Carbon Capture Usage and Storage:

Hynet Track-1 Expansion

CCS-Enabled Hydrogen Project Plan



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# CCS-Enabled Hydrogen Project Plan Introduction

In December 2023, the Department for Energy Security and Net Zero (DESNZ) launched the Track 1 expansion process for the Hynet cluster with the aim of filling the remaining transport and storage capacity expected to be available in 2030, to support HMGs ambition of storing and capturing 20-30Mt CO₂ per year.

This form accompanies the opening of an application window for Projects to apply to expand the HyNet cluster, and should be read alongside the Hynet Track 1 Expansion Guidance Document to understand what is required to submit and why, the timelines for submitting clarification questions and submitting your final application form. You should note in particular that the caveats and reservations set out in Chapter 2 of the Track-1 Expansion Guidance document apply equally here.

This document sets out the questions that CCS-Enabled Hydrogen projects should answer as part of their Track-1x submission. The information and relevant supporting evidence provided by capture projects within the completed Project Plan will, alongside Initial Cost Information Form (Annex B3), Financial Statement Form (Annex C), and Hydrogen Emissions Calculation (HEC) form the basis of the assessment to determine which capture projects are shortlisted. This document is an Annex to the Track-1x Application Guidance Document[[1]](#footnote-2) and should be read alongside it. Please see the Track-1x Application Guidance Document for further guidance on the assessment process, including how the information will be assessed and note that the caveats and reservations set out in Chapter 2 of that document apply equally here.

The Track-1 Expansion Hynet Process will be run by the Department for Energy Security and Net Zero (DESNZ). If applicants have any general questions about the submission process or about filling in any part of the submission documentation, please email queries to ccust1x@energysecurity.gov.uk.

## Important information regarding this process

* **The deadline** for finalised Track-1 Expansion submissions is 23:59 on 28 March 2024.
* The assessment process will be run fairly, transparently, and objectively in accordance with the published Track-1x guidance.
* The information provided within this form will be used throughout the Track-1 Expansion process and the negotiations/due diligence phase. Entering a negotiation does not mean that a contract will be awarded. Any decision to award support would only be made subject to the successful completion of any negotiation and due diligence.
* Further timetable details for this process are set out in the Track-1 Expansion Guidance Document.
* DESNZ will not be responsible for any costs incurred in the preparation of any submission, irrespective of whether the capture project is successful in the Track-1 Expansion process.
* Projects will need to satisfy the eligibility criteria to be considered in the Deliverability Assessment.
* Cost and Economic Benefit information will also be collected. Cost information provided will inform shortlisting and value for money assessment. Economic benefits data will not be considered when assessing Projects against the eligibility criteria and will also not be considered as part of the deliverability assessment. However, capturing the economic benefits of Net Zero is an important priority for UK government and to do this we need to develop robust, resilient, UK supply chains. If Applicants are shortlisted to go through to negotiations and/or offered access to the T&S network, HMG may ask the Applicant to submit or publish more detailed plans on supply chains, skills and economic benefits.
* This document, the CCS-Enabled Hydrogen Project Plan, is divided into four sections:
	+ Section 1, Applicant Information.
	+ Section 2, Eligibility, information submitted in this section will be used to determine the eligibility of the CCS-Enabled Hydrogen Project.
	+ Section 3, CCS-Enabled Hydrogen Project Overview, information submitted in this section will be used to improve DESNZ’s understanding of the Project and may also be used to inform the Deliverability assessment.
	+ Section 4, Deliverability, information submitted in this section will be used to assess the project against the Deliverability criteria set out in the Track-1x guidance document.
* Alongside the CCS-Enabled Hydrogen Project Plan the assessment of the Project will be supported by the submission of several forms:
	+ Annex B3 – Initial Cost Information Form will be used to collect the cost data for the CCS-Enabled Hydrogen Project, allowing a calculation of Levelised Cost of Hydrogen (LCOH).
	+ Annex C - Financial Statement Form will be used to assess the financial and commercial health of participating companies within the Deliverability criterion. This form should be considered supplementary to the questions to assess the Project’s deliverability. The figures included in the form should be supported by relevant accounting notes and documentation.
	+ Annex D – Economic Benefits Form seeks to understand how key components and services required to deliver the Project will be sourced; how risks that may affect the supply of these key components may be mitigated; and how Projects are engaging with new entrants and small and medium-sized enterprises (SMEs).
	+ A Hydrogen Emissions Calculation (HEC) allowing for determination of CO₂e intensity to demonstrate LCHS compliance.
* Across the assessment DESNZ will place significant emphasis on the credibility and consistency of information provided.
* DESNZ reserves the right to use information provided within the submission to inform any part of the Track 1 Expansion assessment. This is to allow for consistency and credibility checks and not so answers can be continued in other sections. Any obvious continuation of answers will be removed.
* After the CCS-Enabled Hydrogen Project submissions have been individually assessed, DESNZ will carry out a Shortlisting Process, which has been designed to enable us to ensure the overall outcome of the process meets the strategic objectives of the Track-1 Expansion process and Department as a whole. The process used for this step is described in Chapter 10 of the Track-1 Expansion Guidance Document.
* DESNZ reserves the right not to accept any submission and reserves the right to cancel the process before it has completed or at any time before any support has been awarded.
* DESNZ reserves the right not to consider a submission further if an applicant fails to disclose information requested.
* Each individual piece of supporting evidence can be referenced multiple times in the CCS-Enabled Hydrogen Project Plan but should be uploaded only once to the portal.
* Please note that the word limit does not cover the references sections. This is so applicants can be specific as to where information can be found in any documents provided. If this section is used to continue answers, the words will be removed before the assessment.
* Any information provided above the word limits will be removed before information is provided to assessors and will not count towards the score. We will remove words in excess of the count from the end of the relevant question or section. This will be completed before the documentation is provided to assessors.

