REA response to Hydrogen to Power market engagement need and design.

The Association for Renewable Energy & Clean Technologies (REA) is pleased to submit this response. The REA represents industry stakeholders from across the sector and includes dedicated member forums focused on green gas & hydrogen, biomass heat, biomass power, renewable transport fuels, thermal storage and energy from waste (including advanced conversion technologies). Our members include generators, project developers, heat suppliers, investors, equipment producers and service providers. Members range in size from major multinationals to sole traders. There are over 500 corporate members of the REA, making it the largest renewable energy trade association in the UK.

We have engaged with the energy department on a wide range of hydrogen policy. This includes:

- Feedback on the Low Carbon Hydrogen Standard version 3
- Development of a hydrogen certification scheme
- Strategic decision on blending into the gas grid
- Hydrogen transport business model (HTBM) market engagement
- Hydrogen storage business model (HSBM) market engagement

Related to this particular consultation we have also or are currently responding to

- Review of Electricity Market Arrangements (REMA)
- Carbon Capture Usage and Storage-enabled gas generation (Power CCUS)
- Long-Duration Electricity Storage (LDES)

A number of our members are particularly interested in production pathways other than electrolysis or methane reformation and we have engaged in detail on these 'alternative' pathways.

We look forward to continuing to engage with the department on these and related policies.

Consultation Questions

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

REA supports trade members from across the renewable energy sector and agree that there needs to be a range of options to achieve Net Zero Targets, particularly regarding decarbonising the power system by 2035. There needs to be a collaborative approach and the solution is a more technology agnostic one with the right technology at the right place. Therefore, we strongly agree that hydrogen to power will play a significant role alongside other technologies such as CCUS and Long Duration Electricity Storage (LDES) to avoid the inflexibilities that renewable energy can create with periods of curtailment and unserved load through diurnal and seasonal change. Above all there is a need to move away from unabated gas power generation.
The REA published a report on REMA in 2023 with recommendations on what was envisaged would be needed, stating that,

`the range of physical options is limited; i) unabated gas generation…., ii) hydro water…., iii) interconnection…, iv) BECCS fuel…, v) large storage of hydrogen ….. Apart from resolving the UK building stock and behaviours regarding thermal waste, then there is no single solution here, so we need to harness as much as we can get from each type. `

Multiple assessment studies such as from the Climate Change Committee (particularly the AFRY Net Zero Power and Hydrogen: Capacity Requirements for Flexibility report), the National Infrastructure Commission, and the Royal Society have all concluded that hydrogen will play a key role in decarbonising the power sector albeit with varying capacity and deployment predictions. There is also alignment with other developments such as the Dispatchable Power Agreement (DPA) and Power CCUS projects.

Given previous limitations in LDES, developments in technologies for longer storage such as flow batteries, mechanical (pumped, hydro, liquid and compressed air) and thermal, alongside hydrogen, will provide some significant flexibility for future energy systems. Changes to geographical location of a more renewable and decarbonised electricity system mean that deployment of alternative solutions to balance the system will be required. Therefore, although it may not be the most appropriate solution in certain scenarios, there will be many opportunities where low carbon hydrogen can play a key role for power production and is likely to play a strategic role in decarbonising the UK's power system.

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.

There have been significant advancements in the UKs hydrogen strategy with the recent announcements of successful applications from the hydrogen production business model first allocation round or HAR1, the Net Zero Hydrogen Fund (HZHF), Track 1 and 2 CCUS enabled hydrogen projects as well as the opening of the HAR2 to applicants in Dec 2023. Collectively this will help deliver the ambitions to deploy 1GW of low carbon hydrogen by 2025 and 10GW by 2030.

The delivery of these hydrogen production projects, as well as the further development of storage and transport business models for hydrogen, is creating a viable market with increasing investment. This will allow production to gear up and increase the access of low carbon hydrogen fuel for end use, including to the power market, which will provide demand certainty. The analysis to suggest deployment of low carbon electricity generation capacity (between 5 and 12 GW by 2035, rising to between 20 and 90 GW by 2050) can be achieved is reasonable.

The accompanying report "The need for government intervention to support hydrogen to power" effectively argues that in cases where H2P is intended to mostly be run flexible but at relatively low load factors, H2P would be more preferable from a capital intensity perspective, than comparable Power CCUS plants. This is also supported in the AFRY report. It's agreed that over time the market and infrastructure development will determine H2P's specific role in the power system. So, in order to ensure the future development, the intention to enable a clear market framework for H2P to come forward will be needed.

