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Second National Infrastructure Assessment: Baseline Report Call for Evidence – Drax Response

Drax Group plc (Drax) owns and operates a portfolio of flexible, low carbon and renewable electricity generation assets. At the Drax Power Station in North Yorkshire we have been trialling Bioenergy with Carbon Capture and Storage (BECCS) to produce negative emissions following the conversion of most of the power station to operate using sustainably sourced biomass in place of coal. Drax can deliver 8 MtCO2 of negative emissions as part of phase 1 of the Drax BECCS programme in the 2020s, which unlocks future investment from Drax and other BECCS developers and provides technical learnings which will enable these technologies to grow in the UK and globally, throughout the 2030s.

Drax also owns and operates renewable and flexible assets across the UK including Cruachan which is the UK's second largest pumped storage hydro facility. We are actively looking at how we can increase the capability of Cruachan through the construction of additional generation units. We are also involved in supplying renewable power to the non-domestic market, and through this aim to help our customers better manage their energy consumption for example with Electric Vehicle charging.

We welcome the opportunity to respond to the NIC's Second National Infrastructure Assessment baseline report.

We believe that the NIC's Second Infrastructure Assessment has a crucial role to play in outlining the infrastructure and policy barriers to reaching net zero. We anticipate that a range of technologies will contribute to the UKs net zero ambitions including Greenhouse Gas Removals (GGRs) and low-carbon flexible renewable assets. Drax stands ready to deliver on a number of the challenges outlined in the baseline assessment through our deployment of innovative technology such as BECCS. We would like to highlight the following points from our response:

- **Engineered GGRs as a sector** – We believe that engineered GGRs should be considered as their own sector and challenge within the NIC's assessment due to the size and expected growth of the market. The NIC in their July 2021 report on Engineered GGRs predicted the sector would grow to be as large as the water sector by 2050.The Second National Infrastructure Assessment should consider the deployment of engineered GGRs as a tenth challenge as we believe the government has, in the past, been to slow in delivering critical new infrastructure and elevating the significance of GGRs will be vital in ensuring the start of a successful roll out by 2027.
- **Barriers to GGR deployment –** We have outlined several barriers to GGR deployment in the UK which need to be acknowledged with the Second Infrastructure Assessment. Currently there is a lack of financial mechanisms in place to support the

first wave of projects and we have outlined the need for bespoke mechanisms to support first of a kind (FOAK) projects like BECCS power. In the long term we also believe that a market framework which includes revenues from the UK ETS and voluntary markets will be beneficial once projects are established and negative emissions rewarded. Lastly, we outline the importance of, and barriers to, successful CO2 Transportation and Storage (T&S) network deployment in the UK. The UK government has a clear role to play in addressing these market barriers.

- **Ensuring system flexibility –** It is Drax's view that a growing reliance on intermittent renewable power without reforms to the market for flexible, long duration storage alternatives like pumped hydro will reduce the flexibility of the power system and could jeopardise net zero targets. The NIC should look to address market issues for flexibility within the assessment.
- **Levelling Up –** Infrastructure deployment has a clear role to play in delivering on the levelling up agenda. For example, projects like Drax's BECCS power project will provide thousands of high skilled jobs in the Humber region and Large-Scale Long-Duration Electricity Storage (LLES) projects like Cruachan 2 will provide construction, technical and permanent roles in rural Scotland. The NIC should highlight the key role that infrastructure will play in securing high skilled jobs across the UK.

Please find detailed answers to individual questions relevant to Drax appended to this letter. We would welcome the opportunity to discuss the points raised in the inquiry in further detail with the Commission.

Yours sincerely,

By email

Richard Gow

Senior Government Policy Manager

Drax Group plc

Appendix

Introduction

Q1 - Do the nine challenges identified by the Commission cover the most pressing issues that economic infrastructure will face over the next 30 years? If not, what other challenges should the Commission consider?

Drax is supportive of the nine challenges outlined in the baseline report. In particular, we would like to highlight our views on networks for hydrogen and CCS and our view that GGRs should be considered a separate tenth challenge.