## Disclosure of information

Reasons for decisions on submissions will be recorded at all stages for good administration and to ensure that there is a clear audit trail for all decisions. Administrative records will be maintained for all submissions irrespective of whether they are successful or not.

Please refer to Section 2.2 (Entry Process) of the Track-1x Guidance Document for additional detail on entry into non-disclosure agreements and Chapter 3 (Further Considerations) for additional detail on parties involved in the Track-1x process.

All information provided by applicants may be disclosed in accordance with DESNZ’s legal obligations (including under the Freedom of Information Act 2000 (FOIA), the Data Protection Act 2018, General Data Protection Regulation (GDPR) and the Environmental Information Regulations 2004 (EIR) in the event that a request for information is received). More information on the FOIA, Data Protection Act 2018, GDPR and EIR (including information on exemptions) can be found at: <https://ico.org.uk/for-organisations/>

To help DESNZ deal with information requests and without prejudice to the paragraph above, in the box below, please set out the reasons why you consider any specific information should not be disclosed, including (if possible) by reference to the specific exemption contained in the relevant legislation (for example, because disclosure of the information would prejudice your commercial interests under section 43 of the FOIA), explaining why this is the case.

Where appropriate, please also state whether you consider the reason(s) information should not be disclosed by DESNZ only apply for a particular time period. If we receive an information request, we will consider your views as stated on the submission form. However, DESNZ will ultimately decide how to respond to an information request and whether any information should be withheld, subject to the Information Commissioner's Office decision in the event of the requestor appealing the decision.

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| Please detail what specific information, if any, within this submission should not be disclosed and the reasons why. Please include (if possible) reference to the specific exemption contained in the relevant legislation. |
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## Glossary of terms

Table 1 – Acronyms

| Acronym | Meaning |
| --- | --- |
| BAFO | Best and Final Offer |
| BECCS | Bioenergy Carbon Capture & Storage |
| CAPEX | Capital Expenditure |
| CO₂ | Carbon dioxide |
| CO₂e | Carbon dioxide equivalent |
| CRI | Commercial Readiness Index |
| COD | Commercial Operation Date |
| DCO | Development Consent Order |
| DPA | Dispatchable Power Agreement |
| FID | Final Investment Decision |
| FEED | Front-End Engineering Design |
| GGR | Greenhouse Gas Removal |
| GHG | Greenhouse Gas |
| HEC | Hydrogen Emissions Calculation |
| HHV | Higher Heating Value |
| HoT | Heads of Terms |
| ICC | Industrial Carbon Capture |
| JV | Joint Venture |
| LCHA | Low Carbon Hydrogen Agreement |
| LCHS | Low Carbon Hydrogen Standard |
| MJ/kg | Mega-joule per kilogram |
| MoU | Memorandum of Understanding |
| MRV | Monitoring, Reporting and Verification |
| GWh, MWh or MW | Giga-Watt Hour, Mega-Watt Hour or Mega-Watt |
| OCP | Operational Conditions Precedent |
| OPEX | Operating Expenditure |
| QCRA | Quantitative Cost Risk Analysis |
| QSRA | Quantitative Schedule Risk Analysis |
| SMEs | Small and Medium-Sized Enterprises |
| T&S | Transport and Storage |
| T&SCo | Transport and Storage Company |
| tpa | Tonnes per annum |
| TRL | Technology Readiness Level |
| WACC | Weighted average cost of capital |