There are a number of specific roles which could be played by H2P:

- Firm dispatchable power volumes during periods of prolonged renewables shortfall
- Peaking power supply when renewables are unable to meet demand.
- Provision of system services historically provided by fossil fuel generation.
- Route for existing gas generation to decarbonise, reducing risk of stranded assets.

Most of the H2P projects which our members are currently working on are to deliver relate to the provision of fast-response/flexible capacity.

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.

Given the provision of funding through the Capacity Market, as part for the government electricity Market reform package, deployment should be possible without additional/bespoke funding under the circumstances suggested and given the considerations already modelled as part of the consultation report. Planning to either provide new plants or refurbish older ones will be part of future delivery programmes and therefore other than the conversion costs with FOAK technology, the additional costs and risks to consider should relate to fuel availability and access, including considerations of hydrogen storage. However, there are complex interdependencies with the supply of low carbon hydrogen at a competitive cost, which may still hinder deployment. HPBM support for low carbon hydrogen will help a lot but none of this is going to be easy or quick to deliver. There is also significant cross-chain risk to address. And worth reiterating that availability of fuel would be a significant risk for H2P, as Capacity Market punishes failure to be unavailable. If H2 supply fails, this is a big risk to predicted revenue streams.

Model 3 from the consultation indicates that under the Capacity market plants with low CAPEX and low hurdle rate would sit more comfortably within the Capacity Market. There may be some change or risk to the fuel capacity/deliverability when factoring in project lead times and deployment may mean rising costs that move this into a higher CAPEX bracket. It will therefore depend how many plants adapting to H2P will fall into the low(er) CAPEX bracket rather than the alternatives (Low Capex but high hurdle/ High CAPEX / high CAPEX and high hurdle).

We would generally agree with the assumption that a larger plant is expected to be more CAPEX-intensive than a smaller plant, and for a plant with easier access to hydrogen fuel to represent a less complex project. However, this should not be a reason to prevent support for smaller plants perceived to fall in this bracket under alternative market intervention scenarios. and where the business case suggests a strategic benefit. It's also agreed that, in theory, CAPEX for all H2P plants could be expected to reduce as deployment improves confidence in H2P's role in the system and technology costs fall.

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 requirement to provide replacement of retiring generation power plants whether for mid merit or peaking operation, either through new construction or refurbishment will already be part of future planning to ensure we meet the decarbonisation targets over the coming years, supporting abatement of existing capacity and meeting the growing electricity demands. This will need significant investment in "low carbon flexible and dispatchable capacity" and for H2P, decisions on 100% Hydrogen or hydrogen ready plants will need to be made ahead of the fuel capacity being secured. Although there is the ability to utilise blended hydrogen in increasing volumes as the supply ramps up, the embrittlement impact of hydrogen steel will mean that

investment will still be needed to ensure safe operation so an additional factor on deployment and investment.

Therefore, decisions are needed now so inclusion to compete in the Capacity Market as soon as practical is sensible but will depend on those plants that are eligible financially and the issue is when this will be practical. The ability to deploy technology that is sufficiently technology ready level and FOAK along with availability of fuel type, may disadvantage a quick entry into the competition. The ability to future proof should help compete in the process although there are associated risks competing with proven and existing technology even at predicted costs variance of 10%. We would support the enablement of H2P capacity competing as soon as practical given that the Capacity Market is an established market - but interim support is still likely to be required and for some time. Without the intervention, the pace on progress may be too slow.

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.

Through the hydrogen business models for production and more recently storage and transport, there will be some alignment for end use as H2P plants would need to be able to connect into a suitable storage facility and the capacity to meet increasing obligations of power flexibility requirements for renewable sources. Although there would be some benefit to co-locating, ensuring access to hydrogen fuel, there could be some HPBM, HTBM and HSBM weighting for use with H2P plant end users. Also, some flexibilities on the demand from this type of end use given the nature of being an intermittent off taker. However, although there has been progress made the initial storage and transport business models are limited in scope, requiring only 2 projects each and more strategic. There will be a need to ensure to only availability but access to low carbon fuel and more needs to be done strategically to ensure sufficient delivery of H2P which could be in types of fuel and methods of transport. Such as the type of fuel could be ammonia to enable more efficient transport routes where no pipeline exists and transport could be outside of pipelines both of which are not yet aligned with the hydrogen business models.

