

**Testimony of Paul Browning
Chief Executive Officer
Fortescue Future Industries (FFI)**

Before the

House Select Committee on the Climate Crisis

Hearing on

“Manufacturing a Clean Energy Future: Climate Solutions Made in America”

February 2, 2022

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Good morning Chairwoman Castor, Ranking Member Graves, and members of the Committee. My name is Paul Browning, and I am the Chief Executive Officer at Fortescue Future Industries, North America, or FFI.

I joined the company in January after serving as President and CEO of Mitsubishi Power Americas since 2016. Earlier in my career I was CEO of General Electric’s Thermal Power business and a Vice President at Caterpillar Solar Turbines. In those roles, I had the opportunity to lead large manufacturing operations around the world and in the US, including in Florida, Georgia, Kansas, Ohio, Connecticut, South Carolina, New York, Maine and California. My teams launched successful green energy businesses in green hydrogen, battery energy storage and renewable power project development, and developed and built energy projects.

As an American citizen, I’m honored to be invited to take part in the American democratic process today. I am excited to have joined FFI at the same time the world is entering an energy transition that will power more of our energy needs with renewable electricity, including hard to abate sectors where renewable electricity will be converted to renewable fuels such as green hydrogen.

FFI is a global green hydrogen company that is committed to producing zero-carbon, green hydrogen made from 100 percent renewable energy. FFI was launched 18 months ago, and in recent months we have developed an ambitious plan to build a large-scale green hydrogen business in North America. A unique appeal of green hydrogen is the breadth of its end-use applications: it can be used to lower carbon emissions in transportation, electricity generation, industrial heat, steelmaking, and other applications. Green hydrogen is already proven – its production, storage, transport, and use have all been safely demonstrated for decades or more.

Green hydrogen is an important option for the US: given the global imperative to address climate change, and the US goals to reduce greenhouse gas emissions by as much as 52% by 2030 and achieve a carbon-free power sector by 2035, we must immediately and significantly increase our investment in the lowest carbon alternatives like green hydrogen produced by renewable energy. Now is the time for America to lead with investment in innovation and scale, and FFI is prepared to lead with you.

Today, my testimony will focus on the following points:

- Green hydrogen is happening right now, and our work at FFI to develop green hydrogen at scale is evidence of this phenomenon.
- Green hydrogen presents an extraordinary opportunity for the US to create new and protect existing manufacturing jobs, increase US competitiveness, and enhance US energy security.
- Capturing the green hydrogen opportunity relies on the right policy environment.
 - Our focus must be directed toward investing in green hydrogen production. With this type of laser focus, the US can capture the environmental, economic, and security benefits of a US green hydrogen economy.

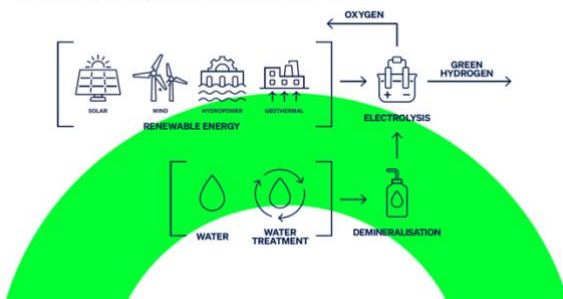
Green hydrogen overview

Before delving into further details, I will answer the question that many are undoubtedly asking: **what makes hydrogen green?** In short, the carbon footprint of hydrogen is determined by the energy sources and the raw materials used to produce it.

Hydrogen is the world's most abundant element. Green hydrogen – hydrogen produced from renewable resources – is the only color of hydrogen that stores intermittent renewables like solar power and wind power, and allows us to deliver them when and where they are needed.

I want to say that again: Green hydrogen stores renewable power. It solves the intermittency problem by capturing this power in chemical form, so that it can be used at a later time, and at a different location. Green hydrogen can be used across sectors to lower carbon emissions in transportation, electricity generation, industrial heat, steelmaking and other applications.

Green hydrogen production process



Green hydrogen is produced through electrolysis, in which electricity is used with a catalyst material to split demineralized water into hydrogen and oxygen. The oxygen is released back into the atmosphere, and hydrogen can be used within the US economy, or exported for uses around the globe. Electrolysis requires electricity, and when that electricity is generated using renewable energy resources like solar, wind, hydropower or geothermal energy with zero carbon dioxide emissions, the result is green hydrogen.