## Definitions

Table 2 – Definitions

|  |  |  |
| --- | --- | --- |
| Term | Definition |  |
| Applicant | Legal entity that intends to apply for support, and will be taken through to negotiations if successful (see also Project Representative). |
| Battery Limit | The geographic boundaries identifying scope of works for process units or the Project. |
| Biomass-to-Hydrogen project | Hydrogen projects using a feedstock which produces ≥ 90% biogenic CO₂ |
| Biomass Requirements  | These are the requirements set out in the Low Carbon Hydrogen Standard (LCHS) intended to mitigate against negative environmental and social consequences that can arise from the sourcing of biomass used as a feedstock, including the Sustainability Criteria, the Minimum Waste and Residue Requirement, and reporting on estimated indirect land-use change emissions. See also the definition for the LCHS and the LCHS, Version 3[[2]](#footnote-3) for further details of its requirements |
| Carbon Intensity | Grams of CO₂ equivalent per tonne of hydrogen g CO₂e/tonne |
| CCS or CCUS | Carbon Capture and Storage or Carbon Capture, Usage and Storage |
| CO₂e | Carbon Dioxide equivalent. The amount of carbon dioxide emission that would cause the same radiative forcing, over a given time horizon, as an emitted amount of greenhouse gases (GHG). As calculated using global warming potential (GWP) values for a 100 year time horizon, relevant to reporting under UNFCCC, published by the IPCC in its Fourth Assessment Report (AR5). |
| Cluster | Transportation and storage network (incorporating the onshore and offshore network and offshore storage facility) and an associated first phase of carbon capture projects. |
| Cluster Lead | Party responsible for submitting the Cluster Plan to BEIS. It should be the entity primarily responsible for the T&S network. |
| Commercial Operation Date | The date the plant is confirmed to meet the Operational Conditions Precedent (OCP) and the Project is capable of operating and transporting captured CO₂ emissions to permanent storage. |
| Cross Chain | All elements of the Project including development, delivery and operation of all capture projects as well as Onshore, Offshore and storage infrastructure. |
| Hydrogen Production Plant | CCUS-enabled facility producing low carbon hydrogen. |
| Hydrogen Production  | CCUS-enabled hydrogen production. |
| Hydrogen Project | Project to develop, construct and commission a new build CCUS-enabled Hydrogen Production Plant and where applicable, any associated hydrogen infrastructure. |
| Levelised Cost of Hydrogen | Calculation to consider overall cost of hydrogen production. *Note: Please see Section 2* |
| Hydrogen Production Plant | Facility producing CCUS-enabled low carbon hydrogen. |
| Mitigation | Mitigation refers to actions taken to reduce the overall risk either pre- or post-event. |
| Offshore | The offshore element of the CO₂ transportation network up to the point where CO₂ enters the geological Storage. Note: This excludes shipping transportation. |
| Onshore | The onshore element of the CO₂ transportation network which may include intermediate CO₂ storage for T&S operational purposes. Note: This excludes road and rail transportation. |
| Operational Conditions Precedent | The Operational Conditions Precedent (OCPs) are a set of requirements a Project must demonstrate to the appropriate counterparty to prove that they have commissioned their facility and are ready for commercial operations. The OCP requirements are outlined in the relevant business model Terms and Conditions. |
| Project | Power CCUS, ICC including Waste ICC, Hydrogen, GGRs or pBECCS production facility – including carbon dioxide emission source(s) targeted for abatement – development and its associated CO₂ capture facilities, that will be assessed in the Track-1 Expansion process. |
| Project Representative | Legal entity responsible for accessing the submission Portal and submitting the Project Plan and associated Annexes to DESNZ. The Project Representative is expected to be from the primary, or partner, organisation responsible for Project development. For Capture-as-a-Service (CaaS) this must be a CaaS Group Lead. Project Representative may be the same person as the Applicant. |
| Storage | Geological store for the captured CO₂ from the end of the injection well. |
| Technology Readiness Level | Technology readiness levels are an indication of the maturity stage of development of a technology on its way to being developed for an application or product. The section below defines TRLs 1 to 9. **Research and development** TRL 1 – Basic Research: Scientific research begins to be translated into applied research and development. TRL 2 – Applied Research: Basic physical principles are observed, practical applications of those characteristics can be 'invented' or identified. At this level, the application is still speculative: there is not experimental proof or detailed analysis to support the conjecture. **Applied research and development** TRL 3 – Critical Function or Proof of Concept Established: Active research and development are initiated. This includes analytical and laboratory studies to physically validate analytical predictions of separate elements of the technology. Examples include components that are not yet integrated or representative. TRL 4 – Laboratory Testing/Validation of Component(s)/Process(es): Basic technological components are integrated to establish that the pieces will work together. TRL 5 – Laboratory Testing of Integrated/Semi-Integrated System: The basic technological components are integrated with reasonably realistic supporting elements so it can be tested in a simulated environment. 18.3 Demonstration TRL 6 – Prototype System Verified: Representative model or prototype system is tested in a relevant environment. TRL 7 – Integrated Pilot System Demonstrated: Prototype near or at planned operational system, requiring demonstration of an actual system prototype in an operational environment. **Pre-commercial deployment** TRL 8 – System Incorporated in Commercial Design: Technology is proven to work - actual technology completed and qualified through test and demonstration. TRL 9 – System Proven and Ready for Full Commercial Deployment: Actual application of technology is in its final form - technology proven through successful operations. |
| Transport & Storage Network (T&S Network) | The network consisting (wholly or mainly) of:• pipelines used for the transportation of captured carbon dioxide from one capture plant to a storage facility or to or from any T&S Network; or• routes used for the transportation of captured carbon dioxide from one capture plant to a storage site or to or from any T&S Network; and• storage site for the geological storage of carbon dioxide. |
| Unsupported Users | This has the meaning given to it in Chapter 3.3 of the T1x HyNet Process – Application Guidance.  |
| Waste-to-Hydrogen project | Hydrogen projects using an eligible waste feedstock which produces under 90% biogenic CO₂ |

## Units

Where possible please use units of measurement defined by the International System of Units (SI) within your answers. For example:

* Electrical energy or Power: MWh or MW.
* Thermal energy or Power: MWh or MW.
* Gas energy or Power: MWh or MW – Gross Calorific Value basis.
* Gas calorific value: MJ/kg – Gross Calorific Value basis.
* CO2 flow rate: mass basis – tonnes per annum, (tpa, ktpa or Mtpa) for annual average or total annual flow rate. Instantaneous or peak flow rates should be provided in tonnes per hour (tph).

# 1. Applicant information

Contact information will be collected through the Expression of Interest process. Completed versions of this document, Hydrogen Initial Cost Information Form (Annex B3) and Financial Statement Form (Annex C) are to be uploaded to the individual SharePoint site alongside any supporting evidence.

# 2. Eligibility

Eligibility Criteria are fully described in the Track-1x Guidance Document.

Eligibility will be checked against the evidence submitted within this section, Section 3, and Section 4. Applicants will be notified via email on whether or not they have met the eligibility criteria. Only eligible Projects will progress to the next stage where they will progress to the Deliverability Assessment.

Please confirm and evidence how the CCS-Enabled Hydrogen Project meets the Eligibility Criteria and provide appropriate supporting evidence for the following requirements.

**Must be located in the United Kingdom (100 words)**

Supporting evidence could include a site layout or map or location plan, including postcode.

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**Evidence:**

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| Document reference | Document name | Relevant page/section |
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**The Applicant must be incorporated and registered in the UK. (250 words)**

Supporting evidence is expected to include a UK company registration number demonstrating that the Applicant is incorporated and registered in the UK.

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**Evidence:**

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| Document reference | Document name | Relevant page/section |
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**Must be able to demonstrate direct, onshore, pipeline access to the HyNet T&S Network, with no intermediate non-pipeline transportation of CO2 (250 words)**

Evidence of access to a T&S Network should include as a minimum:

* an MOU with the T&S Co;
* a high-level pipeline connection study including routing of intermediate pipelines or pipework to connect to the T&S Network.