The First of a kind (FOAK) and emerging technology ready level nature may create barriers through existing markets where costs are predicted to be at least 10% higher than for comparable unabated gas plants given such immature technologies. Although there have clearly been some advances in the sector, such as with SSE Thermal and Equinor's proposed hydrogen plant in Keadby, there is a need for government support to help investment confidence and incentivise early adopters of H2P. Also, plants such as the one proposed in Keadby is considered to be within proximity of both hydrogen production and storage.

The LCHS certification system that will be introduced for low carbon hydrogen will provide a mechanism of value to the fuel that meets the eligibility and threshold set under the LCHA. But to enable security of supply, the alignment with standards from the EU and elsewhere will help initially with imports but also provide an export market when there is surplus. However, in order to stimulate the off-taker confidence to invest, such as in this case, assurances of fuel capacity and consistency will be the main barrier. And it's agreed that the interaction with the ETS will also be key. The benefit experienced through certifications schemes and trading of guarantees of origin has been particularly felt within the Green Gas Certification Scheme (GGCS) for

biomethane. It has provided a value that has been important where models have changed from a gate fee to purchase of feedstock and has even helped the move towards no subsided production, although eligibility in schemes such as the GHG protocol and SBTi is vital.

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.

The provision of clarity over hydrogen to power that has already been provided by this market engagement, will start to remove the barriers that will otherwise have been there. It's important to acknowledge that as hydrogen is still at a nascent stage, even though technology is being advanced, it may still be at a lower Technology Readiness (TR) level to be eligible. Assistance to raise TR levels has come through innovation programmes such as the Net Zero Technology Centre (NZTC), through its Open Innovation Programme in providing investment for pilot projects such as with the Hiiroc and Centrica project to decarbonise peaking units at the Brigg site. There are also further investment possibilities through schemes such as the Hydrogen Innovation Initiative via Catapult which is looking at exactly this area.

The safety regulations/standards are being introduced as new areas of the hydrogen economy opens up and are being implemented. But the process can be slow and being nascent can prove difficult to provide assurance for the industry, ultimately posing additional risks to investment and deployment at this early stage and with additional costs. There are also occasions, through demonstration plants for production, where the hydrogen is not able to be captured for use where it could be used for trials by technologies and end users to stimulate the end use market. In fact, access to H2 volumes today for testing of equipment and delivery of commercial operation seems to be a key issue at the moment.

At present industry recognises we have a skill shortage, as hydrogen is different to natural gas. Although this can be said across the green economy. The sector is already experiencing a skills shortage and strides have been made to identify where additional support will be needed such as through the Green Jobs Delivery Group and hydrogen skills alliance, which is similar to a scheme run in the EU. This aims to provide a focal point where jobs, training and importantly apprenticeships are signposted. There will also be a transfer of skills from fossil-based roles to the renewable fuels sector although this will be a slow transfer due to the natural transition. Although it should be noted that the skills also shortage spans the planning, permitting and construction roles.

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.

Industry is working collaboratively where possible to provide the conduit required to the barriers with the examples provided above. There is a collaborative approach with private sector that stretches the expertise through legal, finance, production, transport, storage and technical areas needed for this.

The support systems provided by the government do de-risk and although the process of awarding of contracts has seemed slow at times, each round builds expertise and knowledge

from both ends. Industry has been increasingly engaged with DESNZ who have provided the means to do so. This such as with the extremely useful hydrogen production working group provided opportunities for industry to express their concerns and help direct the decision makers with identified priorities which has been invaluable.

There may be a need to increase the engagement to improve public perception that may have been damaged through backlash to the hydrogen levy and hydrogen village trials along with safety concerns. There will also need to be careful consideration of what is the right use of hydrogen in the right circumstances, and this should be effectively argued. The use for long term storage and electricity balancing is a strong case and backed up by good data. Best alternative solutions for particularly location setting can also be of significant importance which will be the case of water shortage and the EA have already set out a draft guidance (GET) and evidence review for hydrogen via electrolysis.

Ultimately, although there is recognition that industry will initially need government support to derisk early progress for projects and deployment, recognising that there are barriers within the cross chain, particularly with infrastructure. This should ease over time as will be needed to allow projects to move forward and lead to a subsidy free hydrogen economy. Therefore, it would be correct to say that the government should expect developers to ensure that they have the appropriate arrangements in place to support operation. However, there may need to be some considerations of flexibility.

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.