We agree with the NIC's July 2021 report into Engineered GGRs that the UK has been too slow to deliver new infrastructure in the past.[1] With engineered GGRs, government has a chance to get ahead, act decisively, and deliver the sector in a well-managed way. Engineered GGRs are vital for the UK to deliver its ambitious climate targets outlined in BEIS's Net Zero Strategy but the successful rollout of engineered GGRs is contingent on the timely identification and construction of T&S networks for hydrogen and CCS which should be explored in more detail in the Second Assessment. T&S networks currently face several key barriers to rapid deployment including the length of time for storage site appraisal, the number of sites already appraised, and wider market uncertainty both for the hydrogen market and finance mechanisms to support engineered GGRs.

According to analysis from the Climate Change Committee (CCC) to achieve the government's 2035 net zero power sector objective and wider 2050 net zero objective large-scale deployment of engineered GGR's will be required. As outlined in the NICs report on Engineered GGRs, given the scale of GGRs likely to be needed, these technologies would represent a whole new infrastructure sector that could reach revenues matching that of the UK's water sector by 2050.[2] For this reason, we believe the NIC should consider the deployment of GGRs as a **separate tenth challenge** in their baseline assessment and full Second Infrastructure Assessment.

Q2 – What changes to funding policy help address the Commission's nine challenges and what evidence is there to support this? Your response can cover any number of the Commission's challenges.

Networks for Hydrogen and CCS - Drax agrees that the development of T&S networks for hydrogen and carbon will be crucial in the long-term development and success of GGRs. We were pleased to see the East Coast Cluster announced as a successful 'Track 1' CCUS cluster last year, and with continued government support this should ensure that a CO2 T&S network will be available for use. It is however, important we keep up the pace of T&S roll out in the coming years to meet this (and other CCUS) ambition, particularly the approval of storage sites which will continue to be needed to meet future government ambition. This includes the development of a business model to support T&S deployment.

Decarbonising Electricity Generation - Drax has identified funding policy changes for electricity generation which would address the challenge of decarbonising electricity generation. We believe these are two-fold. Firstly, biomass will be crucial in supporting the rollout of intermittent renewables. Biomass is a low-carbon, renewable, and dispatchable power generation technology, however following the expiration of subsidy regimes to support

[1] https://nic.org.uk/studies-reports/greenhouse-gas-removals/engineered-greenhouse-gas-removals/
[2] https://nic.org.uk/news/government-must-get-uk-ahead-of-the-game-in-crucial-engineered-removals-sector/

biomass in 2027, it is unclear what policy mechanism may be in place to support continued biomass power generation. Biomass will therefore need support from the capacity market or another similar mechanism. The NIC should outline the contribution biomass can make to the UK's energy security and in meeting its challenge of decarbonising electricity supply.

In addition to biomass, the NIC could also outline to government appropriate financial mechanisms to ensure long term stability and decarbonisation. Drax believes that Large Scale and Long Duration Storage (LLES) also has a crucial role to play in decarbonising the UK's energy supply and ensuring flexibility and stability, however significant barriers to LLES deployment have been identified by BEIS[3]. We have identified a Cap and Floor mechanism as an appropriate tool to give confidence for new LLES projects with high upfront costs and a lack of market certainty to progress. We detail this in our response to Question 8.

Greenhouse Gas Removals - Currently, the primary barrier to deploying engineered GGRs at scale is that carbon markets are not mature, are unable to provide a revenue stream for negative emissions or cannot provide price certainty to make most GGR projects investable. Negative emissions are not rewarded through schemes like the UK-ETS or EU-ETS, and, whilst voluntary markets are beginning to develop, these are currently immature markets. To support the deployment of GGRs at the scale required to meet net zero and interim carbon budgets a government policy framework is required to support their early deployment, and to encourage the development of carbon markets to support negative emissions over time.

Voluntary markets have a large potential, catering to a growing market with the global value exceeding £1bn in 2021. There is a real potential to channel private finance from companies committed to meeting their own decarbonisation projects into GGR infrastructure, which can help reduce the costs imposed on taxpayers and / or billpayers. Drax believes the NIC should encourage the government to examine the full potential of this market and maximise its contribution to the development of GGR infrastructure in the UK.

