CO2 Non-pipeline Transport Policy Team

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**Carbon capture, usage and storage (CCUS) Call for evidence on non-pipeline transport and cross-border CO2 networks**

July 15, 2024

## About Uniper

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 decarbonisation 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.

## About Uniper UK

In the UK, Uniper owns and operates a flexible generation portfolio of seven power stations, a fast-cycle gas storage facility and two high pressure gas pipelines, from Theddlethorpe to Killingholme and from Blyborough to Cottam. We also have significant long-term regasification capacity at the Grain LNG terminal in Kent, to convert LNG back to natural gas.

**Key message**

- Government support for NPT needs to be equivalent to its support for pipeline solutions, with the same treatment of transport costs and T&S outage risks, to ensure a level playing field.
- Early NPT projects will have a different risk profile to NPT solutions in a mature market with multiple emitters and stores. First of a kind ("FOAK") NPT projects, therefore, will need to be analogous to pipeline projects. We do not expect this to remain true as the market matures.
- NPT should be included in the anchor phase of Track 2.

**Consultation Response**

*1. Who are you responding on behalf of, and what is your interest in this call for evidence?*

This response is on behalf of Uniper UK. Uniper intends to be completely carbon-neutral by 2040 and aims for its installed power generating capacity to be more than 80% zero-carbon by 2030. To this end, Uniper is developing a project to decarbonise its Grain Power Station using an NPT solution.

Grain Power Station is a 1365MW Combined Cycle Gas Turbine (CCGT) generating facility operated by Uniper UK. It is located in the South East of England on the Isle of Grain and is within a high electricity demand centre for the UK and close to London. The Grain Carbon Capture project ("the Project") is centred around retrofitting post combustion carbon capture technology to the existing units.

The Project is not geographically within any of the identified industrial CCS clusters and is reliant on non-pipeline transport of its CO2 to stores. The Project is part of the Acorn cluster and our current engagement with them assumes that the provision of the NPT service is store led and generally analogous to a pipeline connected project. We are also developing an emitter led proposition with Bluestreak CO2 and its sponsors, as an alternative route to deliver CO2 to Acorn's Peterhead facility.

The Project has a target Commercial Operation Date of 2030, subject to the availability of CO2 NPT and storage and a secured DPA. There is no reason that an NPT solution cannot be made available within this timeframe: the emerging CCS network code needs only minor amendments to enable NPT[i], and a pragmatic approach to support pipeline-like early NPT arrangements will enable the development of more flexible and competitive arrangements as the market matures.

There are a number of practicalities and risks associated with an FOAK project in a market with limited CCS transport and storage infrastructure. The commercial model for these projects will be different from the optimal model for projects operating in a more well established market. We have set out the key issues below – this is not an exhaustive list.

- Firstly, as we have previously discussed with you, the DPA compensation for power CCS is dependent on permanent storage of CO2, which means that we need the certainty of transport and storage solutions that are firm for the duration of the DPA. Without this the project will not be bankable, as the DPA payments outside any shorter contract for either transport or storage must be considered to be at risk. In time, particularly as CCS Power moves from DPA

to Capacity Market support, this risk will diminish but early projects will need the certainty of long-term contracts between emitter and store.

- Secondly, the costs for NPT need to be treated in the same way under the DPA as costs for pipeline transport are – e.g., they need to be a direct pass through, and emitters need to be protected against outages – in order to ensure a level playing field for all CCS Power projects. Treating transport differently, where it is integrated into the total cost of the capture facility (through the Availability Payment Rate for DPA projects), will increase the risks for NPT projects. These risks would then have to be factored into their project costs, which would make it difficult for them to compete with pipeline projects for DPA funding. We recognise that accepting the pass through of entirely unregulated transport prices is likely to be high risk for government in the absence of an established market and/or competition to drive prices down. A store-led or emitter-led model for early NPT would help mitigate this risk, whilst encouraging competitive price discovery through, e.g., competitive tendering of shipping contracts.
- Thirdly, there are elements of the infrastructure that will be associated with NPT that will by nature be monopolistic in the absence of a competitive market – for shipped solutions this would particularly include the port/injection facilities at the store, and port and buffer storage facilities at the shore. Regulated management of monopolistic risk, e.g. mandated third party access, would ensure fair access and support market growth. This could work under either a store-led or emitter-led model, with regulation of such assets being part of the T&SCo or emitter contract.