Concern has been raised about the ambitions/potential uses of hydrogen being more than the production capacity and it is already increasingly obvious that some imported hydrogen may be needed to meet the demands, particularly for green hydrogen (such as the proposals for transport of ammonia from Saudi Arabia Neom plants production of green hydrogen via Humber). This means that support for, and alignment with, international standards on low carbon hydrogen is likely to become increasingly important and we support the UK's efforts to take a leadership stance here and drive the development of workable standards. The ability to transport hydrogen effectively will determine the barriers that are needed in the future at least where a dedicated pipeline doesn't yet exist. The consideration of which is the best way to transport and use a hydrogen molecule and on which occasion may become a measure of how well the transition to hydrogen can be made across the UK. As previously mentioned, aligning all cross-chain elements remains a key risk, together with the need to match H2 supply and demand being such a new market. In the response to Q5 it was discussed about ammonia as a fuel and this if using the example of Neom production is currently their intended route to transport. If an ammonia power plant was considered this would help with fuel access and limit the need for reforming/cracking.

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.

Model 3, from the consultation report, indicates that under the Capacity market only the low CAPEX and low hurdle rate would sit more comfortably within the CM range. There may be some change or risk to the fuel capacity/deliverability when factoring in project lead times and deployment may mean rising costs that move this into a higher CAPEX bracket. It will therefore depend how many plants adapting to H2P will fall into the low CAPEX bracket rather than the alternatives (Low Capex but high hurdle/ High CAPEX / high CAPEX and high hurdle) as to how much this is needed. Therefore, if the majority of plants fall outside of the Low CAPEX bracket and particularly for larger plants, the capacity market won't be a suitable mechanism to support and therefore the need for a bespoke solution is evident. Also, there would be risk of impacting the capacity market with a higher price If including all plant types and sizes. The circumstances for hydrogen plants, due to the nascent nature with risks to fuel capacity, will mean that a more bespoke solution is needed at least where the uncertainties arise and while the market develops.

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.

The market interventions considered and listed below are broad and provides a good measure for comparison. We also agree with the criteria of effectiveness, investability, cost effectiveness and strategic fit with deliverability being used to assess.

• Capacity Market (CM)
• Split CM with a separate auction for low carbon dispatchable power technologies
• Deemed Generation Contract for Difference (CfD)
• Dispatchable Power Agreement (DPA) style mechanism
• Revenue Cap and Floor
• Unabated Fossil Fuel Ban

We are not aware of any other options not considered which we believe would be of benefit to include.

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

For the reasons specified in the report, we agree that the three market interventions considered not suitable to be shortlisted and detailed as follows.

- Capacity Market model: although the Capacity Model is familiar to the sector for providing intermediate and peaking power, for the reasons already set out in question responses 3,4 and 9 this would only be suitable for Low CAPEX plants. Therefore, this would not be suitable until the market has developed.

- Unabated fossil fuel ban: although any intervention where the shift to renewable options for energy are incentivised should be encouraged, we are not yet in a strong enough deployment opportunity to make this change. The transition period will need to be carefully managed and there is not enough confidence in when the issue with cross links

will be resolved or deployment of alternatives such as long duration storage, to make the best use of this intervention.

- Deemed generation CfD: the REA are generally supportive of the CfD mechanism as it is widely recognised within the renewable energy sector and comparable so very useful where this would be the best option and increasingly favoured by government. Production plants where units are paid for based on ability to produce is measurable but for H2P this would be intermittent and based on external factors of demand. Its therefore difficult to see how this could work effectively for this scenario.

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.

The benefits as summarised below are well reasoned and recognised.

- Has sufficient design optionality and flexibility,
- Can be implemented relatively quickly compared to the other two shortlisted options
- Existing support mechanisms in the wider hydrogen value chain will be sufficient in bringing forward sufficient LCHS-compliant hydrogen fuel for H2P plants to access.
- Use within the Power CCUS has considered the DPA suitable for the purpose so will be aligned and familiar to those in the industry with multiple projects.
- is a private law, commercial contract, with the role of incentivising the availability of low carbon flexible generation capacity
- it provides investment certainty and ensures that gas-fired Power CCUS facilities can dispatch ahead of unabated gas generation.

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.

For the reasons provided to the previous question and the links to use in the Power CCUS with related issues, we agree this is the most suitable option from those investigated. There is sufficient flexibility and optionality to provide the buffer needed and particularly when considering the deployment of technologies and plants that have higher CAPEX. The ability to initiate more quickly than another mechanism will help provide the pace that is needed for deployment and initially investment decisions for replacement of retiring generation power plants. The ability to also use a similar mechanism to provide operational support to effectively support the deployment of H2P capacity and ensure value for money is also valuable.