The connection study need not be detailed for this eligibility criteria but must identify onshore, direct, pipeline route options between the project site and connection point to the T&S Network. Further detail, if available, would be beneficial for the Deliverability assessment question 4.7.

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**Evidence:**

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| Document reference | Document name | Relevant page/section |
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**Must be able to be operational no later than the end of December 2030 (250 words)**

Supporting evidence is expected to include a project schedule.

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**Evidence:**

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| Document reference | Document name | Relevant page/section |
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**Must be a new build CCS-enabled hydrogen production plant, excluding Biomass-to-Hydrogen projects4 (250 words)**

The CCS-enabled hydrogen plant must be a new build, where both hydrogen production and capture units are constructed.

Supporting evidence could include a basis of design, process summary or other engineering study showing the technology and configuration.

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**Evidence:**

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| Document reference | Document name | Relevant page/section |
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**Must be capable of meeting the requirements of the Low Carbon Hydrogen Standard (LCHS) (250 words)**

The CCS-enabled hydrogen project must be designed to be capable of meeting the Low Carbon Hydrogen Standard ((LCHS)[[3]](#footnote-4)), including the Biomass Requirements..

Supporting evidence must include the completed Hydrogen Emissions Calculation (HEC) form, demonstrating that the Project is likely to meet the LCHS including the emissions threshold of 20gCO₂e/MJLHV H₂ and any relevant Biomass Requirements, and any supportive evidence for the Biomass Requirements. Projects must complete one HEC for each of the first three years of operation.

Projects must also provide a Fugitive Hydrogen Emission Risk Reduction Plan demonstrating how fugitive hydrogen emissions at the production plant will be minimised. Projects will have to detail the sources of emissions and their expected rate of fugitive hydrogen losses in kgH/year with justifications of estimates, measurement, and monitoring in place.

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**Evidence:**

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| Document reference | Document name | Relevant page/section |
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**Must meet additional waste feedstock specific criteria (250 words)**

**Where relevant, Waste-to-Hydrogen projects must use an eligible feedstock.**

If utilising feedstocks not directly derived from fossil sources, applicants must demonstrate that less than 90% of the CO2 generated shall be of biogenic origin[[4]](#footnote-5) and to be eligible it must meet relevant sustainability requirements.

Facilities must also process at least one of the following feedstocks:

* Municipal Waste[[5]](#footnote-6),
* Commercial and Industrial Waste[[6]](#footnote-7),
* Clinical Waste[[7]](#footnote-8), and/or
* Hazardous Waste[[8]](#footnote-9).

Any waste feedstock used must be appropriate for use in the waste management facility type in line with the priority order of the Waste Hierarchy[[9]](#footnote-10) and environmental permit expectations.

Evidence is expected to include anticipated biogenic and fossil CO2 proportions generated for each year of the contract, the basis of design or process description. Further supporting evidence could include a list of intended waste codes, an environmental permit or evidence of a plan to obtain an environmental permit, supply chain reports, waste supply agreements, or feedstock analysis, or a description of why the project plan complies with the Waste Hierarchy.

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**Evidence:**

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| Document reference | Document name | Relevant page/section |
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**Must utilise a core hydrogen production technology which has been tested in a commercial environment, with a Technology Readiness Level (TRL) of 7 or above (250 words)**

Supporting evidence shall include TRL justifications, details of reference projects and/or pilot/demonstration scale testing.

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**Evidence:**

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| Document reference | Document name | Relevant page/section |
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**Must have identified and engaged with at least one Qualifying Offtaker** **(250 words)**

Supporting evidence is expected to include letters of support, memoranda of understanding, letters of intent, or commercial agreements from eligible offtakers.

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**Evidence:**

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| Document reference | Document name | Relevant page/section |
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**Must be able to demonstrate that they have the appropriate financial support to reach operational status. Applicants must be able to show information about their financing plan and the status of discussions with financiers (250 words)**

Supporting evidence is expected to include letters of support, memoranda of understanding, letters of intent, or commercial agreements from financiers.

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**Evidence:**

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| Document reference | Document name | Relevant page/section |
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# 3. CCS-Enabled Hydrogen Project Overview

### 3.1 Project Overview

### 3.1.1 CCS-Enabled Hydrogen Project Description (2000 words)

The description of the CCS-Enabled Hydrogen Project should include reference to appropriate supporting information to include, but not limited to the following:

* Details of the type of hydrogen production plant, the source of the CO₂ stream for capture, proposed capture plant, CO₂ treatment, any storage, compression facilities.
* A description of the hydrogen production process including any additional power / thermal energy requirements and the proposed technology type (including the extent to which this is a firm position).
* The feedstock source for hydrogen production e.g. national gas transmission system.
* The hydrogen production technology provider, if known, and CO2 capture technology process, if separate to the hydrogen production process.
* Clear diagram(s) / schematic(s) of the CCS-Enabled Hydrogen Project.
* The location of the CCS-Enabled Hydrogen Project. Is the CCS-Enabled Hydrogen Project dependent on, integrated with, or does it provide support or products to other local industrial plant(s)?
* Details of the connection point to the CO2 T&S network, connection point to the electricity grid, connection point to the gas network, water intake/cooling.
* Maps showing the location of the CCS-Enabled Hydrogen Project, including but not necessarily limited to its location in relation to the T&S, grid connection point, gas network connection point, and other relevant local industrial plant(s).
* What state of development is the project at, when is FID programmed / anticipated for the total facility including hydrogen production and capture elements of the plant?
* The design life of the CCS-Enabled Hydrogen Project, including the capture facility and overall plant life.
* The CO₂ capture efficiency and carbon intensity of hydrogen at maximum production capacity operation.
* The captured and uncaptured CO₂ sources across the whole operational site, including anticipated annual CO₂ volumes and the hourly CO₂ volumes during an hour of operation at maximum capacity. Please include the assumptions for load factor which inform the profile of captured volumes.
* A process description of the proposed CO₂ capture technology, including details of power and thermal energy requirements during start-up and normal operation of the plant (including the extent to which this is a firm position).
* An explanation of whether the project will capture and store biogenic emissions and if the project will generate negative emissions.
* Whether CO₂ export to CO₂ users (CCU) is expected alongside transport and storage. For Projects looking to implement a combination of CCU and CCS, please include the estimated percentage of CO₂ stored from the Project’s captured CO₂ volumes per year for the duration of the contract length.
* To what extent the CCS-Enabled Hydrogen Project is dependent on third party agreements (e.g. fuel supply, grid connection, off-taker(s)) to be able to confirm programme delivery dates and volume certainties for both hydrogen production and captured CO2?
* Supporting evidence of any engineering work already completed and the status of ongoing work.
* Anticipated hydrogen production volumes, production profile, how this matches offtaker demand and production efficiency.
* The transport solution to supply hydrogen to the offtakers.
* A description of plans for storage of hydrogen if relevant.