To support FOAK projects like Drax's BECCS power project, mechanisms which cover the two primary sources of value from the project, power and negative emissions, are required. A dual payment mechanism, which covers each of these sources of value can meet the criteria for incentivisation of a BECCS project. The changes implemented by these funding and policy mechanisms will ensure that the challenges identified in the baseline report and by ourselves will ensure the long-term growth of the engineered GGRs sector. Supporting FOAK projects like BECCS power will provide investor confidence and growth in the sector, as well as allowing for the construction of these projects to accelerate. The NIC should acknowledge these barriers in the Second Infrastructure Assessment.

Design and Biodiversity Q's 3-4

Not answered.

Q5 – What are the main opportunities in terms of governance, policy, regulation and market mechanisms that may help solve any of the Commission's nine challenges for the Next Assessment? What are the main barriers? Your response can cover any number of the Commission's challenges

[3] https://www.gov.uk/government/consultations/facilitating-the-deployment-of-large-scale-and-long-duration-electricity-storage-call-for-evidence

GGRs

In our response Question 1 we mentioned that there are at least ten challenges that the Second Infrastructure Assessment should address. Although the NIC currently focus on the infrastructure needed for the successful rollout of CCS technologies more widely, we believe that there are extensive opportunities in terms of governance, policy, regulation and market mechanisms that exist more widely in the GGR market that could be accelerated as a consequence of reclassifying the market as its own sector and its own challenge within the Second Infrastructure Assessment. This reclassification would give engineered GGRs an elevated position in government policy decision making and we believe consequently could accelerate their deployment and make a larger contribution to decarbonising the power sector.

Given the differences between GGR technologies we believe that initial deployment of GGR technologies should not adopt a technology neutral approach to deployment and instead focus on the introduction of policy mechanisms to support the range of GGR technologies that are ready to deploy. BECCS power projects are one of those GGR technologies that are ready for deployment in the near term and can deliver significant benefits. For example, the deployment of BECCS at Drax could save the UK £13 billion in meeting the fifth carbon budget according to analysis for Baringa[4] but cannot be delivered without a supportive policy framework.

As outlined in our answer to Question 2 we believe that for a BECCS power project the most efficient market mechanism for deployment is a dual power CfD and negative emissions payment. However, over time we would expect GGRs to transition away from bespoke mechanisms for initial FOAK projects and the role of the ETS and voluntary markets will be important to support a continued pipeline of projects. We would like to see a long-term market strategy for GGRs in place to ensure investor confidence and allow us to develop our project at pace to begin to provide negative emissions by 2027.

Networks for Hydrogen and CCS

In addition, of the nine original challenges put forward by the NIC, networks for hydrogen and CCS will be a significant factor in the roll out of GGRs. Whilst the government is making good progress in developing business models to support the deployment of CO2 Transport and Storage (T&S) networks the lack of clarity around a business model to support BECCS and DACCS means that there is uncertainty around deployment in the different CCUS clusters around the UK.

The government must ensure that T&S networks can facilitate the deployment of BECCS and DACCS projects and that appraised storage facilities are capable of handling CO2 from multiple large sources within clusters including GGR projects. Government policy must ensure that there is a supply chain operational by the time the first projects are constructed in 2027 and we hope that this report seeks to clarify what the long-term policy objectives should be of the government to ensure that the supply chain is operational by this date.

Decarbonising Electricity Generation

[4] https://www.drax.com/wp-content/uploads/2021/09/Value-of-BECCS-to-the-UK-Decarbonisation-Pathway-Baringa-Report-Exec-Summary-FINAL-2021-2.pdf

Beyond BECCS and GGRs, Drax is working to enable greater flexibility on the electricity system. We identify in Question 8 potential policy solutions that would assist in supporting biomass in the power sector which provides low-carbon firm generation to the system and would welcome the NIC's support for biomass in the conclusion of this consultation. In addition, to support other forms of flexible power we have identified a Cap and Floor mechanism for LLES projects such as pumped storage hydro, which can provide both storage and flexibility services at scale but are difficult to secure investment in due to large capex costs and fluctuations in market revenues.