As an auction which competes different technologies would help to ensure that it is the needs of the power system that determines what is procured, rather than this volume being pre-determined. This would still be the case with a bilaterally negotiated allocation method in a DPA-style mechanism. But with the other advantages that a specifically DPA would have over other

mechanisms. It is agreed that the difficulties facing H2P mean that it will need to able to effectively compete.

for deployment over other low carbon technologies and therefore needs some initial protections through flexibilities that only DPA can at this stage mitigate. The bilaterally negotiated allocation of a DPA could also address initial liquidity challenges and allow for more innovative forms of H2P to come forward.

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

As mentioned in the consultation and as with the Power CCUS DPA design, facilities would receive an Availability Payment, paid per unit of capacity that is available over time and regardless of dispatch. This is similar to a capacity or CM payment, but without the same conditions. It would provide a regular revenue stream to cover CAPEX costs and help build investor confidence through increased revenue certainly via stable and regular payments not linked to security of supply which will support investment. It would provide a mechanism to be flexible to technology size or type allowing dispatch incentivised to be flexible and economically efficient.

The Power CCUS DPA also includes a Variable Payment, paid per unit of output, to help reduce the short run marginal cost of the plant when compared to a notional best in class unabated reference plant, and, therefore, to make it more competitive in the merit order. We agree that given the additional hydrogen value chain support and as a Variable Payment would have to differ for plants using subsidised and unsubsidised hydrogen, factors could create market distortions by having H2P plants dispatch when it is not economically beneficial for them to do so. This would potentially run in contrary to the benefits of flexibility provided through the availability payment. So at this stage we don't see a need for variable payments.

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.

Split CM would allow the flexibilities that would not be offered from a standard CM as In practice, this would be one auction for new build low carbon flexible technologies and one auction for all other technologies. Eligibility for a particular split would be determined for each technology type and the characteristics they provide with auction splits considered mutually exclusive. Even though this was discussed within REMA as one of the potential flexibilities that could be provided under a CM based mechanism, at this stage in development it is agreed that it's not well-equipped to manage the cross-chain risks and initial liquidity challenges which could give rise to the potential for increased system costs arising from the risk of introducing inframarginal rents.

And so, although an auction which competes against different technologies would help to ensure that it is the needs of the power system that determines what is procured rather than this volume being pre-determined, this has to be assessed similarly to the CM for the reasons

provided in Q11. Particularly noted are the risks of penalties for non-delivery based on the lack of mitigation for cross link issues.

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.

At this early stage in Hydrogen to Power, we agree that when compared with DPA, there needs to be more flexibility and therefore the Split CM market intervention would not be as suitable as a DPA. However, the auction structure of a Split CM is designed to promote competition, which in turn should reduce costs so this should be kept under review once the market scales up.

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.

Revenue Cap and floor is a market-based approach which can provide incentivises to developers to deliver capacity by limiting their exposure to electricity market price risk. As such its being considered for the `Transitional support mechanism for large-scale biomass electricity generators` as currently used for electricity interconnectors and so is well understood by investors. It is also being considered for LDES. However, in this scenario it would be difficult to provide a suitable Cap and Floor limit due the options available for inclusion, as identified in Model 3, for either low or high CAPEX and hurdle rates. The significant impact that such a fluctuating OPEX could do in distorting the dispatch incentive is a sound reason to be concerned about Its effectiveness. Similar to a DPA-style mechanism, a bilaterally negotiated allocation of a cap and floor could address initial liquidity challenges and allow for more innovative forms of H2P to come forward. Price based competitive allocation could help to reduce deployment costs and like the DPA-style mechanism, could be a 'stepping stone' to multi-technology competition.

Also, although there is similarity between H2P and LDES, the `feedstock` would differ as most LDES would access electricity whereas this would have the initial uncertainties of fuel availability which is what the intervention seeks to mitigate. We also agree that Cap and Floor would not incentivise increased dispatch of H2P beyond the order determined by its short run marginal cost and that for power technologies with non-negligible operating costs, this could distort dispatch incentives and potentially limit dispatch, particularly given the reconciliation period. And for an industry that has been able to play the market for best prices, the fixed unit price element of this intervention may disincentivize investment rather than what was intended.

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.

At this early stage in Hydrogen to Power we agree that when compared with DPA, there needs to be more flexibility and therefore the Cap and floor market intervention would not be as suitable as a DPA. However, this should be kept under review once the market scales up.

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.