*2. If you consent to members of the team reaching out for clarifications on responses provided, please provide contact details.*

Please contact Liz Kitchen, Uniper's UK Energy Policy Manager, on liz.kitchen@uniper.energy.

*3. Do you give permission for your anonymised evidence to be shared with external advisors for the purpose of technical analysis?*

Yes.

*4. Please provide views on the potential long-term vision for the NPT sector.*

We agree with the long-term vision set out, noting that different elements are likely to develop at different speeds and that it is possible that not all will be realised without regulatory intervention. In particular, we welcome the vision that all clusters would have NPT connectivity.

The government should accelerate delivery of the first NPT connected CCUS clusters so that FOAK NPT connected capture projects can be implemented, and should take learning from these projects to evolve the NPT sector.

*5. Which regions and sectors of the economy will benefit most from NPT solutions unlocking CCUS? Which regions and sectors of the economy will continue to struggle to deploy CCUS? Should the government look to prioritise any particular regions or sectors of the economy for NPT?*

NPT solutions will benefit those regions and sectors which are outside of the clusters that government has identified for development using Track 1 and Track 2 funding.

*6. Please provide details of your potential NPT or cross-border solution. Please provide any information on the timing of the project through the initial phase and into the future, and the minimum viable project.*

As set out above (see Q1), the Project is centred around retrofitting post combustion carbon capture technology to the existing units. Overall, annual CO2 capture rates around 720ktpaCO2 are expected for each of the three units (subject to the commercial despatch of the plant).

Exhaust flue gases from the CCGT would be re-directed towards a proposed post combustion plant, utilising solvent based amine technology to extract the CO2. The CO2 would be cooled, compressed and liquified for further transportation by CO2 carrier ships to the Peterhead Harbour where the Acorn T&S system are developing an import facility for non-pipeline delivered CO2 parcels. Intermediate storage facilities are planned at our Grain Power Station site to buffer stock to CO2 ships, allowing the power station units to run unconstrained and to market conditions at the time.

Uniper has submitted to DESNZ an outline scoping report for consideration as the basis of our Environmental Impact Assessment (EIA), including for the onsite storage. In addition Uniper is also in discussions with the adjacent Grain LNG terminal with regard to the development of a Carbon Processing Facility (CO2 liquefaction storage and export hub). This takes advantage of operational synergies around shipping, and the use of “cold” LNG to liquefy captured CO2 – thus offering the potential for reduced costs of capture and liquefaction.

This scheme, as part of the Acorn cluster, assumes that the provision of the NPT service is store led, and generally analogous to a pipeline connected project.

Further to this activity, Uniper is also working with Bluestreak CO2 to develop an alternative route to deliver CO2 to the Peterhead facility. In this case, floating infrastructure will be provided to store CO2, manage its intermediate handling, and reload CO2 carriers for transit. This would be an emitter-led model but would still rely on a long-term agreement with Acorn and would also be generally analogous to a pipeline connected project.

*7. Please provide the technical and operational considerations for the major pieces of infrastructure, equipment, and transportation. Considerations may include information on the sizes and numbers of the above, CO2 temperature and pressure conditions, loading/un-loading times and NPT journey lengths and duration. Please also provide the rationale for the technical and operational decisions.*

The overall full chain scheme for Grain Carbon Capture, and its interface with the Acorn T&S system is still being developed. A design competition is underway for the decarbonisation plant at Grain Power Station. The two parties involved in the competition are Technip Energies and Aker Carbon Capture.