Types of Hydrogen:

Different types of hydrogen are characterized based on the carbon footprint and include:

- Green hydrogen produced from water through electrolysis powered by renewable electricity
- Grey hydrogen produced from natural gas through steam methane reformation
- Blue hydrogen produced from natural gas through steam methane reformation plus carbon capture
- Pink hydrogen produced from water through electrolysis powered by nuclear electricity

Storage and Transport:

The technology for hydrogen storage, pipeline and transport have been safely utilized for decades in the refining industry, which uses hydrogen to desulfurize motor fuels, and the NASA space program, which uses liquid hydrogen as rocket fuel. Green hydrogen can be safely transported in three ways to its point of use:

- As a compressed gas by pipelines, truck, or rail
- After being liquefied at a very low temperature in marine tankers, on trucks or by rail, or
- After being converted into ammonia, synthetic hydrocarbons, liquid organic hydrogen carriers (LOHCs) or methyl cyclohexane (MCH) by chemical tanker ship

Green Hydrogen Use Cases:

The US power grid is most heavily penetrated by wind and solar power in places like California and Texas, and these power grids are already showing a need to store renewable power to be ready for extreme weather events. Extreme heat and drought in California last summer resulted in large, long-lasting power shortages, and winter storm Uri in Texas did the same. These power grids are currently making massive investments in Lithium-ion battery energy storage to meet their short-term storage needs; but, to address week-long extreme weather events like Texas and California have recently endured, long duration storage technologies like green hydrogen will be needed. In addition, green hydrogen provides an alternative to building new HVDC transmission. Converting renewable energy to green hydrogen, transporting it via pipeline, and converting it back to electricity can be an attractive alternative to building new electricity transmission infrastructure.

In the transportation sector, companies such as Cummins, Daimler Trucks, and Hyzon are developing zero-emissions fuel cell semi-trucks that use hydrogen as fuel. They can refuel faster - with longer range and lighter on-road weight - than battery electric trucks. There are also efforts underway to convert shipping vessels and airplanes to hydrogen and green ammonia fuels.

And there is potential for green hydrogen to be blended into existing natural gas pipelines to decarbonize our industries and homes. Indeed, [HyBlend](#) – a DOE-funded consortium of six U.S. national labs – is studying ways to accelerate the use of existing natural gas pipelines for transporting hydrogen.

Green hydrogen is happening right now, with Fortescue Future Industries (FFI) developing at scale

My first point to make to the Committee today is that green hydrogen is happening right now, and our work at FFI is evidence of this phenomenon. FFI is focused exclusively on the value chain to create green hydrogen. It is the practical and implementable solution that will revolutionize the way we power our planet and decarbonize hard to abate sectors. While many companies in the hydrogen space are focused on just one aspect of the supply chain, such as production, transportation, or storage, FFI intends to pursue an integrated approach that includes developing power generation, electrolysis, storage, and transportation projects.

Our capacity to bring significant resources to the table and deliver projects quickly and at scale sets us apart. Over the long term, our vision is to make green hydrogen the most globally-traded energy commodity in the world. This is what will be required to decarbonize the US and global economies and end our reliance on fossil fuels.

As a wholly-owned subsidiary of the Fortescue Metals Group (FMG), the world's fourth largest iron ore producer, our first job at FFI will be to decarbonize our parent company, which has set an industry-leading goal to achieve net zero across its mining, production and transportation operations by 2030. This gives us the advantage of having an early adopter customer for our products and services. We have already demonstrated the use of green hydrogen and green ammonia to power haul trucks, heavy haul locomotives and iron ore carriers in 2021, and in 2022 we will begin to deploy these technologies into our fleet of trucks, trains and ships.

Our next, and perhaps most important, job is to help decarbonize heavy industry around the world by creating a global portfolio of renewable green hydrogen and green ammonia projects that will supply 15 million tons per year of green hydrogen to the world by 2030, rising to 50 million tons per year in the decade thereafter. We employ more than 700 people across 23 countries, and already have a global renewable power project portfolio of over 400 gigawatts in various stages of project development.

