

Redcar Hydrogen Community – Final Report

Date: May 2023



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NOTE: The information within the following report is correct as of the May 2023 and is in reference to the NGN Hydrogen Village Trial Stage 2 submission submitted March 2023.	2
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NOTE: The information within the following report is correct as of the May 2023 and is in reference to the NGN Hydrogen Village Trial Stage 2 submission to DESNZ and Ofgem submitted March 2023. The documents referenced within the appendix of this report are still under review by DESNZ and Ofgem and are subject to change.



Project Background

Heating in buildings accounts for around 23% of UK carbon emissions¹, with most fuelled by natural gas. This sector of the energy landscape is therefore an immediate priority for decarbonisation to underpin progress towards a UK Net Zero 2050. The UK Government's Energy White Paper (2020) has identified low carbon hydrogen as a potential source of decarbonised heat in buildings.

The UK Government requires a strong evidence base before deciding whether to promote hydrogen transported in the existing gas network infrastructure to decarbonise heat. To gather this critical body of evidence, BEIS (now Department for Energy Security and Net Zero, or DESNZ) has invited the UK Gas Distribution Networks (GDNs) to undertake a 100% hydrogen village trial by 2025.

On 14 December 2021, NGN submitted a Net Zero Pre-construction Work and Small Net Zero Projects Re-opener application for the Stage 2 detailed design study to support the development and delivery of a hydrogen village trial. On the 6 May 2022, Ofgem published the decision² to approve the project.

Project Scope

The Department of Energy Security & Net Zero (DESNZ) refers to the scope of the village trial as follows³:

¹ BEIS internal analysis for the HM Government Heat and Buildings Strategy (2021).

² <https://www.ofgem.gov.uk/publications/hydrogen-village-trial-detailed-design-studies-decision>

³ <https://www.gov.uk/government/publications/hydrogen-village-trial-open-letter-to-gas-distribution-networks/more-about-the-hydrogen-village-trial?h2fd>



The village trial will convert a large village of around 1,000-2,000 properties to hydrogen or alternative heating solution instead of natural gas. Led by the gas distribution networks, it will trial the conversion of existing gas network infrastructure in the local area, repurposing it for 100% hydrogen.

This will involve replacing consumers' natural gas appliances with hydrogen-compatible equivalents and making any other adjustments required to properties. Hydrogen will be piped to premises for the trial period through the existing natural gas network, which will be appropriately modified to ensure it can safely transport hydrogen. Alternative heating solutions and appliances will be offered for those who are unable or do not wish to take part.

This stage, Stage 2, included the development of the detailed design, costs and completion of the detailed design requirements. These requirements were submitted as interim deliverables throughout the project with the final completion requirements being submitted at the end of March 2023 to DESNZ/Ofgem to review and make a decision on funding for the next stages, Prepare and Build, Go Live and Operate, and Trial Exit.

The project was also required to complete an application form that included 76 questions, 12 mandatory attachments and supporting information. This work was to be completed and submitted to DESNZ/Ofgem/HSE on the 30th March 2023.

Redcar Hydrogen Community Project Summary

Following significant investment by Ofgem into researching network conversion to hydrogen, the RHC Project will provide UK Government and industry with further evidence that it is possible to convert an existing network to 100% hydrogen through a planned conversion programme. The primary objectives of the RHC Project are therefore both to determine consumer acceptability of hydrogen, and to provide robust and transparent evidence to the UK Government, public and stakeholders that conversion to 100% hydrogen is economically and operationally viable.

Teesside is at the heart of the UK's green industrial revolution with significant hydrogen production facilities under development by major industrials, world-leading natural assets for storage and a range of industries seeking to decarbonise with hydrogen. With the vision for the development of a hydrogen economy through East Coast Hydrogen, Redcar is ideally placed to deliver an effective Hydrogen Village Trial (HVT).

