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Response to: Consultation on a UK Low Carbon Hydrogen Standard

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Uniper is an international energy company with around 12,000 employees in more than 40 countries. The company plans to make its power generation CO_2-neutral in Europe by 2035. With about 35 GW of installed generation capacity, Uniper is among the largest global power generators. Its main activities include power generation in Europe and Russia as well as global energy trading, including a diversified gas portfolio that makes Uniper one of Europe's leading gas companies. In 2020, Uniper had a gas turnover of more than 220 billion cubic metres. Uniper is also a reliable partner for municipalities, public utilities, and industrial companies for developing and implementing innovative, CO2-reducing solutions on their way to decarbonizing their activities. As a pioneer in the field of hydrogen, Uniper has set itself the target of operating worldwide along the entire value chain in the future and implementing projects that will make hydrogen the mainstay of the future energy supply.

The company is headquartered in Düsseldorf and currently the third-largest listed German utility. Together with its main shareholder, Fortum, Uniper is also the third-largest producer of CO_2-free energy in Europe.

In the UK, Uniper operates a flexible generation portfolio of seven power stations capable of powering around six million homes, and a fast-cycle gas storage facility.

Consultation Response

We have set out below our answers to the questions in the consultation that are relevant to us. Key considerations are:

- The UK low carbon hydrogen standard should adopt a single threshold, as the floor of a tradable market.
- A tradeable certification scheme based on the GHG emissions of a unit or consignment of hydrogen could be used to incentivise demand for lower carbon hydrogen.
- It is critical that the standard is set at a level that would allow all hydrogen production pathways that can play a key role in delivering net zero, such as grid-connected electrolysis or steam methane reforming (SMR).

Consultation questions:

1. **Do you agree that the standard should focus on UK production pathways and end uses whilst supporting future export/imports opportunities? Yes/no. Please expand on your response.**

We support an initial focus on UK production pathways and end uses, as long as the standard developed for the UK can be aligned with international standards in future.

It will be critical that imported low carbon hydrogen is treated consistently in the market. This means that government will need to consider whether/how the standard will be applied to imported hydrogen and other hydrogen bearing vectors, such as ammonia.

2. **Would there be benefits in developing the standard into a certification scheme? Yes/no. Please provide detail.**

Yes. The standard, if designed in a pragmatic and simple to administer way, can be used as a blueprint for a certification system. However, the standard should define the floor of the tradeable market, not the ceiling, and the market should be designed to drive demand for, and therefore value of, lower carbon hydrogen. A tradeable, certification scheme that can identify the production pathway and actual GHG emissions of a unit or consignment of hydrogen would be the simplest way to enable this.

3.

   a. **Is international consistency important, or should the UK seek to develop a low carbon hydrogen standard primarily based on the UK context and criteria set out above? Please provide detail.**

International consistency is critical for an effective export and import market.

   b. **If elements of a UK standard differ to comparable international standards or definitions, would this impact the ability to facilitate investment in the UK or cause issues for business operations across borders? Yes/no/unclear at this stage. Please provide detail.**

Yes. If the UK standard differs from international standards it will increase the costs of exporting or importing hydrogen, making the UK a less desirable market to trade with or operate from.

   c. **If answering yes to 3b, what elements of existing low carbon hydrogen standards or definitions are most important to ensure international consistency?**

The level at which the standard is set and the boundaries of the standard, e.g. the inclusion or not of upstream and/or downstream emissions in calculating the standard.

4.

   a. **Should the standard specify a list of hydrogen production pathways, which would be updated periodically or on request? Yes/no.**

Yes, to minimise administrative burden and avoid delays to trading, the standard should specify a list of hydrogen production pathways. However, this list should be reviewed

regularly to incentivise innovation and improve production standards to drive down emissions, and to enable new production pathways to come to market.

b. If yes, we would welcome respondents' views on what production methods could have significant potential in the UK in the near term.

Both blue and green hydrogen have significant potential in the near term.

c. If no, we would welcome respondents' views on alternative options.

5.

a. Do you agree that the standard should adopt one label of 'low carbon' hydrogen, or would it be valuable to have multiple categories?