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| References to supporting documentation for Section 3.1 |
| Document reference | Document name | Relevant page/section |
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### 3.2 CCS-Enabled Hydrogen Project status and key metrics (250 words)

Please fill in the metrics within the table below. Any additional graphs to summarise the hydrogen production and captured CO₂ profiles would be beneficial. Please also refer to Annex B3 Initial Cost Information Form. Where metrics are repeated across annexes it is expected that the same figures and methodologies should be used.

|  |  |
| --- | --- |
| Metric | Value |
| Final Investment Decision date |  |
| Commercial Operation Date |  |
| CCS-Enabled Hydrogen Project carbon intensity (gCO₂e/MWh (HHV)) |  |
| Overall capital costs to end of 2050 (£m) |  |
| Overall operational costs to end of 2050 (£m) |  |
|  Total stored volumes of CO2 to end of 2050 (MtCO₂) |  |
|  Total produced hydrogen volumes before 2050 (GWh (HHV)) |  |
| Maximum Hydrogen plant output capacity (MW (H2 HHV)) |  |
| OCP Design Capture Rate (%) |  |

### 3. 3 Expansion Phases

This section is to describe whether there is planned follow on development of CCS-enabled hydrogen production at the site, beyond the currently described project. Such projects would be assessed outside of this current Track-1 Expansion process, but it is useful to understand the context and intentions for the site.

### 3.3.1 Expansion of CCS-Enabled Hydrogen Project (500 words)

Please provide a concise description of additional stages of development of the CCS-Enabled Hydrogen Project whether this be multiple staged hydrogen production units or applying capture to additional CO₂ sources within the CCS-Enabled Hydrogen Project site. Please include a description of the uncertainty around these future phases in terms of execution, offtake market, volumes, costs and capture efficiency. Only the phase that will be operational by 2030 shall be considered within this application for support. Additional support and access to the T&S network may be possible and available in the future for the additional phases described herein.

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| References to supporting documentation for Section 3.3.1 |
| Document reference | Document name | Relevant page/section |
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### 3.4 Hydrogen Offtakers (500 words per offtaker)

Please describe the hydrogen offtakers, including the route to end use if this involves more than one party. Please describe any dependencies they have on the hydrogen plant including (please note this is not an exhaustive list and projects should include any additional information they consider relevant):

1. A description of who the hydrogen offtakers are including where they are and what their product/service is.
2. The hydrogen offtakers demand profile, including any variation or seasonality, and how this matches the supply profile and both the maximum and minimum production capacities.
3. The purpose of the hydrogen supplied and whether it is displacing an existing fuel demand or creating a new demand. If displacing existing demand, what fuel is being displaced and what quantity.
4. The current status and progress made to date on developing contractual and commercial agreement, and the physical supply arrangements, between the hydrogen producer and the offtaker(s), including evidence of offtaker engagement. This should include technical and commercial details on all offtaker(s) requirements.
5. A detailed description of outstanding work required to secure all contractual and commercial agreements, complete all physical supply arrangements and any risk and critical dependencies being managed to avoid delays.
6. Any additional development required for any offtaker to receive and use the hydrogen, the engineering completed to date, the status of ongoing work and any technology risk in the design of the development.
7. Details of planning and consenting required for the hydrogen transport to, and/or development required by, any offtaker in order to receive and use the hydrogen.
8. At least one of the proposed, viable offtakers must be a qualifying offtaker to meet eligibility requirements.

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Supporting evidence is expected to include letters of support, memoranda of understanding, letters of intent, or commercial agreements from offtakers.

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| References to supporting documentation for Section 3.3.2 |
| Document reference | Document name | Relevant page/section |
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### 3.5 Feedstocks and Energy – Commercial and physical supply arrangements (500 words per supply)

Please describe plans to source feedstock(s) and meet energy demands required to produce the proposed hydrogen production volumes. Cover both commercial and physical supply arrangements, including an overview of the current status of development and the robustness of these plans to enable successful project delivery to be achieved.

Please provide details on the following:

1. A description of all feedstock and energy needed to produce the planned production volumes (for example, water, waste, biomass, steam, electricity, and/or natural gas);
2. A detailed description of the development progress made to date to finalise all contractual/commercial agreements and all physical and technical supply arrangements;
3. A detailed plan of all future work required to secure feedstock(s) in line with the proposed COD and any risk and critical dependencies being managed to avoid delays.

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Supporting evidence could include letters of support, memoranda of understanding, letters of intent, or commercial agreements from suppliers.