*8. For the above NPT chain, please provide information on the expected ownership/operatorship (e.g. leasing, owned, shared ownership, etc) and expected commercial/contractual arrangements. Please include when equipment is to be shared between multiple entities or for sole use.*

The expected ownership and operation of the chain is being explored currently with Acorn and another shipping provider. However in outline:

- Capture plant – dedicated to Grain Power Station, owned and operated by Uniper.
- Liquefaction – option to have dedicated facility for Grain Power Station, owned and operated by Uniper, or to make use of a shared facility owned and operated by Grain LNG. The commercial arrangement is expected to involve both capacity and volume elements.
- Storage – option to have dedicated facility for Grain Power Station, on site, owned and operated by Uniper, or to make use of a shared facility owned / operated by Grain LNG. Floating storage is also under consideration.
- Jetty/loading – option to have dedicated facility for Grain Power Station, provided by a third party that may expand to include other users or trades/materials in time. The commercial arrangement is expected to involve both capacity and volume elements.
- Shipping – under an emitter-led model, this would be dedicated to Grain Power Station (with option to optimise use as other emitters come on stream, or utilisation drops), owned and operated by shipping third party, chartered by Uniper. Under a store-led model shipping would be dedicated to the Acorn T&S system rather than to Grain Power Station specifically.
- Port / unloading – owned and operated by Acorn for multiple users and charging is expected to involve both capacity and volume elements.
- Injection facilities at store – owned and operated by Acorn for multiple users and charged in accordance with network code charging arrangements is expected to involve both capacity and volume elements.
- Storage – owned and operated by Acorn T&SCo for multiple users and charged in accordance with network code charging arrangements.

*9. Please provide information on the elements in the NPT chain with the longest lead times which could be rate determining in the deployment of the NPT chain. Please provide any information that you have on timelines for delivery of your NPT chain (e.g. project delivery Gantt charts).*

[No Uniper response]

*10. What are the expected transport emissions and fugitive emissions expected within the NPT value chain? Please provide any information on how these emissions can be minimised.*

Work is ongoing to fully scope and understand these emissions. The current estimated range is 2-2.5% of captured CO2 including LNG fuel and fugitive emissions.

*11. Could the costs associated with the full NPT value chain prevent investment and deployment of NPT solutions? If so, why?*

Where the costs of NPT solutions are greater than pipeline connection, this will discourage investment.

The key to establishing the NPT market is to support creation phase emitters and infrastructure. Business models which allow longer term certainty of revenue in the event of glitches in performance of the NPT value chain will make projects bankable. This establishes infrastructure and business models that enable the evolution of an NPT market which is secure and attractive to investors. It also enables the cross border trade of CO2 from other areas where CO2 storage may be unavailable, or more costly.

*12. If available, please provide any assessments that have been carried out to show an NPT solution is more economically viable than a piped solution for your NPT value chain, or that a piped solution is not technically viable.*

The location of the selected Track 1 and Track 2 clusters make a pipeline connection to Grain power station not economically viable at this time. The intent to decarbonise the Grain Power Station and deliver substantial reductions in the carbon intensity of Uniper's generation portfolio by 2030 has driven the development of the project with NPT shipment of CO2.

*13. Please provide evidence on the costs associated with NPT. Where possible disaggregated to the nodes delivered by NPT service providers (e.g. after capture plant and before delivery to the T&S network). Where possible, please provide information in relation to the devex, capex and opex of the operation. Please include the stage and Association for the Advancement of Cost Engineering (AACE) Cost Class at which this cost data has been generated, and please share the methodologies and assumptions that have been utilised to generate this data.*

[No Uniper response]

*14. What are the main financing risks with a disaggregated chain, and how do these differ to the full chain piped approach?*

The financing risks for a disaggregated chain are similar to those of a full chain piped approach.