The standard should adopt one label of low carbon hydrogen so that it is simple to administer. However, the standard should define the floor of the tradeable market, not the ceiling, and the market should be designed to drive demand for, and therefore value of, lower carbon hydrogen. A tradeable, certification scheme that can identify the production pathway and actual GHG emissions of a unit or consignment of hydrogen would be the simplest way to enable this.

b. If multiple categories, what benefits would we get from adopting this approach in terms of emissions reduction and consumer confidence?

6.

a. Do you agree that a UK low carbon hydrogen standard should be set at the 'point of production'? Yes/no.

Yes. Where hydrogen is being delivered via a shared network, or via blending into the gas grid, each producer would not have control or visibility of downstream emissions. Including point of use and/or in use emissions in the standard would create a disincentive to selling into markets in which downstream emissions might occur and create a barrier to flexible market infrastructure and conditions.

b. If no, what would the advantages be of the standard making assessments at 'point of use' or 'point of use + in use emissions'?

7. Which chain of custody system would be most appropriate for a UK low carbon hydrogen standard: a mass balance or a book and claim system? Please explain the benefits of your chosen option.

A book and claim custody system would be most appropriate for a UK low carbon standard. Because it permits some flexibility and supports trading, book and claim drives market uptake. It is consistent with electricity retail and will allow customers to buy low carbon hydrogen and thus drive production and use, even where it is not physically possible for that customer to use pure low carbon hydrogen, e.g. customers taking gas from a blended gas grid. Mass balance is more suited to established markets and markets in which it is possible to physically trace the traded good back to its point of origin.

8. Should other CoC options be considered instead? Yes/no. If yes, please provide detail.

No.

9.

a. If the system boundary was set at the point of production, should there be defined reference purity and pressure levels for a UK low carbon hydrogen standard? Yes/no.

No, there should not be defined reference purity or pressure levels. The maximum GHG content of hydrogen will be set by the standard, the purity outside of its GHG content and the pressure at which it is delivered are technical aspects of gas quality that are not directly related to its climate impacts.

b. If yes, what should they be?

c. If no, what are the benefits to not defining reference purity and pressure levels?

Not having to deliver to defined reference purity or pressure levels will enable more cost effective production for direct use by industrial customers, where there is no requirement for specific purity and pressure levels. The emissions associated with the treatment of low carbon hydrogen after it has exited the system boundary should be subject to industrial emissions policy.

10.

a. Should there be minimum pressure and purity requirements for hydrogen to meet the standard? Yes/no.

No

b. What could the potential implications of setting minimum purity and pressure requirements be?

Minimum purity and pressure requirements would mandate ‘gold plating’ of hydrogen production for industrial users or blending to the grid, which would add unnecessary cost and use unnecessary energy.

11.

a. Do you agree that embodied emissions should be omitted from the calculation of GHG emissions under a low carbon hydrogen standard, to ensure comparability with global and UK schemes? Yes/no.

Yes. Comparability with global and UK schemes is essential to facilitate the development of a competitive and liquid market.

b. If no, what are the benefits to including embodied emissions in the calculation of GHG emissions, and what should be done to ensure that hydrogen is on a level playing field to other energy vectors?

12.

a. Do you agree that a UK low carbon hydrogen standard should include the global warming potential of hydrogen? Yes/no.

No, not until there is greater certainty on the global warming potential (GWP) of hydrogen and there is an agreed means of determining it. In the nearer term there will be operating procedures, BAT, and safety procedures to minimise fugitive emissions;

early work could focus on these. Government should note that some fugitive emissions are from parts of the chain outside producers' control (transport, distribution, end use) and so the limit of any assessment of fugitive emissions for the UK low carbon hydrogen standard should be at the point of production.

b. If no, are there other options for accounting for the GWP of hydrogen outside of a UK low carbon hydrogen standard that could support compatibility with existing standards/schemes?

Not that we are aware of.

13.

a. Should a materiality threshold for total emissions be included in the life cycle assessments of hydrogen pathways? Yes/no.

Yes. The threshold should allow for improvements over time.

b. If yes, what would the most appropriate level be and why?

The level should be aligned with global hydrogen standards.

14.

a. Should CCU with proven displacement or permanence be included as an allowable benefit in GHG calculations under a UK low carbon hydrogen standard? Yes/no.

CCU can offer significant benefits where CO_2 is recycled within processing, as it can be in, for example, the production of low carbon methanol or urea. Government and industry need to do more work to consider the various applications of re-used CO_2 and their implications in terms of reducing or preventing emissions.

