



Opergy
Group

Metro — Dynamics

**Delivery of the
North West Industrial
Decarbonisation
Cluster Plan**

Stage 1 Interim Report

December 2023

Executive Summary



- In August 2023, Cheshire and Warrington LEP commissioned work to explore the delivery requirements of the North West Industrial Cluster Decarbonisation Plan.
- The objectives of this work are to assess and recommend whether and to what extent central coordination systems are needed to facilitate the successful delivery of the recently completed NW industrial decarbonisation cluster plan.
- This commission is in two parts:
 1. An assessment of the need for a central facilitation agency to accelerate the successful decarbonisation of the NW industrial cluster by supporting the development and delivery of projects and addressing barriers to investment.
 2. Dependent on the outcome of part 1, to propose an outline role and structure for the agency.
- This stage 1 interim report summarises the desk-based research and extensive stakeholder engagement undertaken to date to build a picture of the overarching industry and public sector requirements for delivery of the NW Industrial Decarbonisation Cluster Plan.

The Cluster Plan

- The North West Industrial Cluster Plan describes a roadmap to deliver the world's first net zero industrial region by 2040. It outlines a mixed pathway roadmap including £29.65bn investment in a diverse mix of technologies over the near-term targeted at decarbonising major heavy industrial sectors across the North West and North Wales.
- The roadmap outlines investments across a range of 'waterfall' categories including power sector decarbonisation, wide scale hydrogen production and use, industrial energy efficiency measures including electrification of processes, bioenergy with carbon capture and storage (BECCS), and industrial CCUS at industrial plants.
- The development of the cluster plan, led by Net Zero North West working closely with public and private sector partners, involved a large body of research and feasibility work, including the development of a detailed investment case. Within this, the management case set out the need for coordination across a host of different areas to deliver the plan successfully, including in the planning process, development of enabling infrastructure, supply chains, workforce and skills, financing and inward investment. It made a clear recommendation for creating an enabling institution to work across these areas and support delivery of the cluster plan projects.

Requirements for Successful Delivery

- The plan includes a complex portfolio of projects, with inherent interdependencies throughout, particularly in relation to the Hydrogen and CCUS elements. Through this commission, the project team undertook extensive stakeholder engagement with both public and private sector partners to identify the challenges and opportunities in delivery of the cluster plan portfolio. Informed by this work, requirements for its delivery were highlighted including the following:
 - **Policy Certainty and Incentives** driving forward key technology types including Hydrogen and CCUS, balancing the price of hydrogen and providing financial support for decarbonisation.
 - **Development of enabling infrastructure** including address planning and regulatory permitting challenges, provide improved regional grid connectivity, access to suitable low carbon transport networks, water network capacity, and delivery of hydrogen and CO₂ pipelines.
 - Supporting **consistent and effective regional communications** on the industrial decarbonisation agenda to local, regional and national audiences
 - Supporting development of appropriate **skills, workforce and systems** to deliver the cluster plan efficiently.

Executive Summary



→ And provision of overarching **leadership, oversight and assurance** to monitor and oversee progress of the complex and evolving portfolio of projects within the cluster plan and support delivery of multiple projects in parallel.

The Case for Intervention

- The case for intervention is made on the basis of 7 requirements identified through research and engagement. These are as follows:
- **Timely delivery of core infrastructure** - Critical to ensure that all necessary infrastructure projects are completed within the set timelines to avoid delays in the cluster's overall progress.
- **Policy incentives and certainty** – Communicating with central government to improve visibility of regional challenges and support establishment and maintenance of a stable policy environment that offers incentives, encouraging investment and participation from various stakeholders.
- **Project brokering and facilitation** - Active management and coordination between projects under the cluster plan to ensure effective implementation and stakeholder synergy.
- **Progress visibility and assurance** - Implement transparent tracking and reporting mechanisms to provide stakeholders with regular updates and assurance of the Cluster Plan's progress and adherence

to goals.

- **Regional support and alignment** - Foster strong collaboration and support from regional entities to align goals, resources, and efforts towards the collective success of the cluster.
- **National coordination and collaboration** - Coordinate efforts at a national level to ensure that the cluster's initiatives are in sync with national policies and benefit from broader government support.
- **Addressing medium term enablers** - Identify and tackle potential challenges and enablers that may impact the cluster's objectives in the medium term, preparing for future project phases.