The RHC Project comprises residential and commercial sites in the Warrenby and Coatham areas of Redcar, and an industrial site at Kirkleatham in Redcar. The total population of the project area is 5,866 and includes a diverse building stock of 2,677 properties including homes, shops, education establishments, leisure facilities and light industrial units.

The RHC Project area covers a total of 2,157 meter points consisting of 1,949 domestic and 208 industrial and commercial customers including care homes, schools, shops and offices, hotels, pubs, restaurants, and industrial users. The local housing stock covers a range of building types from Victorian terrace houses through to large, detached homes. Initial local engagement has shown a very positive response to hydrogen for heating with 89% of the 699 residents surveyed indicating that they would choose a hydrogen heating option⁴.

The RHC Project will convert this area – including its existing gas infrastructure and homes – from natural gas to 100% hydrogen. Hydrogen-ready boilers will be installed in participating properties before converting the existing

⁴ Northern Gas Networks. (March 2023) *Redcar Hydrogen Community Consultation and Research Final Report*.



infrastructure to 100% hydrogen. Hydrogen-only appliances will be installed during the period of conversion. The live trial will run for two years to ensure that evidence over two consecutive heating seasons is generated.

The hydrogen supply to the RHC will come from two main suppliers BP and EDF with both producers producing green hydrogen through electrolysis. The hydrogen will then be transported via a high-pressure pipeline to the above ground storage and above ground installation (AGI) facility as well as to the below ground storage. The intention of the above ground storage is to meet the individual peak day demand for the morning and evening loads – intraday demand (diurnal storage) – and will consist of 10 pressure vessels operating at 30 barg. The below ground storage, in the form of a salt cavern, is to ensure sufficient storage capacity in 1-in-20 winter peak demand can be met, providing several days' contingency.



Project Outcomes

Objectives Met Successfully

NGN have completed the associated Annex 2: *Project Deliverables – Table 1: NGN’s final project deliverables*, in accordance with the Ofgem decision letter dated 6th May 2022⁵:

Reference	Project Deliverable	Indicative Deadline	Evidence Required	Evidence Provided
1	Project websites and independent third-party TOR	1) 13/05/22 2) 31/05/2022	<p>1. Publicly share details of their research sites and detailed design study plans on project websites and any other engagement channels.</p> <p>2. Submission of a Terms of Reference for an independent third party to support the project, including the expected scope of work to be monitored and evaluated (which may be joint with Cadent).</p>	<p>1. Project Website Complete – https://www.redcarhydrogencommunity.co.uk/</p> <p>2. 2022.06.30 Hydrogen Village Independent Assurance Terms of Reference v2.doc</p>
2	Comms Plan	1) 31/05/22 2) 30/06/22	<p>1. Completion and issue of the Communications Plan.</p> <p>2. Submission of a plan for an independent third party to support the project and monitor consumer research and engagement over Stage 2 (which may be joint with Cadent).</p>	<p>1. NGN Interim deliverables_ Redcar Hydrogen Community Stage 2 Engagement Plan 30062022.pdf</p> <p>2. 2022.06.30 Cadent Hydrogen Village Trial Assurance PwC270522a (004).pdf</p>
3	Evidence mapping	30/06/22	Outline mapping of evidence collection (Stages 2 to 5) against the latest version of BEIS’ Trials Evidence Framework.	<ul style="list-style-type: none"> • NGN Interim Deliverable_ Mapping of evidence collection against BEIS Evidence Framework 30062022.xlsx • NGN Interim Deliverable _ Summary of

⁵ <https://www.ofgem.gov.uk/sites/default/files/2022-05/Hydrogen%20Village%20Trial%20Detailed%20Designs%20-%20Decision1651664774599.pdf>