Until this work is more advanced, government's approach should be in line with its position on the Dispatchable Power Agreement, which allows permanent geological storage only. But this should be kept under active consideration and updated once government has a clear and evidenced position on CCU.

b. If yes, what should a suitable minimum time be for proven permanence and which applications should be eligible?

15. Should CCU credits only be allowed for biogenic carbon, and not allowed for fossil carbon sources? Yes/no.

Further consideration and a more detailed consultation is needed.

16. As the grid is decarbonising rapidly, so will grid connected hydrogen production pathways. How should government policy take into consideration hydrogen production pathways using grid electricity as primary input energy now? Please explain the benefits to the approach you have suggested.

Grid connected electrolytic hydrogen production should be treated the way that it is in the RTFO, with robust and auditable certification to match production to evidence of low carbon power purchase.

For the certification to be robust it will need to be based on near-real time grid carbon intensity, so using the previous year's grid average, if possible, will be better than averaging across the three previous years.

The consideration of how grid electricity is accounted for will also be relevant to some blue hydrogen production technologies. Both Partial Oxidation (POX) and Autothermal Reforming (ATR) require substantial quantities of electrical power for O2 production in air separation units. In order to have a fair comparison between the different technologies, grid connected POX and ATR plant operators should also have to demonstrate low carbon power purchase.

17.

a. What options should we consider for accounting for the use of electricity under a UK low carbon hydrogen standard? Do the options outlined seem appropriate? Are any of these particularly problematic? Please explain your reasoning.

The option of requiring electrolysers to have direct physical links with renewable generation is not appropriate. Excluding grid connected electrolysers will hinder the growth of this technology which can play a key role in achieving net zero. Requiring evidence of low carbon power purchase via guarantees of origin, or equivalent, will ensure that electrolytic producers support low carbon power generation, and using a recent, short term, grid average will ensure that assessments of carbon intensity of grid-supported green hydrogen are accurate.

b. Of the options considered, should further conditions be included to mitigate any negative impacts or potential unintended consequences, such as driving additional high carbon power generation, and what could these conditions be?

18. What evidence should BEIS consider ahead of making decisions around the use of electricity as primary input energy for hydrogen production?

BEIS should consider the potential of green hydrogen as a low carbon fuel and of electrolysers in system balancing in the longer term. Supporting the growth of green hydrogen production in the near term is important, as we need to see its costs reduce over the next decade to enable large scale deployment by 2050. Furthermore, even before power generation has decarbonised, grid-connected electrolysers can offer ancillary services and flexibility to the electricity grid.

19. How should low carbon electricity use in hydrogen production be accounted for in order to support the deployment of hydrogen production via electrolysis, whilst avoiding unintended consequences such as increased generation from high carbon power sources (impacting grid decarbonisation)?

It is important that the standard includes both grid connected and direct-linked electrolysers. Requiring evidence of low carbon power purchase via guarantees of origin, or equivalent, will ensure that electrolytic producers support low carbon power generation, and using a recent, short term, grid average will ensure that assessments of carbon intensity of grid-supported green hydrogen are accurate.
Wide ranging studies show the increase in power generation needed as, for example electrification of vehicles and heating is implemented. Our own analysis shows that

increasing output from unabated gas generation to supply heat pumps, for example, results in a saving in emissions in the heating sector tenfold that of the additional emissions from the power sector. The focus of this policy should be the growth and deployment of low carbon hydrogen which is essential in decarbonising industry as well as other sectors, and could ultimately play a part in providing decarbonised firm flexible power generation itself.

20. Should a UK low carbon hydrogen standard include a requirement on additionality and why? Please explain the benefits to the approach you have suggested.

Yes. However, it must be designed in a pragmatic way that enables the introduction of electrolysers into the existing electricity system. Grid connected green hydrogen can enable maximisation of the value of the renewable fleet and help avoid expenditure on curtailing renewable generation. Certification, such as guarantees of origin, should provide traceable assurance that low carbon hydrogen producers are purchasing renewable electricity.

21. Should additionality considerations also apply to renewable heat and other input energy vectors such as biomethane, in the same vein as for low carbon electricity and why? Yes/no. Please explain the benefits to the approach you have suggested.