Industry recognises the need for government support to be initially focussed on getting the market stimulated and to drive deployment. The need should always be to incentivise where otherwise the objectives would not be met due to various risk and investor caution. Therefore, the need to re-evaluate the type and means of support will change as the market develops. In this case we recognise that the use of a bespoke mechanism is in contrary to support criteria identified in REMA. And that a bespoke market intervention should not be a long-term solution and will need to adapt over time. However, the full deployment across the hydrogen value chain through the timescales for HPBM allocations rounds and the roll out of HSBM and HTBM, will limit the ability to move at pace to an alternative and more competitive market.

Therefore, a price based competitive allocation could help to reduce deployment costs and could be a 'stepping stone' to multi-technology competition avoiding the brick wall that otherwise this deployment might experience if the conditions weren't right to move straight to a technology wide competitive market and too soon. There is a real risk in moving to technology-wide competitive market that less developed technologies are crowded out, never getting the chance to be deployed, and the consumer ends up paying more than would otherwise have been the case. The introduction may need to be reviewed frequently rather than set in timescales from the outset, or could be presented based on meeting certain milestones such as fuel capacity, deployment etc.

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.

As mentioned above a price based competitive allocation could help to reduce deployment costs and could be a 'stepping stone' to multi-technology competition and avoid the brick wall that otherwise this deployment might experience if the conditions weren't right to move straight to a technology wide competitive market. The introduction may need to be reviewed frequently rather than set in timescales from the outset, or could be presented based on meeting certain milestones such as fuel capacity, deployment etc.

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.

The H2P model could provide incentives for those plants where there is the greatest need to be replaced/refurbished and where the timeline for fuel supply also aligns. Initially this may need to be focussed on locational benefits or additionality. Providing the best investment for the least risk when considering transport and supply is important. Obviously, the priority has been in production deployment and the HAR1, NZHF and Track 1 CCUS enabled hydrogen has kickstarted and the anticipated commercial operational Delivery (COD) will now be able to be

tracked. This will help to understand any construction and supply chain delays that may impact future allocation rounds, particularly as we increase the hydrogen capacity required.
Clearly the initial projects for power plants would be based on geographical benefit however where there are understood opportunities for future plants, this could incentivise production projects for HAR2 or more realistically HAR3&4. Obviously, there will need to be consideration for storage and transport as well and this will align better when the initial contracts are allocated under the first round. Aligning with the deployment of Transport and Storage infrastructure will be critical in allowing H2P investment to move ahead as quickly as possible.

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

It is difficult to understand where there may be a clear route to provision of hydrogen to a H2P plant unless the storage facility was also managed by the power plant operator. It is unlikely that Low Carbon hydrogen producers would want to invest directly in H2 storage volumes as production itself comes with risks and constraints. Therefore, the preferred route for most would be handled by separate entities supported by the Storage Business Model. There is some provision for both transport and storage support under the LCHA, although limited and assumed to be related to operational needs of the production site rather than the needs of offtakers/significant variations in demand.

Alternatives would be where the unit market value were either comparable to that provided through the HPBM for supply outside of a mechanism, through a non-subsidised production plant or from imported hydrogen.

Although a strategic decision on blended hydrogen in the existing gas infrastructure network has been made (pending safety considerations), the decision states that “any subsidy support provided for blending would need to be reflected in the HPBM contract, the Low Carbon Hydrogen Agreement (LCHA), where blending is currently a non-qualifying offtaker. This includes the interaction with existing design features of the HPBM (e.g. the role of Risk-Taking Intermediaries (RTIs), technical requirements (e.g. metering and billing) and confirming the level of subsidy support for blended volumes. “

The reasons for this consideration were that “it was important to avoid distorting the offtaker market that could result in blending ‘crowding out’ other offtakers of hydrogen who require it to decarbonise by determining any conditions or criteria under which subsidy support may be provided. In effect this would need to be considered in line with the decision for RTI for storage as at least this would be using the hydrogen in the same way that it was produced rather than blending.

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)?

For the reasons above, decisions on how blending is considered will factor on the decision made here for hydrogen storage and RTI. Also, within a network for hydrogen clusters where there is a strategy prioritising hydrogen storage based on providing a network for production plants and end use with a view to extend accordingly. Therefore, the rules on how this is managed, from the point of view of hydrogen production support, is broadly the same apart from the more long-term storage commitments. Any storage provider will be an RTI and so the rules need to be flexible to offtake needs. If you want to have assurances for supply, then you will need to always to have a sufficient store of hydrogen.