				Evidence Collection Stages 2-5 30062022.pdf
4	Comms and Engagement Plans	1) 30/06/22 2) 30/09/22	1. Detailed comms and stakeholder (including consumers) engagement plan for Stage 2 2. Outcome of early comms and engagement with all stakeholders (including consumers)	1. NGN Interim deliverables_Redcar Hydrogen Community Stage 2 Engagement Plan 30062022.pdf 2. Redcar Hydrogen Community - Interim Engagement and Comms Report.pdf
5	Project Costs	1) 30/06/22 2) 30/06/22 3) 15/12/22	1. Updated best estimate of indicative project costs and any changes from estimates supplied in Stage 1, including in: <ul style="list-style-type: none"> • Total spend in each stage • Profile of spend by financial year • Any optionality under consideration (e.g., consumer offers, exit scenarios) • Materiality of private sector contributions 2. Assessment of any additional funding requirements for activities necessary in advance of starting Stage 3 (e.g. long lead items) 3. Evidence of application for funding to relevant funds if applicable (NZHF, IDHRS)	1. Redcar Hydrogen Community - Updated Indicative Costs.xlsx 2. Redcar Hydrogen Community - Long Lead Item List.pdf 3. Evidence of funding applications provided in December Deliverable
6	Preliminary Site Investigations	30/6/22	Report on the initial site surveys and outline of further reporting requirements of more detailed surveys (if any)	<ul style="list-style-type: none"> • NGN Interim Deliverable_Village Trial_ Initial Site Surveys Report 30062022



7	Evidence Plan	1) 30/09/22 2) 31/03/2023	1. Initial monitoring and evaluation plan for the trial for the evidence generated and type of evaluation methods, including timescales, resourcing considerations, and how lessons learnt will be disseminated with Ofgem, BEIS, and other GDNs 2. Full evidence plan in relation to the latest version of the BEIS' Trials Evidence Framework.	1. Redcar Hydrogen Community - Monitoring & Evaluation Plan – Final.pdf 2. Redcar Hydrogen Community - Evidence Mapping & Collection Against Evidence Framework.xlsx
8	Consumer Offer	1) 30/09/22 2) 30/09/22	1. Detail of provisional consumer offer including alternative offers 2. Provisional strategy for maintaining consumer protections for all (including engagement, approaches to vulnerable consumers or those who opt for alternative offers). 3. Consumer draft agreements with indicative sign-up figures	1. Redcar Hydrogen Community - Provisional Customer Strategy Final.pdf 2. Redcar Hydrogen Community - Provisional Customer Strategy Final.pdf 3. Legal Agreement Outline Legal Agreement- Development Process Legal Questions- Preliminary Responses NGN RHyC consultation questionnaire - interim report – FINAL.pdf
9	End-Users Surveys	1) 30/09/22 2) 15/01/23	1. Report on initial site surveys including demographics 2. Full surveys of all properties in the trial locality, including inventory of appliances (currently in use + required during the trial)	1. Redcar Hydrogen Community - Initial Site Surveys and Demographics.pdf 2. Redcar Hydrogen Community - Domestic Survey Updates.pdf Redcar Hydrogen Community - I&C Survey Updates.pdf Other survey report



10	Supply Chain Analysis	30/09/22	Assessment of appliance, workforce, equipment and material availability and reliability including gap analysis and RAG table	<ul style="list-style-type: none"> Redcar Hydrogen Community - Supply Chain Analysis.pdf Redcar Hydrogen Community - Annex to ARUP Report.pdf
11	Conversion Plan	30/09/22	Initial sectorisation plan, modelling report, and conversion schedule	<ul style="list-style-type: none"> Redcar Hydrogen Community - Sectorisation Plan – Final.pdf
12	Hydrogen Production Design	1) 30/09/22 2) 15/12/22	<ol style="list-style-type: none"> Feasibility analysis of options for hydrogen production Update on final design concept for hydrogen production and review of options outcomes of stress test assessing resilience, mitigation plans, and associated GHG emissions estimates 	<ol style="list-style-type: none"> Redcar Hydrogen Community - Interim Hydrogen Supply Design Report.pdf Redcar Hydrogen Community – 2nd Interim Hydrogen Supply Design report.pdf
13	Property Surveys Complete	31/12/22	Survey database updated with majority of required data	<ul style="list-style-type: none"> Redcar Hydrogen Community – Survey Updates V2.1.pdf IC Report – December Deliverable Final V.1.pdf Further supporting documents
14	Outline Case for Safety	31/3/23	Draft Case for Safety	<ul style="list-style-type: none"> Distribution Case for Safety (1).pdf End User Case For Safety (1).pdf Other Safety case related documents
15	Training Plan	31/3/23	The outline training plan complete to allow the detail to be developed	<ul style="list-style-type: none"> Redcar Hydrogen Community - Training Plan.pdf Redcar Hydrogen Community - Workforce and Recruitment Plan.pdf
16	Regulatory Plan	1) 15/12/22 2) 15/12/22	<ol style="list-style-type: none"> Analysis of regulatory framework and issues with regards to specificities of the trial location, with a plan for resolving any potential issues (e.g., planning, derogations, permissions, etc.) (expanding on collaborative annex work) Outline of options for potential billing 	<ol style="list-style-type: none"> EE HVT Work Package F – Reg’y model – interim report – Dec 22 (002).pdf