No. The treatment of renewable heat and other input energy vectors should be consistent with their treatment in other policies/schemes, and with the goal of supporting the growth of the hydrogen sector. Certification, such as guarantees of origin, should provide traceable assurance that low carbon hydrogen producers are minimising their carbon footprint and purchasing renewable inputs.

22.

a. Should waste fossil feedstocks be considered with counterfactuals under a UK low carbon hydrogen standard? Yes/no. Please explain the benefits to the approach you have suggested.

Yes. Where waste fossil feedstocks cannot be recycled, the counterfactual would have been landfill or incineration. Landfilling fossil derived waste is inefficient, insofar as it misses the opportunity to repurpose the waste, and much direct incineration lacks heat and/or electrical conversion efficiency. More efficient technologies that can process waste fossil derived feedstocks into second life products or forms of usable energy should therefore be promoted and supported.

b. What are the potential implications of supporting the use of any particular waste streams in hydrogen production?

The key challenge of using waste fossil feedstocks will be aligning waste industry economics with sustainability and recycling target requirements. Driving recycling levels up whilst also developing a low carbon hydrogen market using waste fossil derived materials will create competition for the same feedstock. Government will need to keep this under consideration when considering how to incentivise the most efficient use of fossil derived waste feedstocks.

23. What is the most appropriate way to account for hydrogen produced from a facility that has mixed inputs (high and low carbon)? Please explain the benefits to the approach you have suggested.

We support using separate consignments, in order to have a clear difference between high and low carbon products. All low carbon hydrogen should meet or exceed the standard to be eligible for CfD payment.

24. What are the most appropriate units to calculate GHG emissions of low carbon hydrogen?

It would be better to use gCO2e/kg H_2 pure rather than gCO2e/MJ LHV.

A significant proportion of hydrogen is used in the chemical and petrochemical industry for chemical synthesis, where it is the hydrogen molecule, and not its energy content, that is of interest.

If GHG emissions are calculated on the basis of the energy content of hydrogen it is critical that only the hydrogen element of any impure hydrogen mix is assessed. If hydrogen is produced at a quality of 97vol %, the gas that makes up the other 3% could have a very significant impact on its CO2e/MJ LHV – for example, methane is considerably more energy dense than nitrogen.

25. What allocation method should be adopted for by-product hydrogen and why?

26. Should the standard allow for negative emissions hydrogen to be reported? Yes/no.

In principle the standard should allow for negative emissions to be reported, though they may be accounted for separately.

27.

a. Should non GHG impacts be taken into account? Yes/no.

No.

b. If yes, what criteria or factors should be taken into account and how?

c. If no, please set out your rationale for your answer.

Non-GHG impacts should be managed through the existing environmental regulations i.e. through permitting and planning consent.

28. Given the many potential end uses of hydrogen, and the rapid expansion of low carbon supplies required, do you agree that an absolute emissions threshold be adopted, rather than a percentage saving based on a fossil comparator? Yes/no. Please provide detail.

Yes. There are many potential fossil comparators and no obvious best choice. An absolute emissions threshold is simpler.

29. Should the standard adopt a single threshold or several, and why?

The standard should adopt a single threshold for simplicity and transparency. Differentiation beyond that can be delivered via a tradeable certification scheme.

30.

a. Should the GHG emissions threshold be set at a higher level in the early stages of hydrogen deployment, with a trajectory to decrease over time? Yes/no. Please explain the benefits to the approach you have suggested.

Yes. The standard should initially be set at a level that does not exclude hydrogen production technologies that can play a key role in meeting net zero, such as grid-connected electrolysis and SMR, and can tighten over time as the electricity grid decarbonises and other production methods decrease in cost and increase in efficiency.

Projects that secure bilaterally negotiated CfD contracts for hydrogen production should have the standard grandfathered i.e. maintained at the level it was at contract initiation for the duration of the contract. This provision can fall away as the market matures and moves toward competitive auctions.

b. If yes, should this decreasing trajectory be announced from the offset? Yes/no. Please explain the benefits to the approach you have suggested.

We do not believe government will be in a position to announce the trajectory from the offset, but clearly signalling the direction of travel will help create market certainty and maintain incentives for innovation.

31. What would be an appropriate level for a point of production emissions threshold under a UK low carbon hydrogen standard? Please set out your rationale for your answer.