Urban Mobility and Congestion

We also see a great opportunity to facilitate the decarbonisation of fleet vehicles through the switch of these vehicles to EV's. The majority of EV's are purchased by fleet operators and should be a key target demographic for any new framework. Fleet operators, through a new framework would need market incentives to move more quickly to long range, low emission hybrids or EV's. The government should consider carefully what incentives would stimulate market growth from fleet operators.

Levelling Up

Infrastructure is one of the key components to levelling up. Subject to resolving barriers to entry, GGR technologies, particularly large-scale infrastructure projects such as BECCS, have great potential to support levelling up, particularly in industrial heartlands in the North of England. Scaling up BECCS at Drax will contribute significantly to the local economy annually, according to a report from Vivid Economics[5].

Highly skilled jobs requiring a specific skill set will be required with BECCS at Drax itself supporting on average 8,000 direct, indirect and induced jobs per year during construction between 2024 to 2031, peaking at over 10,000 jobs in 2027[6]. We are working closely with local suppliers to ensure that these skills gaps can be met and that our supply chain is as UK-based as possible[7]. Future reports should reflect the socio-economic benefits that these types of project bring to the UK economy like providing long term, highly skilled jobs to areas like the Humber. The rollout of BECCS and other GGR technologies across the UK can have similar impacts on other regional development through job creation and support.

In addition, Drax's Cruachan pumped storage hydro station provides a multitude of skilled and high-quality jobs to the Argyll and Bute area which supports the wider local economy. A second Cruachan site would provide an array of additional benefits to the UK, Scotland, and the local community in which it operates. For example, there would be a need to employ local workers during the construction phase of the project and as the project transitions into the operational phase additional high-quality full-time jobs would be created at the site. These benefits are not unique to Drax's Cruachan site and other LLES technologies deployed across the UK will deliver similar benefits in terms of job creation and contribution to the local economy.

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[5] https://www.drax.com/about-us/levellingup/

[6] https://www.drax.com/carbon-capture/capturing-carbon-at-drax-delivering-jobs-clean-growth-and-levelling-up-the-humber/#chapter-1

[7] https://www.drax.com/press_release/drax-announces-80-british-supply-chain-ambition-to-support-construction-of-worlds-largest-carbon-capture-project/

Furthermore, to support the theme of levelling up the report must identify key opportunities for increasing the speed of the rollout of electric vehicles and their infrastructure. Drax is generally supportive of current EV infrastructure ambition by government. However, we would welcome more detail on incentives for charge point roll out across the private sector to assist with the approximately 30% of households who do not have off road parking[8].

Challenge 1, the digital transformation of infrastructure Q's 6-7

Not answered.

Reaching Net Zero

Challenge 2 – Decarbonising Electricity Generation

Q8 - What are the greatest risks to security of supply in a decarbonised power system that meets government ambition for 2035 and what solutions exist to mitigate these risks?

To meet the government's 2035 net zero power target a vast increase in intermittent renewables is required but this will also see a vast decrease in the high carbon baseload and backup generation that balances the grid currently. We would welcome further consideration of low-carbon flexible power options which are vital in balancing the power system at times of peak demand or when the output of intermittent renewables is low, such as the recent lulls in offshore wind power output in the UK in the winter of 2021-22. We view Large Scale and Long Duration Storage (LLES) and biomass as two solutions to help mitigate the risks to grid flexibility from the increased usage of intermittent renewables.

As identified by National Grid ESO's Future Energy Scenarios (FES)[9], the UK must vastly increase LLES deployment to facilitate the widescale rollout of intermittent renewables technologies. By 2030 up to 13GW of new electricity storage could be required to deploy to the system.

Drax's primary LLES project is the expansion of our existing pumped storage hydro facility in Cruachan Scotland. This project, named Cruachan 2, would look to construct an additional power station to complement the existing power station on site. This involves the construction of a new series of sub-terranean shafts, tunnels and galleries alongside the existing power station, and the construction of a new underground cavern which would hold the new generation units.