			methodologies including analysis of potential risks and issues	2. EE HVT Work Package F – Reg’y model – interim report – Dec 22 (002).pdf
17	Safety	15/12/22	Initial version of detailed plan of the evidence the network intends to submit to HSE before the Trial, based on the HSE ‘Safety considerations for a hydrogen trial’ document and the ‘Guidance on the development of safety evidence for a hydrogen conversion trial’ (to be shared by HSE in due course), including content of the case for safety, timeline for delivery of each element of the case for safety and supporting evidence to HSE	<ul style="list-style-type: none"> • 10373780-1 Deliverable 17 Safety - Companion report for NGN hydrogen village trial spreadsheet Rev. 0.pdf • 10373780-1 Deliverable 17 Safety NGN Redcar HSE Safety Trial Considerations Rev. 0.xlsx • Scope of below 7 bar Network Repurposing Design and Integrity Assessment for the NGN Village Trial 2.1.pdf
18	Network detailed design complete	31/12/22	Initial pipeline design complete, including reinforcement schemes	<ul style="list-style-type: none"> • Redcar Hydrogen Community - Network Design Plan.pdf
19	QRA and modelling completion	31/12/22	QRA report issued incorporating Commercial consumers	<ul style="list-style-type: none"> • 10369984-1 - MP Pipe QRA - Rev C.pdf • 10369984-2 - Distribution QRA - Rev C.pdf • 10369984-3 - Above Ground Storage QRA - Rev B.pdf
20	Stage 2 Report & Results	31/3/23	All technical reports complete and issued	<ul style="list-style-type: none"> • All technical reports completed including all the Detailed Design Requirements
21	Stage 2 Complete	1) 31/03/23 2) 31/05/23	1. Submission of a report by the independent third party that evaluates the success of consumer research and engagement methodologies, including the robustness of evidence generated as a result of these (which may be joint with Cadent). 2. Stage 2 close-down report	1. NGN Hydrogen Village Trial Assessment - Stage 2_ PwC Report_Final (1).pdf 2. This report – Redcar Hydrogen Community – Final Project report.pdf



The project also completed and issued all detailed design completion requirements on 30th March 2023 as required by the *Hydrogen Heating Village Trial Stage 3 to 5 Funding Application Guidance, Annex A, BEIS Grant Funding Detailed Assessment Criteria* (Dec 2022). A list of the detailed design requirements is provided below and due to the number of documents submitted, evidence of completion is included in the table in Appendix A of this document.

