first time bringing together 16 of the major multilateral development banks and development finance institutions to exchange, coordinate and build capacity to catalyse and de-risk investments in the large-scale renewable energy and green hydrogen economy.
- In collaboration with the major development finance institutions, the publication **Priority actions for development finance institutions** was launched at COP27, including the first overview of development finance programmes and investments in green hydrogen projects.
- The publication **Getting the right blend: Innovative development finance for the large-scale renewable and green hydrogen economy** was launched at the Africa Green Hydrogen Accelerator Forum in April 2023 in Mauritania and at the Roundtable on development finance hosted by GH2 chair Malcolm Turnbull in Washington DC in April 2023. The report and the **Nouakchott Message** provides recommendations for development finance institutions and how their support of the green hydrogen economy can be scaled up.



Contracting Achievements

For people and planet

- Expert working group with seven law firms providing pro bono contributions and representatives from governments, project developers, development finance institutions and civil society to develop **good practice guidance on legislation and contracting** for the green hydrogen industry.
- Launched guidance and organised webinar series on **financing, fiscal terms, land access, transparency and community engagement, sustainable development outcomes and dispute resolution**. Guidance underway on shared infrastructure, offtake agreements and local content. The webinar series has been well received with more than 1000 participants from five continents joining the discussions.

**Baker
McKenzie.**



**LATHAM &
WATKINS LLP**

Bird & Bird

Linklaters



SCHJØDT



“Contracts being signed now will have long term implications, and must strike a balance between the needs for returns on investments and long-term benefits for hosting governments and communities.”

--- Director for the Green Hydrogen Development Plan, GH2
Ines Marques



Launch of the green hydrogen contracting guidance
Barcelona, 17-18 May 2022

Planning for Climate Commission

- A multi-stakeholder **Planning for Climate Commission** was launched to raise awareness for the need to raise awareness for the need for improved planning and approval processes for renewable energy projects and the green hydrogen economy. The Commission consists of government, industry and civil society leaders who will be launching recommendations for **fairer and faster permitting** during the UN General Assembly and COP28.
- Research and consultations to identify good practices and case studies are being undertaken with support by a multi-stakeholder expert advisory group.

“We need a fundamental review on how we dramatically shorten the consenting process”

--- Ørsted chief executive **Mads Nipper**



Launch of the Planning for Climate Commission at COP27
Sharm El Sheikh, South Sinai Governorate, Egypt, 6–20 November 2022

GH2 in the News

S&P Global

Commodity Insights

GH2 launches green hydrogen standard to halt global emissions, spur investment

Hydrogeninsight
Powered by Fitch IIFL

OPINION | 'New subsidy schemes will ensure a breakthrough year for green hydrogen – but these other measures must also be taken'

Talk of trade wars is deeply unhelpful, while developing nations will need support from multilateral development banks, writes Jonas Moberg

OFFSHORE ENERGY

DNV to back green hydrogen standard implementation

The Green Hydrogen Organisation (GH2), a non-profit foundation under Swiss law, has appointed assurance and risk management expert DNV to support the assessment of green hydrogen projects in accordance with the Green Hydrogen Standard.

**AUSTRALIAN
FINANCIAL REVIEW**

Former prime minister Malcolm Turnbull is chairman of the organisation and he told the Financial Review in a joint statement with GH2 CEO Jonas Moberg that Australia should aim for a maximum carbon intensity of one kilogram of carbon emissions per kilogram of hydrogen when it set the definition of "green" hydrogen.

A Geneva-based non-profit organisation originally established by FFI called the Green Hydrogen Organisation, has been an influential voice in the creation of Europe's green hydrogen standards.

S&P Global

Commodity Insights

Argentina to submit bill providing incentives to produce hydrogen for export

European markets are looking to buy supplies from Argentina and other countries in Latin America, Malcom Turnbull, president of the Switzerland-based Green Hydrogen Organisation, said at the event.

NIKKEI Asia

OPINION

Our climate emergency requires huge amounts of green hydrogen

Energy sector provides potential to cut global emissions

Malcolm Turnbull and Andreas Forest
September 26, 2021 10:01 AEST

Hydrogeninsight
Powered by Fitch IIFL

First definition of what constitutes 'green ammonia' will allow it to become a tradeable commodity

Ammonia should only be labelled as "green" if the production process emits less than 300g of CO₂-equivalent (CO₂e) per kilogram of NH₃, according to a new standard from Swiss non-profit Green Hydrogen Organisation (GH2).