For a generator with a DPA, the support payments are dependent on permanent storage of the captured CO2. The piped solution gives certain knowledge of the store and the point at which ownership of CO2 is transferred. For an NPT solution there would need to be the same clarity in order to satisfy the conditions necessary to receive the support payments. Without this clarity, NPT CCS power projects would not be investible.

The length of contracts proposed for piped solutions (15 years) allows project cost recovery to be spread over the same timeframe. If shorter contracts were proposed for a disaggregated chain, cost recovery over a shorter timeframe is likely to make many projects unaffordable.

*15. What are the main financing risks associated with operational flexibility, and how do these differ to the full chain piped approach?*

For a power station emitter, parity with pipeline connected emitters in terms of risk sharing and contractual protection will be needed to enable investment.

For pipeline connected DPA emitters, fixed costs such as capital depreciation are covered through long term contracts which provide Availability Payments whether the power plant is required to be dispatched or not. The same coverage of fixed costs needs to be true for NPT connected DPA emitters.

The fixed costs that may be different for an NPT solution are likely to be (where not included within an overall T&S cost for store led models): ship charters, terminal capacity contracts (loading port) and receiving terminal capacity contracts (where not part of T&SCo). These costs should be covered in the DPA.

*16. Which archetype do you think would be most attractive to investors? Why?*

From an emitter's perspective, the store-led model is most attractive because the risk allocation is closest to the pipeline model. A storage operator would be best placed to quickly move to the flexible mature market envisaged in the consultation. However we understand that the emitter-led model might be more attractive to project financers, and thus might be better to unlock investment in FOAK projects.

*17. What types of financing are best placed to deliver NPT value chains?*

A combination of state funding via business model support and project financing. For a nascent market, such as CO2 shipping, the provision of support via government backed business models will be critical to attracting project financing by debt to this sector.

*18. Do you agree the rationale for economically licensing NPT service providers does not exist? Or do you believe that some elements in the NPT value chain may still require some kind of economic licencing?*

It is likely that in the medium term electricity generators with carbon capture plant will only operate with a DPA. It is clear that for pipeline connected generators the availability and variable payments cover the CO2 T&S costs of the generator. For an NPT generator to be competitive its DPA would need payments to cover its NPT costs. As long as this is the case, as a generator we are agnostic to the economic licensing of NPT service providers.

However, as NPT service providers will interface with T&S companies there is a case for NPT service providers to be signatories to the CCS Network Code. This could govern factors such as CO2 specification.

*19. Considering the expected deployment timelines for potential NPT projects within the CCUS programme, can the risks associated with the deployment of an NPT value chain be effectively managed commercially between the different actors within the NPT value chain? If not, please provide evidence and rationale why these risks cannot be managed commercially.*

Risk management will be dependent on the archetype and the detailed arrangements between the disaggregated parties in the chain. There needs to be clarity on the point at which CO2 ownership transfers, who is responsible for any carbon tax payments if a leak occurs, and whether an emitter would be deemed to have failed to meet its capture rate if the leak occurs in part of the NPT chain prior to reaching a store.

*20. Please provide details on how you believe that the CCS Network Code would need to be updated to facilitate NPT.*

The CCS Network Code would need to set out the conditions with which NPT service providers would need to comply at the interface with the T&S system. This would include factors such as CO2 specification, nomination of injection – i.e. direct to stores or to the transport system, charges, and outage planning.

*21. What changes to the Track-1 capture BMs do you envisage being required to make the capture BMs work for NPT solutions? What considerations would be required for power-BECCS and GGR BMs when developing for NPT? Please flag in your response which of the capture BMs you are answering in reference to.*

Under the DPA for pipeline connected generators the availability and variable payments cover the CO2 T&S costs of the generator. For an NPT generator to be competitive its DPA would need to cover its NPT costs.

With minor modifications the DPA is suitable for NPT solutions. The current DPA includes an Availability Payment and a separate element for T&S capacity charges. If a third element covering NPT costs were added the DPA would be suitable for NPT connected generators.

As T&S variable and volumetric fees are already included in the DPA variable payment, this element of the Track 1 capture BM does not need modifying to be suitable for NPT.