Evidence Requirement	Requirements
Evidence Base	1. Detailed evidence generated during Stage 2
	2. Expected Benefits
	3. Detailed Plan on how evidence will be generated in Stages 3-5
	4. Case for Safety
Planning and project delivery risk mitigation	5. Detailed plan, schedule and scope of work for Stages 3-5
	6. Organisation of responsibilities
	7. Evidence of satisfactory regulatory model
	8. Development of the exit plan
	9. Risk Register
Infrastructure and Delivery	10. Plan to provide resilient hydrogen supply
	11. Plan to provide alternative solutions
	12. Design and plan for grid conversion
	13. Detailed procedures for end-user conversion
	14. Workforce and Training
Public and local engagement	15. Comms and Stakeholder Engagement
	16. Consumer Offer
	17. Consumer Protection Plan
Cost & Commercial	18. Cost and funding plans

All detailed design requirements, as listed above, were completed by the project and submitted via Egress on 30th March 2023.

The project was also required to produce a public-facing application publication for the project that would be made available on the NGN website. The report, titled *Redcar Hydrogen Community – Detailed Design Phase of the Hydrogen Village Trial*, was completed and uploaded on 11th April 2023. Please refer to link below for further details:

<https://www.northerngasnetworks.co.uk/wp-content/uploads/2023/04/RHC-Network-Element-Application-Publication- FINAL-April 23.pdf>



Objectives Not Met Successfully

The project successfully completed all project deliverables as set out in the *Ofgem Decision letter, Annex 2: Project Deliverables – Table 1: NGN’s final project deliverables (May 2022)*, and the detailed design requirements as described in the *Hydrogen Heating Village Trial Stage 3 to 5 Funding Application Guidance, Annex A, BEIS Grant Funding Detailed Assessment Criteria (Dec 2022)*.

Throughout the Stage 2 period the project continued liaison with DESNZ, who agreed that some components of the deliverables were not suitable for completion at this stage of the project and that they would be captured in a future stage. The project intends to continue to progress these items during the DESNZ determination period. The project bid refers to this period in its bid as Stage 2.5. During Stage 2.5 the following will continue:

- Respond to HSE feedback on Dec 22/Mar 23 deliverables.
- Further development of QRA reports for Storage, Distribution and End User.
- Phase 2 of Reliability, Availability and Maintainability (RAM) study with DNV.
- Pre-planning activities for above ground installations, including storage.
- Development of shipper agreements.
- Procurement of vendor design packages.
- NGN G17 Detailed Design internal process including approval and appraisal of the design.
- A full network integrity assessment to link the network to the QRA and safety work already completed.
- Further regulatory work.
- Further consumer engagement panels.

The project believes it has completed all objectives and has provided a fully compliant bid, which we believe is evident by the nature of the clarification questions raised.

Main Learning Generated for Future Similar Projects

- Clarity on information requests – The project teams found that questions were received from multiple working groups within DESNZ at varying times, with little consistency or apparent coordination between them. The project was still receiving ad hoc requests for information, just two weeks prior to the full submission deadline.
- Improved access for in home surveys – Consumer uptake for surveys dwindled throughout the project period. A considerable proportion of properties in the project area are managed by landlords, making access less straightforward. Where no access is achieved, a letter-drop was used, with poor results. A more targeted approach to access would be beneficial, with more warning, more personalisation, (e.g. name rather than ‘dear occupier’) longer timescales, and active engagement with landlords, who were notably supportive during the initial consumer engagement phase. Future stages must consider how to sustain or re-engage enthusiasm for survey uptake.
- Better understanding of the DESNZ funding/approval timeline for producers – The DESNZ funding for producers does not align with the critical milestones of our own project, making cross-industry collaboration hard, and impacting dependent deliverables. Where possible, funding approval should be aligned for those projects whose success or delivery depend upon each other.
- Preparation for dissent – Protestors and anti-hydrogen groups were unexpectedly vocal. Future stages and related projects must better involve research personnel in the consumer and media



engagement processes. A robust strategy is needed for what to do with challenging research findings, enabling honesty and transparency without creating public concern or media over-reaction. A team or specialist to keep up with current research and argue the case objectively would be valuable.