Conclusions and Recommendations

- The research and stakeholder engagement undertaken during phase 1 highlights an alignment from all stakeholders on requirement for some form of intervention to support delivery of the NW Industrial Cluster Plan. This interim report concludes that the following core functions are required to deliver the cluster plan:
 - Oversight and monitoring of cluster plan delivery
 - Effective engagement across regional partners
 - Support consistent and strategic communications

- Engagement and collaboration with other industrial clusters
- Brokering the relationship with national government
- Supporting inward investment
- Managing risks to delivery

- The following functions were considered out of the direct scope for any intervention body, though it is appreciated this body will need to feed into other forums or projects identifying and working to address these challenges into the future:
 - Support for smaller industrial and manufacturing decarbonisation
 - Delivery of skills and workforce development
- It is the recommendation of this report to move forward to stage 2 of the commission to develop recommendations on potential delivery options for a new agency or coordination body to support and facilitate delivery of the cluster plan.
- This work will identify role, structure and governance of such a body based on the requirements outlined through the work to date. Recommendations will be presented in a final project report in December 2023.

Contents

The Cluster Plan & Strategic Context – Page 6

- The Cluster Plan and Portfolio of Projects
- North West Renewable Energy Project Pipeline
- National Policy Context & National Policy Incentives
- Incentivising the Hydrogen Ecosystem
- Energy Efficiency and Electrification
- Setting the National Policy Context
- UKRI Insights on Enabling Net Zero
- Emerging Decarbonisation Clusters

What is Needed for Successful Delivery? – Page 19

- Project Interdependencies and Phasing
- Wider Renewables and Net Zero Investment
- Policy Requirements
- Project Enablers
- Communications
- Skills, Workforce and Systems
- Leadership, Oversight and Assurance

- Regional vs. National Lever and Influence

The Case for Intervention – Page 32

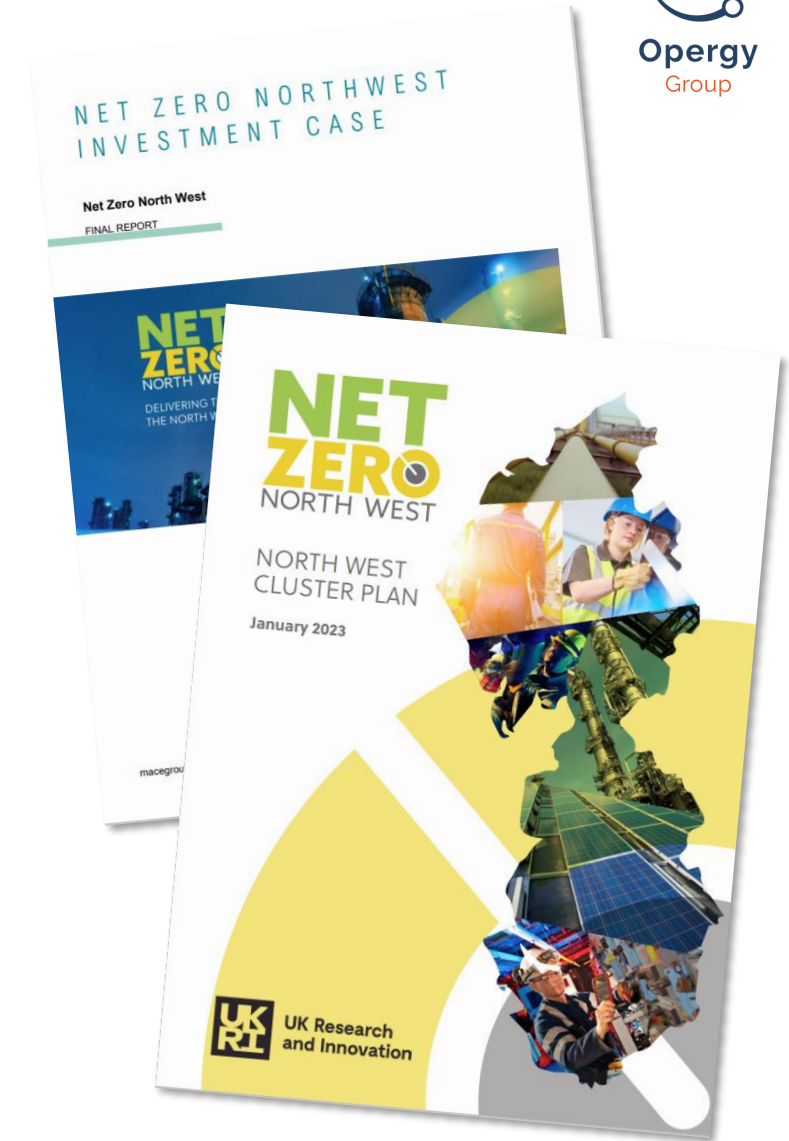
- Revisiting the Management Case
- Lessons from Other Clusters
- Requirements Built on Research and engagement
- The Case for Intervention
- Benefits and Opportunities of Intervention
- Conclusion
- Developing options for implementation

Appendices – Page 40

- Recent Policy Incentives no Longer Available
- Organisations Consulted
- Key Contacts