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| References to supporting documentation for Section 3.3.3 |
| Document reference | Document name | Relevant page/section |
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# Deliverability

### Organisational and Technical Maturity

### Organisational structure – company level (750 words)

What is the company structure? Please provide a chart which positions the project vehicle within any wider company structure highlighting the following information for each entity within the structure:

1. Primary activity and location
2. Ownership (including details of any stock market listings)
3. Where within the company/group structure will key investment decisions be taken.
4. If a new legal entity is to be created for the purpose of this Project, where in the company/group structure this will sit and the expected timing of its incorporation.

Please provide a capability statement, which includes relevant corporate experience and identifies personnel with key roles and responsibilities. Please also provide brief details of the company’s approach to ensuring Corporate Governance best practice.

Please provide details of the ultimate beneficial owner of the corporate group, as well as the details of any shareholder (or group of related shareholders) owning more than 5% of the group’s equity capital.

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| References to supporting documentation for Section 4.1.1 |
| Document reference | Document name | Relevant page/section |
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### Organisational structure and governance – project level (750 words)

Please describe the organisational structure at a project level including how the delivery of the Project will be managed and the experience of key personnel. Please describe the status of any commercial agreements between parties within the delivery structure alongside plans to progress future agreements, including key milestones and any dependencies.

Please also provide details of any new legal entity to be created for the purpose of this Project. Where relevant please include any anticipated joint venture arrangements or agreements alongside the activities and associated timeline to finalise any joint venture arrangements.

Please describe the capability of the project developers and governance arrangements.

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| References to supporting documentation for Section 4.1.2 |
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### Technical Maturity

Please describe the level of project engineering definition providing the studies completed as evidence. With reference to the schedule describe the studies to be completed and where identified, who will complete them.

Please describe the project and provide supporting information detailing the following:

1. The location and layout of the project, clearly identifying related facilities and required third party connections;
2. Process description with schematics or process flow diagrams;
3. Engagement with the supply chain to date including technology providers, contractors (tier 1 contractors or beyond), equipment suppliers, consultants and external advisors, and planned future engagement;
4. Maturity of the supply chain for this type of project;
5. Access to intellectual property and demonstration of the technologies at scale for both components and system with evidence of the operating record of the technologies (e.g. duration in service). The hydrogen production rate and volumes anticipated, CO2 capture quantities anticipated, capture rate, energy efficiency and any associated emissions;
6. The status of required land, access and third-party connections required to deliver the project such as electricity, fuel, or water. Note; there is a separate section covering the CO2 T&S connection.

Please describe the technology readiness level[[10]](#footnote-11) (TRL) and commercial readiness index[[11]](#footnote-12) (CRI) level of the selected hydrogen production and carbon capture technologies with supporting evidence such as TRL or CRL justifications, reference projects and pilot/demonstration scale testing. Section 6.2 of the T1x Application Guidance sets out a table with TRL definitions.

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Supporting evidence could include engineering studies, drawings, calculations, assessment of supply chain capability and capacity, supply chain agreements, licensing agreements, technology references and operating records, TRL and CRI studies, land agreements, third-party connections agreements or applications.

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| References to supporting documentation for Section 4.1.3 |
| Document reference | Document name | Relevant page/section |
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### Project Programme (1000 words)

Please provide an integrated schedule for the CCS-Enabled Hydrogen Project. This should be at least Level 2 detail, fully logic linked, including critical path and float. This should show when the CCS-Enabled Hydrogen Project comes online, and any key milestones such as: planning, consents, decisions gates, long lead equipment items, water treatment and sourcing, oxygen gas and electricity grid connections, FID, COD etc. This should also show progress to date against the stated Project schedule, with documentation and engineering information provided to demonstrate that the CCS-Enabled Hydrogen Project is progressing to plan.

The schedule must be provided in both pdf and native file format - Primavera P6 (XER) or MS Project (XML/MSP).

Please provide a concise description of the schedule’s critical path with reference to important parts of the schedule that the critical path is dependent on.

Please describe the development of the business plan and how this relates to other key activities in the programme including securing intellectual property rights, finance and supply chain and any additional services you may be providing.

We recognise different projects are at varying degrees of development, so please provide the greatest level of detail currently available that is supportable with evidence.

Please describe areas of uncertainty in the schedule: if possible, please present the Base schedule with uncertainty ranges around individual activities and identify the key risks that could expand these ranges further.

Reference to separate ‘What if’ scenarios or quantitative schedule risk analysis of the schedules would be beneficial to increase confidence of deliverability within a given time.

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Supporting evidence is expected to include a project schedule (at least Level 2), and could include ‘What if’ scenarios or quantitative schedule risk analysis.

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| References to supporting documentation for Section 4.2 |
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### Planning and Consents (750 words)

With reference to the schedule, please provide a description of the planning and consents required for the Project and the route to securing those consents. This is expected to include planning consents and environmental permit. It would be beneficial to demonstrate evidence of engagement with the relevant planning and permitting authorities and their feedback, or expert advice on the most appropriate approach to planning and permitting.

Please ensure that you highlight areas of risk and uncertainty surrounding planning and consents that could increase the durations or require design modifications to achieve approvals.

Please include a concise description of the arrangements for any specific planning consent for additional hydrogen T&S/distribution infrastructure if separate to the Project planning consent.

Reference to a separate Planning and Consents Register would be helpful, as would any evidence of engagement with statutory bodies or preparation work for applications. We would anticipate planning and consent risk being an intrinsic element of the Project risk register.

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Supporting evidence could include Planning and Consents Register, planning applications, engagement with planning and permitting authorities, and specialist consenting advice.

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| References to supporting documentation for Section 4.3 |
| Document reference | Document name | Relevant page/section |
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### Risk Management (1000 words)

Please provide a concise description of all the major risks to the CCS-Enabled Hydrogen Project and how they are going to be mitigated. It would be beneficial to evidence the risk management approach with a risk management plan or reference to company procedures in compliance with industry standards such as ISO 31000.

The separation of construction and operation phase risks would be preferable.