As it stands, the greatest barrier to deployment is the cashflow risk profile of Cruachan 2 which is unattractive for investors under current market conditions. As a large infrastructure project with high upfront capex and long operational life, Cruachan 2 would typically attract investors who require long-term stable returns on investment. However, the revenue streams available for the project are very difficult to forecast for the horizon of the project as well as being volatile year-on-year due to being influenced by the wider power market fundamentals. For example, arbitrage of the wholesale market and ancillary services market are unable to provide the stability or certainty required to invest.

It is Drax's view that a Cap and Floor mechanism would provide the revenue certainty required to deploy Cruachan 2. Under this mechanism the project would be able to receive revenue through the wholesale market, Balancing Mechanism, ancillary services, and the

[8] https://es.catapult.org.uk/report/on-street-parking-and-electric-vehicles/
[9] https://www.nationalgrideso.com/future-energy/future-energy-scenarios/fes-2021

Capacity Market, with a floor mechanism in place to top up these revenues to a minimum (if needed) level thereby reducing the overall cost of capital required to finance the project.

In addition to LLES deployment, decarbonising the power sector will mean replacing fossil fuel powered energy. Most of the UK's coal capacity has closed already, all of the UK's existing nuclear stations are due to close by 2027 and, with the exception of Hinkley Point C, new nuclear capacity will not be available until the 2030s. Without support for alternatives like biomass, which is a low-carbon, renewable, and dispatchable power generation technology that is well placed to support an increased rollout of intermittent renewable technologies over the next decade, the risk to security of supply in the UK is greater.

Our existing biomass units make a major contribution to UK security of supply. The Drax site currently provides 2.6GW of dispatchable, renewable power, making it the single largest provider of firm capacity in the UK. Recent events in the energy market have shown the value to the UK of having this capacity available, which can provide reliable, renewable power when the wind isn't blowing, and without dependence on the volatility of gas prices. However, support for the biomass units is due to come to an end in 2027. They will need support – whether from the capacity market or another mechanism – in order to keep them operational. The NIC should therefore outline these challenges in the findings of this consultation and challenge the government to firm up support for biomass after 2027 to ensure long term security of supply.

The transition of Drax's biomass units to BECCS provides several additional benefits to the UK energy system beyond standalone biomass as it can provide, negative emissions as well as baseload power. Drax believes that the NIC should reflect these benefits in their next report and urge the government to consider the true value of GGR's like BECCS to the energy system.

Challenge 3: Heat transition and energy efficiency Q's 9-10

Not answered.

Challenge 4: Networks for hydrogen and carbon capture and storage

Q11 - What barriers exist to the long-term growth of the hydrogen sector beyond 2030 and how can they be overcome? Are any parts of the value chain (production, storage, transportation) more challenging than others and if so why?

Drax believes that a primary barrier to the growth of the hydrogen sector is the uncertainty around the utilisation of hydrogen produced. For example, we are awaiting government decisions on hydrogen for heating which has been pushed back to 2026, and there is currently little wider understanding by hydrogen producers on how hydrogen will be utilised. Therefore, without market confidence it is likely that the hydrogen sector will be under invested without significant pull factors for investors who would need market certainty. Potential hydrogen producers will need to see a full hydrogen strategy with detailed financial mechanisms which stimulate market demand to have the confidence to invest.

Another barrier to the growth of the hydrogen sector is a lack of appropriate financial mechanisms to support its development. Although BEIS is developing a hydrogen production business model it is unclear whether production of hydrogen from multiple technologies will be supported which is also driving the uncertainty in the market. For example, Biomass gasification produces low carbon hydrogen and, whilst its potential is more limited than electrolysed or blue hydrogen given sustainable biomass is a finite resource, when combined with CCUS, biomass gasification can produce negative emissions, which will be

highly valuable as the UK attempts to reach a net zero target. Negative emissions are not currently rewarded through the UK Emissions Trading Scheme, nor are they rewarded through any standalone scheme. We believe that the government should develop and consult on a mechanism to reward negative emissions as soon as possible in addition to supporting the research and innovation of biomass gasification through development funding.