Introduction

- The Cluster plan, published in January 2023, outlines a roadmap for decarbonising power generation and heavy industry across the NW region, including North Wales.
- In August 2023, Cheshire and Warrington LEP commissioned work to explore the delivery requirements of the North West Industrial Cluster Decarbonisation Plan.
- The objectives of this work are to assess and recommend whether and to what extent central coordination systems are needed to facilitate the successful delivery of the recently completed NW industrial decarbonisation cluster plan.
- This commission is in two parts:
 1. An assessment of the need for a central facilitation agency to accelerate the successful decarbonisation of the NW industrial cluster by supporting the development and delivery of projects and addressing barriers to investment.
 2. Dependent on the outcome of part 1, to propose an outline role and structure for the agency.
- In setting the context for this work, it was well recognised that the NW is a leading region in terms of Industrial Decarbonisation. Innovate UK gave excellent feedback on the region's cluster plan, complementing the business case work produced through its development as one of the best of the 6 Industrial Cluster locations nationally.
- This leading role continued in the region's ambition to be the first region to achieve Net Zero industrial emissions. This first-mover advantage can potentially set the region apart from the rest.
- To build on this success, this project will outline how the region can take a leading role in the delivery of its plan, demonstrating lessons learned that could inform the national policy discussion and be applied elsewhere across the UK.
- This stage 1 interim report summarises the desk-based research and extensive stakeholder engagement undertaken to date to build a picture of the overarching industry and public sector requirements for delivery of the NW Industrial Decarbonisation Cluster Plan.
- Building on this intelligence, stage 2 will seek to identify the minimum that's necessary to support delivery of cluster plan in the timeframe required.





Operry
Group

The Cluster Plan and its Strategic Context

Working in partnership with **Metro** — **Dynamics**

The Cluster Plan

- The North West Industrial Decarbonisation Cluster Plan launched in January 2023, following two years' work to scope a blueprint for industrial decarbonisation in the region. It describes a roadmap to deliver the ambition to become world's first net zero industrial region by 2040, reducing industrial emissions of 17.1MtCO_{2e} as of 2021.
- The NW Cluster Plan is one of 6 industrial cluster plans developed with a share of £8m fund from UKRI created by the **Industrial Decarbonisation Strategy**. Having committed to achieve net zero Green House Gas emissions by 2050, the Industrial Decarbonisation Strategy, targets emissions reductions across a range of the UK's most energy intensive heavy industry (e.g. oil refineries, chemicals, cement, and glass production) collectively responsible for around 6% of UK's emissions, though also playing an essential role in society and the economy.
- The Strategy aimed to identify how the UK can maintain its thriving industrial sector whilst aligning to the net zero target, and the government support to achieve this. It forecast that emissions from industry must reduce by at least 90% by 2050, including through technology such as carbon capture, usage and storage (CCUS), and switching to low carbon fuels.
- Alongside funding the development of Cluster Plans, the Industrial Cluster Strategy also provided £171m to Deployment Projects aiming to develop and deliver