- We are building the world's largest electrolyzer plant in Gladstone, Australia with a capacity of 2 GW per year.
- In January, our company announced the acquisition of Williams Advanced Engineering (WAE), an offshoot of the Williams F1 team and world-leading technology and engineering business renowned for its ground-breaking projects in high performance battery systems and electrification. The FMG, FFI and WAE teams will come together to develop world-leading green hydrogen, green ammonia and battery electric freight trains and haul trucks for use in industrial applications.
- In December 2021, FFI and AGL Energy (AGL) announced a plan to evaluate repurposing the infrastructure at a coal-fired power station in Australia for green hydrogen production using renewable energy.

- In October, we announced¹ our first green ammonia supply agreement with construction giant J C Bamford Excavators (JCB) and Ryze Hydrogen of Great Britain to purchase up to 10% of FFI's global hydrogen production.
- Two weeks ago, we announced our second green ammonia supply agreement to provide up to 100,000 tons of green hydrogen equivalent per year, starting as early as 2024, to Covestro, a world-leading supplier of high-tech polymer materials, which has substantial operations [across 11 US states](#).²

FFI is planning a large investment in the United States, which will include research and development, hydrogen offtake agreements, and large projects for renewable power, hydrogen production, green ammonia production and ammonia import/export facilities. These investment decisions are driven by the market conditions created by the combination of the bipartisan Infrastructure Investment and Jobs Act and the energy tax measures in the Build Back Better proposal which I will discuss later my testimony, coupled with conditions on the ground.

As FFI evaluates sites for renewable electricity generation and green hydrogen and green ammonia production, the company considers four key factors:

- *Natural Resources:* Availability of high-quality renewable energy sources such as wind, solar, geothermal and/or hydropower, and access to available water sources.
- *Infrastructure:* Access to existing infrastructure, or the ability to build new infrastructure, for production, storage, and transportation.
- *People:* Our desire to reuse existing infrastructure often leads us to sites that formerly housed a coal or natural gas fired power plant or mining operations. We hope to hire and re-train the people working at those fossil fuel facilities to work at our projects and start a new career in the green energy sector.
- *Investment Environment:* The speed with which this industry moves to full capacity will depend on the investment environment which can be accelerated by smart government investments and tax incentives.

FFI has begun to acquire US companies with critical technology. In November 2021, FFI acquired Xergy to form FFI Ionix Inc, a Delaware-based technology company focused on the commercialization of advanced hydrogen membrane technologies. We also recently announced that we have signed a Memorandum of Understanding with Universal Hydrogen in California for a global offtake agreement to supply green hydrogen for the aviation sector through 2035. In the projects space, we are evaluating green hydrogen project opportunities across the Western US and Texas, and we plan to expand our activities across the country. These actions, coupled with our offtake agreement with Covestro mentioned earlier, are just the first steps in this journey.

And we're hiring as we speak, across the country:

Delaware: We plan to expand our existing Ionix team in Delaware, which specializes in advanced membrane technologies that will help us dramatically reduce the cost of electrolysis.

Florida: My team is recruiting along the I-4 corridor that stretches from Tampa Bay through Orlando for people with Project Development expertise.

Texas: We're also hiring as we speak in the Houston area where we plan to assemble a large team to execute our projects in North and South America. We're looking for civil, electrical, and chemical engineers, wind and solar experts and project construction specialists.

¹ <https://ffi.com.au/news/fortescue-future-industries-signs-agreement-with-jcb-and-ryze-hydrogen-to-become-united-kingdoms-largest-supplier-of-green-renewable-hydrogen/>, downloaded 1-28-22

² <https://www.covestro.com/en/company/covestro-worldwide/united-states/covestro-in-the-united-states/about-covestro-llc/sites#baytown>, downloaded 1-28-22.

Green hydrogen will create and protect US manufacturing jobs, improve US competitiveness, and enhance US energy security

My second point to make to the Committee is that there is an enormous opportunity for hydrogen development in the US to create and protect manufacturing jobs while cutting carbon emissions and enhancing the energy security of the US and our allies.

Building out the green hydrogen industry is a major economic opportunity for the United States. Goldman Sachs forecasts that the green hydrogen industry could be worth up to 12 trillion dollars by 2050, and most analysts believe green hydrogen will account for between 12-25% of the total energy mix by 2050.