The risk registers should include:

* Risks for all elements of the Project and downstream chain risks, including interface risks and details on risk owners
* Mitigations and how they will be managed (e.g., eliminate, reduce, transfer, insurance, etc.) alongside estimated mitigation costs
* Identification of risks that cannot be transferred to contractors or insurers or others
* Probability estimates both pre and post mitigation
* Three-point (high, low and most likely) impact estimates for cost and schedule impacts for both pre and post mitigation
* Identification of any schedule activities that are impacted by the occurrence of each risk, also detailing the magnitude of the impact.
* Activity IDs included in the risk register
* Any significant residual safety risks
* Highlight Project innovation risks and mitigations

Below are examples of key risks that may need to be considered in relation to the CCS-Enabled Hydrogen Project (noting that this is not an exhaustive list of possible risks and that certain market and cross chain risks are addressed in the proposed LCHA business model):[[12]](#footnote-13)

Development risks including

1. If existing assets cannot be re-used after further assessment
2. Delays in obtaining planning consents and permits or any required licence or connection agreements

Construction and commissioning risks including

1. Contractor interfaces
2. Insolvency of key suppliers
3. Supply chain delays and delivery delay of critical equipment items
4. Workforce/ Key skills availability
5. Commissioning dependencies including unavailability of downstream T&S

Operational risks including

1. Limited design and operational experience of type of plant
2. Underperformance of capture plant, increasing vented volumes of CO₂
3. Low availability/high downtime of capture plant, increasing vented volumes of CO₂ and resulting in greater intermittency
4. Higher than expected energy consumption, increasing Opex and reducing net export MW
5. For pre- or post-combustion capture, higher than expected solvent consumption, increasing Opex
6. High emissions of pollutants (e.g. nitrogen compounds)
7. Low availability/high downtime of Hydrogen Plant
8. Low load factor for the hydrogen plant
9. Delays or cancellations of downstream projects – stranded asset risk
10. Closure/bankruptcy of T&S – leaving capture plant as stranded asset
11. Underperformance of Hydrogen Plant, reducing volumes of produced hydrogen
12. Fluctuations in the demand for hydrogen from offtakers

Overarching or general risks including

1. Force majeure events
2. Regulatory risks for new technology or processes, for example, hydrogen – natural gas blending or other novel processes
3. Limited design experience, codes and standards for hydrogen distribution and storage or blending with natural gas

To increase our understanding of the Project and its credibility, the inclusion of an opportunity register alongside the risk register would be beneficial for the assessment.

A quantitative risk assessment for cost and schedule where available would be beneficial to evidence confidence in the estimates.

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Supporting evidence is expected to include a risk register and could include an opportunity register, quantitative risk assessment for cost and schedule, and risk management plan or risk procedures.

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| References to supporting documentation for Section 4.4 |
| Document reference | Document name | Relevant page/section |
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### Health and Safety (1000 words)

Please provide a concise description of the work that has been performed to identify and mitigate additional Health and Safety risks specific to the Hydrogen Project, beyond those anticipated for any industrial/infrastructure project. Describe the work performed to demonstrate that all residual project and Health and Safety risks to staff, contractors and the local population during project development, execution, operational and post-cessation phases are as low as reasonably practicable. Supporting evidence of risk analyses or process hazard reviews would be beneficial.

Please also describe the systems, processes, and governance in place for Health & Safety Management.

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 Supporting evidence could include relevant sections of a project health and safety policy.

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| References to supporting documentation for Section 4.5 |
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### Financial and Commercial

This section aims to understand the financial and commercial health of all the companies involved in the development of the CCS-Enabled Hydrogen Project and the proposed financing plan for the CCS-Enabled Hydrogen Project. To support this assessment, please submit copies of the Financial Statement Form (Annex C) and associated financial documents as requested in Annex C for each *Business plan and financial health – company level* response.

* + 1. A - Business plan and financial health – company level (750 words)

Note: Each company participating in the development of the CCS-Enabled Hydrogen Project must provide a response. Multiple responses may be necessary if the CCS-Enabled Hydrogen Project is being developed in partnership.

Please describe the following:

1. Describe how your company business plans and industrial output have been impacted by events since the start of 2020.
2. What is the outlook for the company out to 2030? (Your answer should include, but not be limited to, a description of, and rationale for, expected trends in revenue, overheads and profitability, plus a comparison of these to the historical period.)
3. Describe how the Project aligns with the company’s overall strategic ambitions in the UK to 2030 and beyond.

Please provide copies of the latest two sets of audited accounts, any accompanying reports, management accounts covering the remainder of the current financial year, and forecast financial accounts covering the remainder of the current financial year and a further ten years for the following companies where applicable:

1. The company or companies operating the Project
2. The company or companies financing the Project
3. The company or companies responsible for key investment decisions in relation to this Project
4. The group parent company or companies (e.g., consolidated accounts) and ultimate parent. For the avoidance of doubt, the group parent should be regarded as the largest group in which the accounts of the companies operating and/or financing the Project are consolidated.

In support of these accounts and reports for the above entities, please include key assumptions underlying financial forecasts.

Please confirm that accounts for the above entities have not received a qualified audit report in any of the previous five years. Highlight any areas of material uncertainty raised by auditors in this period.

Please confirm if the corporate group currently has any financial obligation to HMG and provide details where applicable.

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| References to supporting documentation for Section 4.6.1 A |
| Document reference | Document name | Relevant page/section |
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4.6.2 B - Business plan and financial health – company level (750 words)

Note: Each company participating in the development of an individual T&S or project must provide a response. Multiple responses may be necessary where projects are being developed in partnership.

Please see Section 4.6.1 A for further details.