Beyond uncertainty around deployment and support mechanisms, it can be difficult for developers to source hydrogen in bulk to test operational characteristics. Using the power sector as an example, it can be difficult for turbine manufacturers to source enough hydrogen to test blended operation or full hydrogen operation of the turbine with hydrogen. This is hindering the development of hydrogen compatible technologies. The UK has the opportunity to establish a hydrogen test centre which could become a hub for the development of hydrogen technologies in Europe and globally. We would encourage the government to explore this approach.

Q12 - What are the main barriers to delivering the carbon capture and storage networks required to support the transition to a net zero economy? What are the solutions to overcoming these barriers?

One of the main barriers to deploying CCUS technologies such as BECCS and DACCS is that these technologies are reliant on the availability of a Transport and Storage (T&S) network to take captured CO2 for storage, as identified in the baseline report. The development of T&S networks in the UK is moving at pace, as well as the development of a business model to support these networks. Timely development of the T&S network will be critical for CCUS enabled GGR technologies to develop, and for the government to meet their ambition of 5 MtCO2 of engineered removals by 2030. Therefore, it will be important that Government provides clarity and visibility around key milestones in the development on T&S to give investors in GGR technologies the confidence to proceed.

It is also vital that the support regime for BECCS and DACCS projects is developed in a timely manner to ensure that these projects, which can provide significant anchor loads to T&S networks, are developed in step with the wider T&S system. For example, in the Humber industrial cluster the first BECCS unit at Drax could be deployed by 2027 and provide ~4 Mtpa CO2 – the largest source of CO2 in the Humber T&S network.

Whilst the development of T&S network business models is moving at pace, the appraisal of storage sites suitable for storing CO2 is moving slowly. Most projects in the UK are reliant on the historical information of appraised sites from the first attempt to deploy CCUS projects several years ago. Given the increased ambition around CCUS deployment since initial appraisal there is a risk that appraised storage sites will be unable to handle the potential volumes of CO2 from multiple projects. Therefore, the government should look to incentivise appraisal of additional storage sites to prevent a bottleneck in CCUS and GGR deployment.

Similarly, the continued growth of the engineered GGRs sector requires a clear route map for the appraisal of new storage sites to match the ambition outlined in the Net Zero strategy of 75-81 MtCO2 removals by 2050. Currently new BECCS projects have a five-year timeline to be completed but also require the confidence in the storage capacity to invest in and develop new projects. Assessment and construction of new storage sites can also take approximately five years to be completed. Therefore, the government must ensure that the UK has enough storage capacity to allow for the growth of the engineered GGRs sector and should prioritise CO2 storage assessments.

Climate resilience, the environment Q's 13-15

Not answered.

Levelling Up

Challenge 9: Interurban transport across modes

Q17 - What are the barriers to a decision making framework on interurban transport that reflects a balanced approach across different transport modes?

Drax believes currently that there is not a clear identification of appropriate mobility options in UK policy and a lack of joint up policy mechanisms to ensure end-to-end zero carbon transport. Meanwhile, the EU has identified urban mobility as a key area of change in the next 30 years. EV charge points are to be placed in areas that will not compete with walking, cycling or other active or public transport methods according to the strategic rollout plan to support the rapid deployment of alternative fuels infrastructure[10]. This focus on building interconnected infrastructure is important in reaching any objective to decarbonise transport.

Having a stronger understanding of where charge points are needed as well as the quantity will assist in accelerating decarbonisation efforts, increase the value of the EV charging industry to the UK economy, create more jobs, and ensure that the electrification of transport is a success for business and that of the general public. A coherent plan is therefore needed in the UK for EV infrastructure rollout. We are encouraged by the governments Transitioning to zero emission cars and vans 2035 delivery plan[11] published last year and we would like this to be developed in more detail to provide one coherent plan for charge point rollout in the UK.

10 https://ec.europa.eu/info/sites/default/files/strategic_rollout_plan_support_rapid_deployment_of_alternative_fuels_infrastructure.pdf

11 https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1005301/transitioning-to-zero-emission-cars-vans-2035-delivery-plan.pdf