Green hydrogen manufacturing can create jobs in the US, many of them located in communities that formerly relied on fossil fuel industries like coal mining or coal-fired power generation and often have the resources, infrastructure and workforce required to site a hydrogen production facility.

Additionally, green hydrogen will help protect US manufacturing jobs in hard to decarbonize sectors. Today there are about [12 million Americans](#) employed in manufacturing jobs, many in industries that are extremely hard to decarbonize, such as iron or steel production. But these jobs are in jeopardy, because already we are seeing leading companies like Apple, Google, Amazon and others require that their suppliers reduce carbon emissions to net zero. Demand for products like green steel, green vehicles, green agriculture and many others will increase rapidly. By replacing fossil energy sources with green hydrogen, it is possible to reduce the carbon footprint of US manufacturing and protect these jobs over the long-term.

A robust domestic green hydrogen sector, will increase US energy security. Green hydrogen made in America can power our country's industrial sector, keeping Americans at work in manufacturing as we move to a low carbon economy. The US can supply the world with green hydrogen, increasing our economic competitiveness and continuing the evolution of the US into an energy exporter. American-made green hydrogen can be a cornerstone of US energy diplomacy, contributing to global stability by reducing the reliance on natural gas supplied by adversarial nations.

Fully capturing the US green hydrogen opportunity requires the right policy environment

My final point for the Committee is that for the US to fully capitalize on hydrogen's potential, the right policies need to be put in place.

The most significant variable in the growth of the green hydrogen sector in the US is the policy environment. Across the globe, we are seeing governments dedicate enormous capital to attracting green hydrogen producers and building their own domestic industry. In the last year, we have seen the US begin to take similar steps. At this early stage in the development of this industry, foundational government support can help de-risk investment and attract private capital. It is imperative that this investment be targeted toward green hydrogen, which today does not have access to the federal support provided to fossil fuel-based hydrogen production.

Specific policy principles that are critical for the growth of the US green hydrogen sector include the following:

- 1) Unlike fossil-derived grey and blue hydrogen, green hydrogen has zero direct carbon emissions. Government support for research and development related to achieving rapid cost reduction of green hydrogen production is essential.
- 2) Today green hydrogen and green ammonia projects are not eligible for tax credits, while blue hydrogen and blue ammonia projects do receive a subsidy in the form of 45Q carbon capture credits. Green hydrogen should receive a production tax credit (PTC) and an investment tax credit (ITC.) We should not allow fossil fuels to receive a subsidy when green hydrogen does not.

We believe the Build Back Better Act must be enacted with provisions that support green hydrogen to provide a level playing field within the hydrogen landscape. Without it, blue hydrogen will have an advantage through the existing 45Q provision, and we risk locking in unnecessary greenhouse gas emissions from the hydrogen sector.

Conclusion

The conditions are ripe for expansive growth in US green hydrogen production and use. Now is the time for America to lead with investment in innovation and scale, and FFI is prepared to lead with you.

Green hydrogen is a reality today. And given that it can be a game-changer in the transition to a low carbon economy that can decarbonize both hard to abate manufacturing and electricity generation, it should be a focus of government efforts to address climate change.

As global demand for green hydrogen rises, those countries with domestic production capacity will be able to meet their own demand at a lower cost without relying on imports. These global leaders will help supply the world, creating manufacturing jobs at home and reaping the economic benefits that come along with being an energy exporter. And American-made green hydrogen can advance our energy diplomacy objectives by reducing reliance on natural gas supplied by adversarial nations.

Governments around the world already recognize the opportunity and are adopting policies to create strong market conditions for hydrogen production. The time for action in the US is now.

FFI is investing in the United States now because in the last twelve months, the outlook for the US hydrogen market has changed dramatically with the investments adopted in the bipartisan infrastructure law and those energy tax measures proposed in the Build Back Better Act.

In summary, if we are to make progress on climate change, we must direct our focus toward green hydrogen production. With this type of laser focus, the US can solidify its position as a global leader in green hydrogen production and capture the environmental, economic, and security benefits of a domestic hydrogen economy.

Thank you for the opportunity to present testimony before the Committee today, and I look forward to your questions.