- Commercial appliance supply – Due to the number of bespoke appliances identified during the appliance survey phase, this will be a bigger issue than initially expected. Manufacturing industry is well behind on producing hydrogen-ready commercial appliances, and the production of appropriate domestic appliances is also an issue, impacting our dependent project milestones including a lack of hydrogen cookers or fires.
- Original Equipment Manufacturers working at risk – Original Equipment Manufacturers are reluctant to invest in the research and development that is necessary without a firm Governmental decision that the UK will proceed with hydrogen for heat. This decision will not be finally made until 2026.
- Coordinated engagement with council and local utilities – Achieving efficiencies with council and local utilities planning would be beneficial on several levels. Due to the significant amount of work needed to convert to the hydrogen network, it could save costs, minimise disruption, and support public acceptance if we were able to coordinate with related/unrelated local plans for future regeneration or improvement/maintenance works.
- Improved asset security – Projects should attempt to keep above ground equipment on suitable land. Greater engagement in local community land ownership and planning processes could deliver time savings and minimise asset losses/degradation.
- Work downstream of the ECV – The project underestimated the scale of the survey work required downstream of the ECV, as this goes beyond BAU, and due to the time constraints, and the time it would have taken while in people’s homes, it was not possible to gather all this information.

Valuable learning was identified as follows:

- Domestic surveys were carried out by British Gas (BG) on behalf of NGN and although these surveys gathered a substantial amount of evidence, they could have been further enhanced to provide a more in-depth insight into each property as the project progressed.
- Part of the survey included recording the service materials (the key information required), but provided only a high-level requisite i.e., steel or PE. Further detail would be valuable, such as; service techniques, service insertion, what condition the service entry to the property was in, by what route/method the service enters the property, could the meter be relocated if required etc. This information is required moving forward, applying to every property as some services will require renewal and meters repositioned.
- The physical size of cookers and hobs was not recorded as it was not deemed essential when the surveys commenced. This evidence was then required to assist with the development of the Procurement Strategy and going forward, for submission to OEMs showing the range of appliances required for development.
- Central heating appliance data was recorded but did not include exact location, access restrictions, or space constraints applicable to installing replacement appliance etc.
- The surveys could have been supported by an all-encompassing photographic storyboard of the installation, starting from the service entry point and including gas and electric meters, and electrical consumer unit. Progressing through the property it would be valuable to include pipework and appliances, providing an overall picture of the entire installation both gas and electric. The storyboard would provide a visual reference to ascertain what further work could be required for each installation as procedures and appliances develop. It would also provide a real-life reference to installation conditions in the trial area and also feed into the development of the procedures and appliances.



- Gas Conditioning, DSEAR and electric surveys were carried out at commercial properties by Corgi on behalf of NGN. These surveys focused primarily on safety, feeding high-level information into the QRA with time constraints in order to meet submission deadlines.
- Appliance development in the commercial sector is not as advanced as domestic development. Like for like replacements may not be available for the I&C appliances and as a result alterations to existing systems may be required which were not initially anticipated.

Recommendations for the Supply Chain to ensure scalability of hydrogen.

- Storage requirements are a primary concern. Salt cavern storage is a complex and lengthy process. Additional storage availability, such as above ground storage in bullets must be considered to provide both resilience and flexibility of supply.
- Consideration must be given to the over-arching alignment of hydrogen production/hydrogen storage/project deliverables. Coordinating these co-dependent workstreams alongside funding application and award schedules is complex.
- More OEMs must be engaged – Successful engagement with OEMs willing to work at risk will be key in the successful delivery of this project. Industrial & commercial consumers in particular require timely development of a range of bespoke, hydrogen-ready appliances.
- A substantial body of enabling works are required, including significant reinforcement and sectorisation valves, all of which requires early interaction with local councils to avoid work clashes and minimise disruption. Work will also need to be completed at risk, to meet the local councils requirements, ahead of the DESNZ decision on the project.



