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Response to: Hydrogen to Power: Consultation on the Need and Design for Market Intervention

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Düsseldorf-based Uniper is an international energy company with activities in more than 40 countries. The company and its roughly 7,000 employees make an important contribution to supply security in Europe, particularly in its core markets of Germany, the United Kingdom, Sweden, and the Netherlands.

Uniper's operations encompass power generation in Europe, global energy trading, and a broad gas portfolio. Uniper procures gas—including liquefied natural gas (LNG)—and other energy sources on global markets. The company owns and operates gas storage facilities with a total capacity of more than 7 billion cubic meters.

Uniper intends to be completely carbon-neutral by 2040. Uniper aims for its installed power generating capacity to be more than 80% zero-carbon by 2030. To achieve this, the company is transforming its power plants and facilities and investing in flexible, dispatchable power generating units. Uniper is already one of Europe's largest operators of hydropower plants and is helping further expand solar and wind power, which are essential for a more sustainable and secure future. The company is progressively expanding its gas portfolio to include green gases like hydrogen and biomethane and aims to convert to these gases over the long term.

Uniper is a reliable partner for communities, municipal utilities, and industrial enterprises for planning and implementing innovative, lower-carbon solutions on their decarbonization journey. Uniper is a hydrogen pioneer, is active worldwide along the entire hydrogen value chain, and is conducting projects to make hydrogen a mainstay of the energy supply.

In the UK, Uniper owns and operates a flexible generation portfolio of seven power stations and a fast-cycle gas storage facility.

Consultation Response

We have set out below our answers to the consultation questions. Our views in summary:

- Market intervention will be needed to support early hydrogen to power projects.
- A business model based on the Dispatchable Power Agreement but adapted for hydrogen to power will be the most suitable form of market intervention.
- The biggest risk facing early hydrogen to power plant is fuel insecurity, so early and significant investment in hydrogen transport and storage infrastructure will be critical.

Our views in full:

1. What are your views on the vision we have set out for hydrogen to power?

We agree that it is likely that hydrogen to power ("H2P") will play a role in covering longer periods of lower renewable output but we note that the timing and extent of this depends on the value of hydrogen, which is yet to be determined by the market.

The technical papers accompanying the consultation focus on large scale CCGT. This may not be the best role for H2P in the short term, as limited low carbon hydrogen supply may make operation of large scale plant difficult – and may be more valuable elsewhere. In the longer term, with robust supply and hydrogen transport and storage ("T&S") infrastructure, H2P can play a peaking and mid-merit role.

2. In your view, what role should hydrogen to power plants be playing in the power system? Please provide details and an explanation of your reasoning.

In the long term, we think H2P should play a similar role to gas generation today, providing both peaking plant and also longer duration flexible power.

3. Do you agree with our assessment that less CAPEX-intensive plants and/or plants with ready access to low carbon hydrogen fuel could deploy in the short term without bespoke support? Please provide an explanation of your reasoning.

No. In the short term the availability and security of supply of hydrogen is a real issue. This means that H2P plant face higher risks than more established technology – and in the Capacity Market ("CM") they would face penalties or very significant derating for not being able to dispatch when called to do so if hydrogen was not available. In addition, hydrogen turbines have not been commercially proven at scale. Our assessment of the options for decarbonising our gas fleet is that post-combustion CCS is lower risk as the infrastructure support plans are further advanced and the transport and storage ("T&S") facilities for gas are very well established.

4. What are your views on our proposal to enable hydrogen to power plants to compete in the Capacity Market as soon as practical?

The CM is not designed to deliver decarbonisation: it is designed to deliver security of supply. We support the future integration of H2P plant – along with other low carbon

dispatchable generation technologies – into the CM, once the technologies and fuel supply are proven and secure: having this longer term clarity on the markets in which plant will operate is needed for investor confidence. There won't be take up at any scale in the CM in the near term without additional support.

Providing longer term clarity on whether, when and how H2P plant will transition into the CM is needed for investor confidence.