Bloomberg Tax

Tax Incentives May Change the Game for Green Hydrogen Investment

"The Green Hydrogen Organisation has predicted that some US facilities may become the cheapest producers in the world for producing green hydrogen."

Weekly Wrap

The GH2 Weekly Wraps are our effort to stay in touch with you all, capture trends, share what is important and in our diary in a way that is longer than a tweet, but shorter than a podcast or article.

We take the pulse of the green hydrogen sector each week, so you don't have to!

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22 May 2023

[Now from Portugal: scaling up renewables and green hydrogen in Latin America](#)



13 May 2023

[Reflections from Rotterdam: the 2023 World Hydrogen Summit](#)



5 May 2023

[We want meet the Sustainable Development Goals without green hydrogen](#)



1 May 2023

[Modular hydrogen standards set on update on the Green Hydrogen Standard](#)



25 April 2023

[The time for development finance for green hydrogen is now!](#)



5 April 2023

[The EU is getting its act together on demand for green hydrogen](#)



31 March 2023

[Hydrogen standards should only lend credibility to truly emissions-cutting projects](#)



17 March 2023

[Green hydrogen is a key part of the Edo Net-Zero Industry Act](#)



10 March 2023

[Hydrogen centre stage at CERAWeek 2023: Africa Green Hydrogen Finance Accelerator Forum](#)



3 March 2023

[India is thinking big on green hydrogen](#)



24 February 2023

[Financing large scale green hydrogen in developing countries and emerging economies: a radical new approach is needed!](#)



17 February 2023

[European Union adapts definition of green hydrogen – implications for domestic and imported production](#)



10 February 2023

[Four takeaways from California on green hydrogen in the United States in 2023](#)



5 February 2023

[The European Green Deal Industrial Plan is welcome but insufficient for green hydrogen](#)



27 January 2023

[Getting legislation and contracting right for a sustainable green hydrogen economy](#)



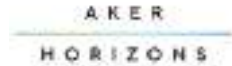
26 January 2023

[Seven, the US Inflation Reduction Act and responses from the EU](#)

Members & Partners



Adani New Industries Ltd
adani.com



Aker Horizons ASA
akerhorizons.com



Ark Energy
arkenergy.com



CWP Global
cwp.global



Envision Group
envision-group.com



Fortescue Future Industries
ffi.com.au



H2 Green Steel
H2greensteel.com



Hy Stor Energy
hystorenergy.com



Hyundai Motor Group
Hyundaimotorgroup.com



Korea Zinc Co LTD
Koreazinc.co.kr



thyssenkrupp
thyssenkrupp.com



The African Hydrogen Partnership (AHP)
afr-h2-p.com



Youth for Green Hydrogen (Y4GH2)
y4gh2.org



Global Renewables Alliance
globalrenewablesalliance.org



World Bank H4D
worldbank.org

“We need to bring civil society and local communities along with us. The green hydrogen economy won’t succeed otherwise.”

--- GH2 Director of Strategy and Communications
Joe Williams



GLOBAL CALL FOR
100 by 2030

At least 100 million tonnes of green hydrogen annually by 2030 – for climate and security

gh2.org | @gh2org

Board and staff

GH2 Board



Hon Malcolm Turnbull
Chairman – the
Green Hydrogen
Organisation



Dr Andrew Forrest
Founding Chairman
- Fortescue Future
Industries



Dr Frannie Leautier
CEO - Southbridge
Investments



Mr Kristian Rokke
CEO - Aker Horizons



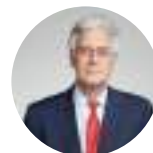
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CEO - Tree Energy
Solutions



Prof Yu Gan
CEO - Nordic Asia
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Center (NAGIC)



Dr Tae Won Lim
Executive VP, Head of the
Hydrogen and Fuel Cell
Business Centre –
Hyundai Motor Company



Lord Adair Turner
Chair – The Energy
Transitions
Commission



Ms Sharan Burrow
Former General
Secretary
The International
Trade Union
Confederation



Ms Nienke Homan
President -
Sustainable
Hydrogen Club



Ms Martina Merz
CEO – thyssenkrup
(succeeded by Dr
Stefan Kaufmann May
2023)



Hon. Kandeh Yumkella
Former Special Representative
of the UN Secretary-General for
Sustainable Energy for All and
Director-General of UNIDO



Mr Yun Choi
Chairman/Co-CEO -
Korea Zinc



Mr James Josling
Regional President
Africa - CWP Global



**Ms Maria Paz
de la Cruz**
Former CEO - H2
Chile



Mr Lei Zhang
Founder and CEO -
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Green hydrogen
moves to centre stage.



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