*22. How important should consistency in approach between capture BMs be? How important is consistency between NPT users and piped users within a specific BM (e.g. ICC via pipeline and ICC via NPT)?*

It's very important that the DPA treats pipeline and NPT connected generators consistently as they will be competing in the same market.

*23. If NPT solutions are assessed against pipeline solutions, would this raise any concerns?*

Due to the amount of infrastructure required, and the fact that this is not initially shared between multiple users, NPT solutions may appear to be more expensive than pipeline solutions. Their broader benefits should be taken into account in assessing NPT solutions against pipeline ones, in particular the options NPT might offer in terms of providing a decarbonisation solution for otherwise hard to reach areas of significant emissions.

*24. If government is to allow all archetypes of NPT, how should an assessment of an NPT value chain be considered to allow comparisons?*

There are a number of criteria Government might use to compare NPT value chains, such as location of a proposed NPT value chain and the viability of other decarbonisation options in that geographic area, scalability of a solution and its potential to onboard multiple users, proof of concept, and development of an associated supply chain, in addition to regular criteria of cost and deliverability.

*25. Please provide views on the potential vision for cross-border CO2 T&S networks in the UK.*

The creation of a cross-border CO2 T&S network would be beneficial for the UK in the way described in the potential vision. An increase in the number of users and available stores would allow a market to develop and provide operational flexibility, driving down costs as well as increasing the volume of CO2 permanently stored.

*26. With regard to Questions 18 and 19 and in the context of establishing cross-border CO2 T&S networks, do you have a view on:*

*i) whether an economic licensing framework for CO2 T&S might need to evolve to accommodate cross-border T&S networks?*

There would need to be clear rules on third party access, and consideration of any future requirement for unbundling.

*ii) how cross-border CO2 volumes should be viewed within a commercial landscape currently designed for domestically captured CO2 volumes?*

There will need to be a clear understanding of how both the UK ETS and the EU ETS treat volumes of CO2 which are moved across borders.

*iii) how service providers could manage the risks on a commercial basis that would allow for a merchant delivery model?*

The use of common standards between the UK and the EU would help service providers to manage risk. For example common CO2 standards would enable interoperability between service providers.

*iv) whether there are any specific changes needed to the current suite of capture business models if CO2 cross-border T&S networks are established?*

There would need to be clarity that exported CO2 stored in a non-UK store was still considered to be permanently stored for the purpose of business model support payments.

*For each answer please provide further explanation.*

*27. With regard to Question 20 do you think any changes will be required to the CCS Network Code to ensure cross-border CO2 T&S networks can be established?*

Common standards, for example CO2 specification, would better enable cross-border interoperability.

*28. To what extent would enabling NPT users and cross-border users incentivise storage exploration and appraisal activity? If not, why doesn't it?*

[No Uniper response]

*29. Could a store which is solely reliant on NPT users be viable? What are the technical challenges to operating a store solely reliant on NPT users? How would this operating model impact the risk profile of the project?*

[No Uniper response]

*30. Please provide evidence for the potential viability of shipping CO2 straight to the wellhead for CO2 injection. Please expand on the risks/barriers and benefits of straight to wellhead shipping*

[No Uniper response]

*31. What regulations need to be considered or amended for NPT value chains to deploy (excluding those regulations which are covered in the CCUS policy landscape section)?*

Delays in the consenting and environmental permitting processes remain a significant barrier to NPT and to decarbonisation progress more widely.

*32. Do the current processes to comply with existing health and safety or environmental regulations or controls create barriers to NPT deployment when transporting CO2 via road, rail, barge, ship, or processing CO2 at intermodal facilities? If so, what are those barriers, and what would you suggest as an alternative?*

[No Uniper response]

*33. Are there any specific changes to UK legislation, existing regulations or permitting processes which are necessary to support the development of cross-border CO2 T&S networks?*

[No Uniper response]

*34. What do you see as the biggest regulatory barriers to the growth of cross-border CO2 T&S networks?*

The London Protocol has not been broadly ratified and remains a barrier to cross-border CO2 T&S networks, although some countries have signed bilateral agreements. Government should seek to advance bilateral arrangements with countries that wish to participate in any proposed cross-border scheme.