5. **Are there any additional changes to existing markets which could support the deployment of hydrogen to power? Please provide details and an explanation of your reasoning.**

If we are to have production ready and able to ramp up supply to meet demand for power generation when it is needed, producers will need to be supported to have the capacity to do that in addition to meeting more steady demand. This will be increasingly important as the carbon intensity threshold for new build in the CM is reduced to a level below unabated gas.

In the slightly longer term, supporting the development of H2 storage and transport options is key: access to stored volumes of hydrogen would significantly decrease the current risk of inadequate fuel availability. Until fuel security can be addressed, generators risk being penalised, or very heavily derated, in the CM as they will not be able to despatch when hydrogen is not available.

A robust carbon price will help levelise costs between H2P and fossil generators.

6. **Do you agree with the risks and barriers to hydrogen to power deployment that we have identified? Please provide an explanation of your reasoning.**

We agree. In addition, hydrogen gas turbines have not yet been proven at commercial scale. And the maintenance schedules for hydrogen gas turbines are untested, which is a further risk factor with cost implications.

7. **In your view, what should industry's role be in addressing the barriers that we have identified? Please provide details and an explanation of your reasoning.**

None of the risks that you identify are currently within industry's gift to address: industry will need additional support until the market is more developed and risks can be better understood. Once they are understood and can be quantified it is up to industry to manage them within established market frameworks, as we currently do for natural gas.

8. **Are there any other potential risks and barriers that we should be considering? If so, which ones? Please provide details and an explanation of your reasoning.**

No.

9. **Do you agree with our assessment that bespoke hydrogen to power market intervention is required to mitigate our identified deployment barriers and accelerate the deployment of hydrogen to power plants, likely those which are more CAPEX-intensive? Please provide an explanation of your reasoning.**

Yes

10. **Have we considered all credible market intervention options for hydrogen to power? Please provide details of any design options you think we may have missed and explain your reasoning.**

You have considered all the credible options.

11. **Do you agree with our shortlisted three market intervention design options? Please provide an explanation of your reasoning.**

We do not support consideration of splitting the CM: liquidity in the CM is already limited, splitting the market will only reduce it further and will damage investor confidence. Furthermore, as you have identified, splitting the CM does not offer a short-medium term solution, which is what is needed to support early H2P projects.

12. **Have we accurately identified the benefits and risks of a DPA-style mechanism? If not, are there any further benefits and risks to consider? Please provide details and an explanation of your reasoning.**

Yes

13. **Do you agree with government's assessment that a mechanism based on the Dispatchable Power Agreement is the most suitable option for bespoke hydrogen to power market intervention to support the accelerated deployment of hydrogen to power? Please provide an explanation of your reasoning.**

Yes – this would essentially be a bespoke variation of a CM-type mechanism, without penalties for not being able to dispatch. We think this is a good model for supporting first-of-a-kind H2P projects as it will support their higher costs whilst mitigating fuel supply risk.

14. **What are your views on the need for a Variable Payment? Please provide details and an explanation of your reasoning.**

If government wants H2P plant to dispatch ahead of unabated gas, a variable payment is likely to be needed at least initially, to compensate for the lower efficiency and therefore higher costs of H2P. As with the DPA, if the carbon price is right the variable payment could fall away as the cost of unabated dispatch increases. In addition, we would expect H2P to become more efficient in time.

15. **Have we accurately identified the benefits and risks of a Split CM? If not, are there any further benefits and risks to consider? Please provide details and an explanation of your reasoning.**

Yes. We particularly agree that splitting the CM would not provide a solution in the near-medium term, that it would not address the risk of hydrogen availability and of generators being penalised for not delivering in the CM when hydrogen is not available, and that the higher costs of first-of-a-kind H2P projects make them unlikely to be successful in an auction with more established technologies. Even in the longer term, splitting the wholesale market is not an option that should be pursued as it will reduce market liquidity, which has long been an issue in the UK market, and damage investor confidence.

