

Written evidence submitted by AFC Energy (IND0037)

Introduction

As a UK-based innovator and manufacturer of zero-emission power generation solutions, AFC Energy shares the Government's ambition to deliver clean power that drives growth, investment and high-quality jobs for local communities across the UK.

Founded in 2005, AFC Energy is a leading manufacturer of hydrogen fuel cell technology and ammonia conversion products. We currently employ 120 people in highly skilled roles at our Cranleigh facility, which we project will grow to a skilled workforce of over 200 by the end of 2026.

- Our hydrogen fuel cell power generators are designed to replace noisy, polluting diesel generators. We provide clean, quiet power for customers in the UK and export our products across world, helping to decarbonise hard-to-abate sectors including construction and transport. The diesel generator market has a worldwide value of nearly £20 billion and is growing steadily as off-grid power drives construction and infrastructure growth.
- Through our subsidiary, Hyamtec Ltd, we are now bringing to market our next-generation ammonia cracking technology, which converts clean ammonia to hydrogen on-site. In 2023, we opened the UK's largest pure hydrogen-from-ammonia pilot site in Cranleigh, which can generate 400kg/day of fuel-cell grade hydrogen.
- Hyamtec is well positioned for commercial entry into the growing global market for clean ammonia and ammonia conversion technologies. By 2030, the International Renewable Energy Agency (IRENA) projects that up to 20% of the global ammonia market could be green ammonia.
- There is only one other company in the world with technology at a similar stage of development and quality to Hyamtec's ammonia cracker, meaning this is truly a major manufacturing and exports opportunity for the UK.

AFC Energy welcomes this inquiry on delivering the industrial strategy for clean power. The submission below addresses three specific questions set out in the Committee's call for evidence.

Summary of our evidence

- Hydrogen fuel cell and ammonia cracking technologies have strong potential to drive economic growth and strengthen domestic supply chains as industry moves to decarbonise.
- **Without coordinated action from the Government, the UK risks missing out on the growing global market opportunity in clean ammonia.** Other governments in Asia, the Middle East, Europe and North America are already taking action to develop the clean ammonia sector.

- Support from the Government is needed for industry to adopt decarbonisation solutions and for the UK to fully capture the economic potential of hydrogen fuel cell and ammonia technologies. **Our key recommendations for the Government are as follows:**
 - **Ensure upcoming hydrogen funding enables ammonia technologies.**
 - Include ammonia cracking technology within the criteria for future Hydrogen Allocation Rounds.
 - Include ammonia cracking technology as eligible for funding within the forthcoming £500m green hydrogen manufacturing fund, which should be brought forward by the National Wealth Fund.
 - Assess the potential to support the development of ammonia to hydrogen plants in the UK, either through the National Wealth Fund or a separate funding mechanism.
 - **Develop a strategic approach to ammonia across government.**
 - For example, the Government could convene a cross-departmental ammonia working group, with a view to develop a coordinated plan to capture the clean ammonia market opportunity and support UK technology innovators and manufacturers to scale-up our operations.
 - Include a focus on ammonia technologies within the industrial strategy for clean power, as part of enabling the growth of the UK clean energy sector.
 - **Enact policy reforms to realise the UK's ammonia market opportunity.**
 - Classify ammonia as a fuel, rather than industrial chemical, to support the ability of domestic businesses to invest in ammonia cracking technology.
 - Prioritise UK content in domestic clean power projects. Future Hydrogen Allocation Rounds should consider the level of UK content included successful projects. This would drive investment towards UK-made products and support local jobs, which could also bolster domestic energy security.
 - The Environment Agency should streamline the commercial permitting process for clean ammonia to hydrogen projects. Hyamtec is at risk of losing out on our market advantage – and the economic benefits for the UK – due to lengthy and costly delays in permitting. Providing an exemption for an R&D low impact permit for short-term commercial usage would unblock barriers to early adoption of new technology, spurring investment and growth in UK businesses such as AFC Energy.

1. How can UK plc capture its fair share of the economic potential of emerging or less developed energy technologies?

Maximising the UK's expertise in hydrogen and ammonia technologies

With UK innovators at the forefront of hydrogen fuel cell and hydrogen-from-ammonia technologies, there is strong potential to both accelerate decarbonisation and drive economic growth by scaling these technologies.

Hydrogen is widely recognised as the preferred clean fuel solution for decarbonising hard-to-abate heavy industrial sectors, such as steel and cement manufacture, mining, chemicals and power generation – which account for over 50% of global emissions. The UK's Hydrogen Strategy identified hydrogen as critical to the success of the net zero transition.

The Government's existing low-carbon hydrogen funding and support schemes are welcome and necessary to develop the nascent hydrogen economy. However, there remain barriers to hydrogen adoption, such as the lack of dedicated hydrogen pipelines and the large-scale storage, cost and power requirements of on-site electrolysis.

Ammonia cracking technology, in which ammonia acts as a hydrogen carrier, can help to overcome these near-term challenges. Hyamtec's ammonia cracker can make on-site, on-demand hydrogen at a 90% reduction in cost compared to truck delivered hydrogen. There is only one other company in the world with ammonia cracking technology that is at the same stage of development and quality to our ammonia cracker.