Appendix A – Requirements Completion Evidence Table

Evidence Submitted	Requirement Number
Redcar Hydrogen Community - Evidence Mapping & Collection Against Evidence Framework .xlsx	1,2 & 3
Redcar Hydrogen Community - Expected Benefits.pdf	1,2 & 3
Redcar Hydrogen Community - Monitoring & Evaluation Plan.pdf	1,2 & 3
Distribution Case for Safety (1).pdf	4
End User Case For Safety (1).pdf	4
2023-03-17 EUSE status summary for HVT stage 2 submission CLEAN.pdf	4
Final - HSE - HHP ERG - Complete evidence pro-forma - V4 (1) Stage 2 HVT submission.docx	4
ENA-10377759-02 Hydrogen Safety Case Frameworks Rev 2.pdf	4
PIE_R_22_571 NGN HVT Repurposing Design and Integrity Report V2.0a.pdf	4
10369984-2 - Distribution QRA - Rev E.pdf	4
10369984-1 - MP Pipe QRA - Rev E.pdf	4
10369984-3 - Above Ground Storage QRA - Rev D.pdf	4
10373780-1 Companion report for NGN Redcar hydrogen village trial spreadsheet Rev. 1 (1).pdf	4
10373780-1 NGN Redcar HSE Safety Trial Considerations Rev. 1 (1).xlsx	4
Appendix J - Detailed Project Schedule.pdf	5
Dependencies Table.pdf	5
Detailed Project Schedule - Agreed Outputs & Key Knowledge Deliverables.pdf	5
Detailed Project Schedule - Critical Path View.pdf	5
Detailed Project Schedule - Regulatory Workstream.pdf	5
Detailed Project Schedule - Safety Workstream inc HSE Assurance.pdf	5
Detailed Project Schedule - Stage 2.5 Completion of Stage 2 Scope.pdf	5
Detailed Project Schedule - Stage 3_Build & Prepare_ Above 7 Bar.pdf	5
Detailed Project Schedule - Stage 3_Build & Prepare_ Below 7 Bar.pdf	5
Detailed Project Schedule - Stage 4_Go Live & Stage 5_Exit Plan.pdf	5
Detailed Project Schedule - Stakeholder Engagement.pdf	5
Detailed Project Schedule - Summary View (WBS).pdf	5
Detailed Project Schedule - Training Workstream.pdf	5
Optimistic_Central_Pessimistic Timeframes.pdf	5
RACI Matrix.pdf	5
Redcar Hydrogen Community - Plan on a Page.pdf	5
Redcar Hydrogen Community - Organogram.pdf	6
Redcar Hydrogen Community - Organogram.pptx	6
Redcar Hydrogen Community - Training Plan.pdf	7
Redcar Hydrogen Community - Workforce and Recruitment Plan.pdf	7
HVT - Exit Plan.pdf	8
Redcar Hydrogen Community - Exit Options.pdf	8
Redcar Hydrogen Community - Risk Register.xlsx	9