16. **Do you agree with our proposal to discount the Split CM as an option for bespoke hydrogen to power market intervention to support the accelerated deployment of hydrogen to power? Please provide an explanation of your reasoning.**

Yes.

17. **Have we accurately identified the benefits and risks of a Revenue Cap and Floor? If not, are there any further benefits and risks to consider? Please provide details and an explanation of your reasoning.**

Yes.

18. **Do you agree with our proposal to discount the Revenue Cap and Floor as an option for bespoke hydrogen to power market intervention to support the accelerated deployment of hydrogen to power? Please provide an explanation of your reasoning.**

Yes.

19. **What is your view on the need for price-based competitive allocation within/between bespoke business models versus moving assets straight to a technology-wide competitive market? Please provide an explanation of your reasoning.**

We agree there is a need for bespoke business models to prove and de-risk new solutions before moving them into technology-neutral price-based allocation. We would like to see all dispatchable generation technologies move into the CM over time, but in order to do so they need to be able to compete on an even footing.

20. **How should a bespoke hydrogen to power business model be evolved to promote competition between low carbon flexible technologies? Please provide details and an explanation of your reasoning.**

Like the DPA, an H2P business model should evolve from bilaterally negotiated bespoke contracts, to price-competitive but fuel/technology specific competition, to technology neutral support through the CM.

21. **What are your views on the alignment of hydrogen support and policies needed to enable the deployment of hydrogen to power capacity. Please provide details and an explanation of your reasoning.**

It is critical that hydrogen support and policies are aligned to support H2P, particularly as the biggest barrier to H2P is secure fuel supply. There are a number of misalignments in the existing emerging hydrogen policy landscape.

There may be a timing mismatch in ambition for geological hydrogen T&S and H2P: at present the hydrogen T&S allocation process envisages awarding the first contracts in 2025, with projects to come online between 2028-2032. It is then likely that stored volumes will be small whilst hydrogen production scales up.

The LCHA needs to be amended to better support either large scale but intermittent production of hydrogen by CCS-enabled producers (at present, intermittent production is not competitive as plant would have to be sized to maximum production capacity but

would only operate for part of the time, making them more expensive per tonne of H2 than baseload competitors), or blending, which could enable baseload operation by ensuring an offtake route for volumes that are not sold to hydrogen to power.

In addition, amending the terms of the LCHA to permit the sale of hydrogen to risk-taking intermediaries, such as shippers and fuel aggregators, will facilitate the intermittent supply of fuel to H2P – and will more broadly support market growth.

22. **Do you have any reflections on the feasibility of hydrogen producers, or qualifying offtakers, to facilitate the volume of storage required for hydrogen to power – for example, regarding sourcing finance/capital? Please provide details.**

Government has recently consulted on a support scheme for geological hydrogen storage: we don't believe, in the short-medium term, geological storage will come forward outside this scheme.

The leading alternative is tank storage, which we have considered as a decarbonisation route for some of our existing power plant. We found that tank storage is a more costly solution, per kg hydrogen stored, and is unlikely to be practical for CCGT H2P because of the volume required: we have calculated that a 4700m^3 liquid hydrogen sphere, like NASA's, could store ~300t liquid hydrogen, which would provide 13 hours operation for a single 400MW CCGT unit. A tank farm of 175 x 800kg bullets would have a much larger footprint (though a much lower profile) and would provide 6 hours operation of the same 400MW unit.

23. **What are your views on the feasibility of developing commercial arrangements between hydrogen producers, storage providers, and electricity generators that meet the Hydrogen Production Business Model (HPBM) requirements relating to Risk Taking Intermediaries (RTIs)?**

This is likely to be possible, but would be very inefficient. RTIs, particularly shippers, are essential to the efficient functioning of the market: we would expect the cost of all hydrogen projects – particularly production projects and offtake projects such as H2P – to fall if the costs of contracting between producers and offtakers could be passed to RTIs.