The Government's *Invest 2035* green paper recognised the strength of the UK's technical and technological expertise in clean energy. To maximise this expertise, the industrial strategy for clean power should include a focus on ammonia technologies to fully unlock growth in the clean energy sector. Ammonia cracking technology presents a major manufacturing, decarbonisation and export opportunity for the UK, in the context where clean ammonia is poised to play a significant and strategic role in global economic growth and decarbonisation.

The clean ammonia market opportunity

By 2050, the International Energy Agency (IEA) estimates a nearly 40% increase in ammonia production based on current consumption trends alone – which primarily involve ammonia for use as a fertiliser, chemical and refrigerant. Ammonia demand is likely to increase further as ammonia is used for newer applications, including as a hydrogen carrier, energy store and marine vessel fuel. IEA suggests that maritime shipping will use 25-45% of all ammonia consumed in 2050.

There is therefore a need to meet this projected ammonia demand growth whilst simultaneously achieving decarbonisation goals. As such, a global market for clean ammonia and ammonia technologies is emerging. By 2030, the International Renewable Energy Agency (IRENA) project that up to 20% of the global ammonia market could be green ammonia.

Governments around the world have begun to introduce substantial policy support and investment into the clean ammonia market. For example:

- Italy and Saudi Arabia have signed a Memorandum of Understanding on energy cooperation, including a focus on green ammonia.

- The Japanese Government included a focus on the production, transportation and supply chains for ammonia in its 2023 Hydrogen Strategy.
- Japan is collaborating with South Korea on creating a green ammonia supply chain.
- China is funding low-carbon ammonia-related projects and has released an official ammonia co-firing strategy.
- The European Union, Japan and the United States have worked to align carbon intensity standards for low-carbon ammonia.

Within this global context, the UK risks missing out on the clean ammonia market. The UK Government has not yet put forward a coordinated strategy to support the development of the clean ammonia sector.

The industrial strategy for clean power should recognise this opportunity to support the scaling of UK-made ammonia technologies, which can both support entry into the global commercial clean ammonia market and provide more decarbonisation options to British industry.

Policy reforms and funding support are required to fully capture the UK's fair share of this economic opportunity. To this end, our recommendations for Government are detailed in the section below.

2. What more can the Government do to encourage greater domestic supply chain investment in the energy industry by 2035, including through the Contracts for Difference scheme?

To achieve the Government's growth and clean power missions, industry will need to overcome the high costs and complexity of adopting decarbonisation solutions.

Especially with a view for the UK to capitalise on the growing global clean ammonia market, there are steps the Government can take to support UK businesses in adopting clean energy technologies and growing the domestic supply chain.

Our recommendations to unlock supply chain investment in the energy industry include:

- **Ensure upcoming hydrogen funding enables ammonia technologies.**
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- **Develop a strategic approach to ammonia across government.**
 - For example, the Government could convene a cross-departmental ammonia working group, with a view to develop a coordinated plan to capture the clean ammonia market opportunity and support UK technology innovators and manufactures to scale-up our operations.
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- **Enact policy reforms to realise the UK's ammonia market opportunity.**
 - Classify ammonia as a fuel, rather than industrial chemical, to support the ability of domestic businesses to invest in ammonia technology.
 - Prioritise UK content in domestic clean power projects. Future Hydrogen Allocation Rounds should consider the level of UK content included successful projects. This would drive investment towards UK-made products and support local jobs, which could also bolster domestic energy security.
 - The Environment Agency should streamline the commercial permitting process for clean ammonia to hydrogen projects. Hyamtec is at risk of losing out on our market advantage – and the economic benefits for the UK – due to lengthy and costly delays in permitting. Providing an exemption for an R&D low impact permit for short-term commercial usage would unblock barriers to early adoption of new technology, spurring investment and growth in UK businesses such as AFC Energy.

3. To what extent would growing the domestic supply chain bolster UK energy security?

Increasing the level of UK content into clean power projects could strengthen domestic energy security. Greater adoption by industry of UK-made hydrogen fuel cell and ammonia technologies, such as those manufactured by AFC Energy and Hyamtec, would contribute to a more localised supply chain.

We already supply our hydrogen fuel cell generators to UK customers in need of affordable, clean off-grid power. We have received significant industry interest in our ammonia cracking technology, as it can provide clean hydrogen at a fraction of the cost of hydrogen delivered by truck – without the need for subsidisation. As such, the affordability of hydrogen cracked from ammonia can benefit both UK taxpayers and UK companies looking for a cost-effective decarbonisation solution. With support to remove key policy blockers and scale up our operations, we can provide a secure, reliable UK-made power source to more organisations across the UK.

Our ammonia cracking technology can also bolster UK energy security by bypassing current challenges with hydrogen transport and storage – especially as there are currently no major hydrogen transport pipelines operable in the UK.

Further, the UK could seize the opportunity to become an exporter of clean ammonia technologies, acting as a global leader in a net zero future. This has potential to reduce reliance on imports, boost domestic energy security and support the Secretary of State for Energy Security and Net Zero's aspirations for a "future made in Britain."

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