The way that cross-border CO2 movements are treated by ETS schemes needs to be clearly established. If the treatment is different in the UK vs the EU ETS schemes, the consequences of this need to be clearly understood.

The use of common standards would enable cross-border movement of CO2. Different standards would be a barrier to cross-border CO2 movement. Relevant standards include CO2 specification and the operating pressure of transport vessels and infrastructure.

*35. What are your views on the best approach to creating interoperable CCUS networks?*

The use of standard specifications will promote commonality and enable interoperability for CCUS networks.

*36. How should the UK design the standards and specifications for CO2 T&S which offers network users sufficient flexibility in store choice but also provide sufficient protection to core T&S infrastructure? How can the UK ensure that its T&S network design does not impede access to an interconnected and interoperable European system?*

See answer to Q35.

*37. Are there any technical or operational limitations that may exist that could be a barrier to domestic NPT or cross-border T&S network deployment? Please explain.*

[No Uniper response]

*38. Is there any specific foundational infrastructure that must be operational in the UK before UK stores can offer storage to domestic NPT or international customers? If so, what should the UK prioritise?*

[No Uniper response]

*39. Do you foresee any infrastructure innovations which could speed up the deployment of NPT and cross-border T&S networks and/or reduce associated costs? Please provide any supporting evidence.*

[No Uniper response]

*40. What are your views on other flexible users of CCUS networks, e.g. flexible use of technologies such as DACCS? Do you foresee that NPT and buffer storage could be complimentary to operate alongside a flexible piped user (e.g. projects that could ramp up or ramp down CO2 output, potentially including technologies such as DACCS).*

In a mature CO2 network a diverse range of users and transport methods will be complementary and will improve both utilisation and availability of the broad T&S network.

*41. Does the UK have the relevant skills and capability to deliver NPT? Does the UK have a competitive advantage to deliver certain elements of the NPT value chain?*

No. The UK needs to develop both skills and capability to deliver NPT.

*42. What other areas should government be considering for successful deployment of NPT?*

To start NPT deployment the government must get the FOAK projects underway by including NPT in the Track 2 Clusters. NPT projects should be given the opportunity to compete in the anchor project phase.

*43. Please respond with any other comments that are not contained in the above questions.*

[No Uniper response]

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[i] NPT parties will need to be code signatories to secure capacity in and flow capacity to the CO2 storage facilities, to agree to standards for metering and CO2 Specification and to pay charges for use of T&S infrastructure. If the definitions of “User” and “User Type” in Sections A & B include NPT parties then the other requirements roll through the code structure, with some review to accommodate the pattern of NPT operation.
SECTION A: INTRODUCTION, STRUCTURE AND INTERPRETATION
NPT party meets definition of “User” if it delivers CO2 into T&S Network at a Delivery Point
Change needed to user accession requirements as NPT may not need construction agreement with T&S Co.
SECTION B: GOVERNANCE
NPT party needs to be included as a User Type (no definition at present) for representation on the Modification Panel.
SECTION E: NETWORK USE AND CAPACITY
User’s Connection Agreement identifies Delivery Point.
Capacity Allocation will need to be reviewed to confirm suitability for the pattern of NPT processes.

User Forecasting, Nomination process, Maintenance Programme co-ordination and Capacity Constraint process will need to be reviewed to assess compatibility with NPT operation.

SECTION F: NETWORK DESIGN AND SPECIFICATION

Metering and CO2 Specification will need to be reviewed to assess compatibility with NPT operation.

SECTION H: CHARGES, INVOICING AND PAYMENT

Charging regime Specification will need to be reviewed to incorporate appropriate charges for NPT operation.