An appropriate initial level for the standard would be one that includes all low carbon production pathways, including SMR and grid-connected electrolysis, but excludes grey hydrogen. Both SMR and grid-electrolysis have a role to play in 2050, with the emissions of SMR falling as upstream emissions are tackled and amine and other technology improves, and the emissions of grid-electrolysis falling as the grid decarbonises. In practice, we will need to understand how the standard is calculated, and the assumptions underpinning that calculation, before we can offer a view on exactly what level it should be set at.

32.

a. Could some net zero compliant hydrogen production pathways be disadvantaged by the introduction of an emissions threshold set at 15-20gCO2e/MJLHV? Yes/no.

Yes.

b. If yes, please explain which methods are likely to be disadvantaged and why.

Grid dependent electrolysis couldn't meet a threshold of 15-20CO2e/MJHLV but is a critical technology for 2050 Delaying grid-electrolysis until 2030 could significantly slow the growth of green hydrogen production, and associated cost reductions in that technology pathway.

Some SMR technologies might also struggle to meet a threshold of 15-20CO2e/MJHLV. Excluding these SMR technologies could significantly impact market growth and the delivery of the government's 5GW target.

33.

a. How could we ensure that a low threshold does not negatively impact projects on a trajectory to net zero and learning by doing at the early stages of hydrogen market development?

Setting the trajectory at a more realistic initial level whilst delivering policies to decarbonise the electricity grid would help to minimise impacts on key net zero production technologies. Enabling grid-electrolysis to demonstrate its use of low carbon electricity through certification such as guarantees of origin would support emissions reductions without disabling a key technology. Similarly, supporting SMR to grow the market will enable a swifter route to market maturity and thus lower overall emissions in the longer term.

b. What impact could this have on the UK achieving 5GW production capacity by 2030?

Market growth would be significantly slower without SMR projects, which would impact delivery of the 5GW target.

34.

a. Should the UK low carbon hydrogen standard provide for some limited leeway on the threshold for existing hydrogen production facilities? Yes/no. Please explain the benefits to the approach you have suggested.

No. All production facilities will all be competing in the same market and therefore must be treated consistently. Existing hydrogen producers should be incentivised to decarbonise by the industrial CCUS business model, and the low carbon hydrogen standard should be set at a level that efficient retrofit projects can meet.

b. If yes, is a 10% leeway suitable? Yes/no.

35. What would be an appropriate level for a UK low carbon hydrogen standard if it were considering point of use emissions? Please set out your rationale for your answer.

Point of use emissions should not be within scope of the UK low carbon hydrogen standard. It is not possible for a producer to have control over point of use emissions where hydrogen is going into a network with multiple producers and off-takers or being blended into the gas grid. Point of use emissions should be managed through tailored sector-specific schemes.

36. Which type of organisation would be best placed to deliver and administer a Low Carbon Hydrogen standard? Please include examples where possible of effective delivery routes for comparable schemes.

We would prefer BEIS to administer the standard. This would provide transparency, robustness and consistency in the future change process, and thus important stability. It would also ensure that any future changes to the standard would be subject to consultation, giving visibility to the market.

37. Should default data, actual data or a hybrid approach be used to assess GHG emissions? Please explain the benefits to the approach you have suggested.

We would in principle, support the use of actual data once metered data is available. A stringent compliance regime enables robust tradeable certification and can support the development of high-value, low carbon hydrogen products.

38. What should the options be for reporting and verification of low carbon hydrogen? Do any of the options outlined seem appropriate? Are any of these particularly problematic?

Self-reporting seems appropriate for very early market development, with an annual third-party verification to ensure compliance.

39. Are any other options not listed here that are better suited for low carbon hydrogen reporting? Any thoughts on how possible trade-offs between accessibility and robustness or between accuracy and simplicity could be addressed?

40. What would be an appropriate frequency for verification or audit?

This will depend on the method used. In the first instance, external verification should take place annually. There needs to be a balance between frequency and administrative burden for self-reporting; an appropriate balance might be quarterly self-reporting.

41. Over what period of time should the standard be introduced?

Hydrogen must meet the standard to qualify for payments under the hydrogen business model, so the standard needs to come into force alongside the CfD.

42. Do you have any other comments relating to the carbon standard proposals set out in this document?