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| References to supporting documentation for Section 4.6.2 B |
| Document reference | Document name | Relevant page/section |
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### C - Business plan and financial health – company level (750 words)

Note: Each company participating in the development of an individual T&S or project must provide a response. Multiple responses may be necessary where projects are being developed in partnership.

Please see Section 4.6.1 A for further details.

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| References to supporting documentation for Section 4.6.3 C |
| Document reference | Document name | Relevant page/section |
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### D - Business plan and financial health – company level (750 words)

Note: Each company participating in the development of an individual T&S or project must provide a response. Multiple responses may be necessary where projects are being developed in partnership.

Please see Section 4.6.1 A for further details.

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| References to supporting documentation for Section 4.6.4 D |
| Document reference | Document name | Relevant page/section |
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### E - Business plan and financial health – company level (750 words)

Note: Each company participating in the development of an individual T&S or project must provide a response. Multiple responses may be necessary where projects are being developed in partnership.

Please see Section 4.6.1 A for further details. If additional rows are needed, please insert them into the table below.

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Supporting evidence is expected to include audited accounts, any accompanying reports, management accounts as described in Section 4.6.1 A.

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| References to supporting documentation for Section 4.6.5 E |
| Document reference | Document name | Relevant page/section |
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### Financing plan – Project level (1000 words)

Note: In the event of multiple participants in a project, we would expect to see a single overarching financing plan and for it to be clear how each participant fits into that.

Please describe the proposed financing arrangements for progressing the Project. Your response should distinguish between different stages of the Project and explain what is needed to achieve a final investment decision. Within your answer, please provide the timeline, dependencies, key risks and mitigations for the financing process. Please also detail the assumptions underpinning the financing plan including key ratios.

If the Project will be financed by intragroup financing or external debt arrangements that already exist, then please provide a summary of those arrangements. Your summary of the debt arrangements should reference any factors that are material to the financing e.g., headroom, duration, security, and covenants.

If new capital needs to be raised then set out the type and amount of finance anticipated, the level of market engagement that has taken place, feedback received, as well as the activities and timescale needed to secure the financing.

Please summarise the status of key agreements needed to realise the Project and the plans to finalise them e.g., shareholder/sponsor documents, loan and security documents, and Project documents.

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| References to supporting documentation for Section 4.6.6 |
| Document reference | Document name | Relevant page/section |
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### T&S Connection (1000 words)

Please describe the connection between the Project and the T&S network. This should include:

* The battery limits of the Project, the intended interface point where responsibility for the connection is assumed, custody transfer of the captured CO2 will take place, and the eventual ownership and operational boundaries;
* The intermediate pipework, including any longer distance spur pipelines, in private land or pipelines in public land to connect to the T&S network, major crossings;
* Evidence of engagement with the T&SCo, including agreements in place.

The information to answer this section could come from collaboration with the T&SCo or a high-level route options study by the applicant.

Please describe quality controls and required processing for the CO₂ entering the T&S system and how this meets the T&S specification. Please describe how the engineering solution is aligned to meet the T&S CO2 specification and what measures are in place to prevent off-spec CO2 from entering the T&S network.

Please describe the intended operating regime for the capture plant export to the T&S and any measures planned to manage intermittency or operability of the T&S network. In evidence, please provide a table showing total annual mass flow rate, average mass flow rate, and peak flow rate of CO2 to the T&S network and the expected CO2 percentage (on a mass basis) in the CO2 rich export stream.

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Supporting evidence is expected to include:

* Evidence of engagement, and any agreements in place, with the relevant transport and storage company (T&S Co),
* Engineering or routing studies for the T&S connection,
* Annual mass flow rate of CO2 and CO2 percentage (mass basis) in the CO2 rich export stream;
* Evidence of T&S CO2 specification compliance
* Diagrams showing battery limits and the intended interface point, and
* Any land agreements.

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| References to supporting documentation for Section 4.7 |
| Document reference | Document name | Relevant page/section |
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This publication is available from: <https://www.gov.uk/government/publications/carbon-capture-usage-and-storage-ccus-december-2023-statement>

If you need a version of this document in a more accessible format, please email ccust1x@energysecurity.gov.uk. Please tell us what format you need. It will help us if you say what assistive technology you use.

1. <https://www.gov.uk/government/publications/carbon-capture-usage-and-storage-ccus-december-2023-statement> [↑](#footnote-ref-2)
2. https://www.gov.uk/government/publications/uk-low-carbon-hydrogen-standard-emissions-reporting-and-sustainability-criteria [↑](#footnote-ref-3)
3. UK Low Carbon Hydrogen Standard, Version 3, December 2023 https://www.gov.uk/government/publications/uk-low-carbon-hydrogen-standard-emissions-reporting-and-sustainability-criteria [↑](#footnote-ref-4)
4. Using a feedstock composition which will produce > 90% biogenic CO₂ is considered Biomass-to-Hydrogen and should apply through the GGR pathway. [↑](#footnote-ref-5)
5. Household waste and waste of a similar composition from other sources. [↑](#footnote-ref-6)
6. Waste from commercial and industrial activities. [↑](#footnote-ref-7)
7. Waste produced from healthcare or similar activities. [↑](#footnote-ref-8)
8. Waste containing substances harmful to humans or the environment such as chemicals or asbestos: https://www.gov.uk/dispose-hazardous-waste. [↑](#footnote-ref-9)
9. The Waste Hierarchy can be viewed here: https://www.legislation.gov.uk/uksi/2011/988/contents/made [↑](#footnote-ref-10)
10. For the definition of TRL please refer to the Definitions in Table 2 of this document. [↑](#footnote-ref-11)
11. For CRI definitions please refer to <https://arena.gov.au/assets/2014/02/Commercial-Readiness-Index.pdf> [↑](#footnote-ref-12)
12. Applicants should refer to the Draft LCHA published August 2023 for more information on risks. [↑](#footnote-ref-13)