Biomethane Connection Schematic.pdf	10
Hydrogen Model Direct v2.jpg	10
Hydrogen Model via Storage v2.jpg	10
NGN H2 Village Trial RAM Study - Phase I Base Assumptions Report - Issued 24.03.2023.pdf	10
NGN H2 Village Trial RAM Study - Phase I Results - Issued 24.03.2023.pdf	10
Operating Modes.pdf	10
System Control Process Flow.jpg	10
110109-MMD-REDC-XX-DET-M-0001-A1.pdf	10
110109-MMD-REDC-XX-GA-M-0001-A1_Optimized.pdf	10
110109-MMD-REDC-XX-GA-M-0003-A1.pdf	10
Above 7barg Planning Strategy 230308.pdf	10
30-2 Bar PRS Specification.pdf	10
230314-01_Hydrogen Trial Village_Budgetary Quotation.pdf	10
230314-01-002_Rev A.pdf	10
RE_EXT_Redcar Stations.msg	10
WT220051, Rev 2 - Quote.pdf	10
EXT_RE_Northern Gas Networks - Hydrogen Village Trial - Quote __ AIUK Q-GL BUDGETS 23_01_2023 .msg	10
RE_EXT_RE_Northern Gas Networks - Hydrogen Village Trial - Quote QuoGQ388392CD.msg	10
110109-MMD-0000-XX-DS-M-0001 H2 Pressure Vessel Data Sheet.pdf	10
101920-01 Langfields Quotation.pdf	10
22.114 Rev A NGN Nitrogen Vessels.pdf	10
2237333 - Quotation.pdf	10
EXT_RE_Q2301038-VK Northern Gas Networks - Hydrogen Village Trial - Quote.msg	10
RE_EXT_RE_NGN - Redcar Hydrogen Village Trial 23-5072.msg	10
RE_EXT_RE_Northern Gas Networks - Hydrogen Village Trial Project-AN2230083.msg	10
RE_EXT_RE_Northern Gas Networks - Hydrogen Village Trial Project T23.msg	10
5217438-MD-TN-001- Deliverable A Technical Note Final.pdf	10
5217438-MD-TN-002 - Deliverable B Technical Note Final.pdf	10
5217438-MD-TN-003 - Deliverable D Technical Note Final.pdf	10
5217438-MD-TN-004 - Deliverable E Technical Note Final.pdf	10
5217438-PS-RPT-001 (HAZID Report Final).pdf	10
bp NGN HVT HyGreen MOU NGN Execution Copy.docx.pdf	10
Heads of Terms - Land Agreement.pdf	10
HyGreen HoA - Hydrogen Supply Agreement - NGN Draft 1_sm AOC EE comments.docx	10
Tees Green Hydrogen Supply Agreement - NGN comments.docx	10
Template_Hydrogen Supply Contract_30.01.2023.docx	10
9.03 Final Submission 2021-22.xlsx	10
9.04 Final Submission 2021-22.xlsx	10
110109-MMD-0000-XX-BD-J-0002 REV P2 OVERALL SYSTEM ARCHITECTURE-A1.pdf	10
110109-MMD-0000-XX-DS-M-1000 H2 Pressure Vessel Data Sheet.pdf	10



110109-MMD-0000-XX-DS-M-1001 30-2 bar PRS Datasheet.pdf	10
110109-MMD-0000-XX-IS-E-0001 REV P2 ELECTRICAL LOAD LIST.pdf	10
110109-MMD-0000-XX-IS-J-0001 Instrument List.pdf	10
110109-MMD-0000-XX-IS-J-0001 REV P2 INSTRUMENT SCHEDULE.pdf	10
110109-MMD-0000-XX-RP-C-0001 GI Desk Study Final.pdf	10
110109-MMD-0000-XX-RP-M-1001 Rev P2 Relief and Depressurisation Study Report.pdf	10
110109-MMD-0000-XX-RP-Z-0003 Hydrogen Supply TN.pdf	10
110109-MMD-0000-XX-RP-Z-0004 Tagging Convention TN.pdf	10
110109-MMD-0000-XX-RP-Z-0007 Purging Technical Note.pdf	10
110109-MMD-0000-XX-RP-Z-0009 NGN Redcar Design Summary P1.pdf	10
110109-MMD-0000-XX-RP-Z-1001 Redcar Hydrogen Community BOD Rev P2.pdf	10
110109-MMD-0000-XX-RP-Z-1003 Operating and Control Philosophy Rev P2.pdf	10
110109-MMD-0000-XX-SC-Z-1001 Cause and Effect P2.pdf	10
110109-MMD-0000-XX-SP-M-1000 Hydrogen Pressure Vessel Specification.pdf	10
110109-MMD-0000-XX-SP-M-1001 30-2 Bar PRS Specification.pdf	10
110109-MMD-PR-PID-M-1001-P2.pdf	10
110109-MMD-PR-PID-M-1002-P2.pdf	10
110109-MMD-PR-PID-M-1003-P2.pdf	10
110109-MMD-PR-PID-M-1004-P2.pdf	10
110109-MMD-PR-PID-M-1005-P2.pdf	10
110109-MMD-PR-PID-M-1006-P2.pdf	10
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