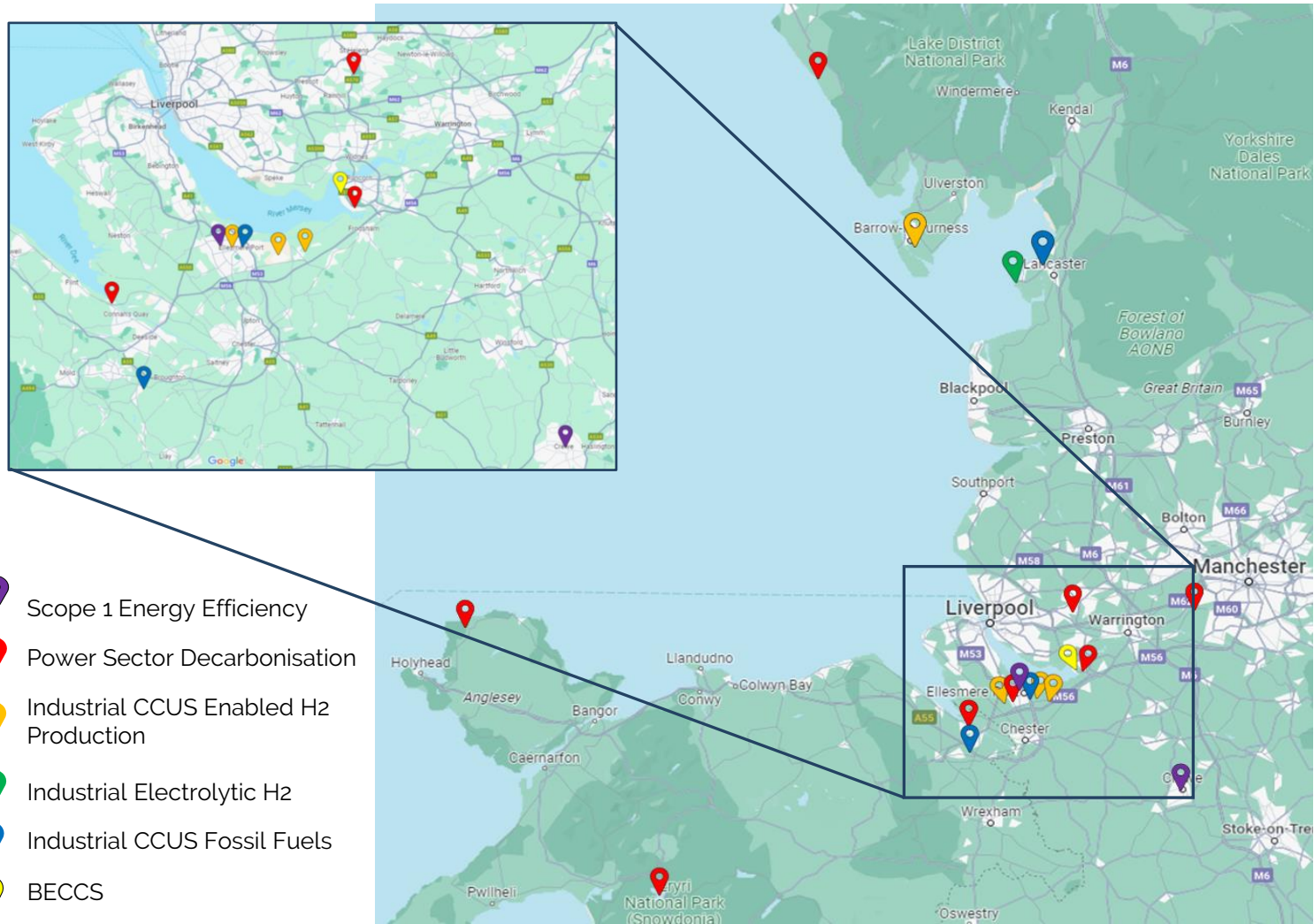
the technologies and infrastructure needed to achieve scalable industrial decarbonisation, as well as provided £20m for the creation of the Industrial Decarbonisation Research and Innovation Centre (IDRIC).

- The NW Cluster Plan set out a Mixed Net Zero Pathway roadmap for the regions industrial decarbonisation including deployment of dispatchable low carbon power generation; power grid investment in both transmission and distribution, helping to support new generation and allowing for industry to electrify processes; on-site interventions to decarbonise industrial consumers; and the development of both electrolytic hydrogen and hydrogen enabled by CCUS. It is expected to take £29.65bn investment over the near-term to deliver the roadmap, through which 34,500 green jobs would be secured, domestic supply chains in green technologies would be developed and up to 46.47Mt of carbon would be abated by 2040.
- A detailed Investment Case was published alongside the NW cluster plan, within which it was recognised a joined-up approach across the North West and North Wales will be crucial to support delivery of the plan; achieving coordination on the planning and delivery of major projects, whole system planning of the power grid, and ensuring an adequate skills pipeline.
- The investment case sets out the strategic and economic case for the selected approach to industrial

decarbonisation. The roadmap selected not only offers diverse of energy vectors, but was also affordable with potential value for money; hedging bets across different future technologies, which helps to reduce risk; its approach to using and growing domestic supply chains; and how it makes the most of regional strengths.

- It also outlined the management case, drawing on the need for coordination across a host of different areas, including planning process, system-wide thinking and enabling infrastructure, project scale for funding and financing, supply chains, workforce and skills, and inward investment. Looking at potential delivery structures, it explored a status quo, or business as usual approach, a Northwest LEP being designated as a regional lead, a Regional Energy Agency, an industry-led body, and a National Energy Agency.
- The management case included a clear recommendation for a new enabling institution with appropriate planning and decision-making powers, or one that at least has the power to influence the planning process. It was predicted that some funding would be needed from national government initially, with contributions from stakeholder groups to help get a new delivery model up and running. This documentation has been the starting point for this research which, through the following chapters, tests the requirements for some kind of intervention.

The Projects Portfolio



- The NW Industrial Cluster Plan focuses on sites of major heavy industry across the North West, targeting intervention at the largest emitters with the greatest potential to decarbonise.
- Through its business case, the cluster plan development exercise included a detailed investigation into the industrial emitters across the region, identifying a long list of 150+ projects, which were narrowed down to 63 short to medium-term investments to achieve decarbonisation at scale.
- Moving into the delivery phase, the cluster plan portfolio has evolved, with projects moving on and off the list as they progress towards securing finance or, in some cases, where they have been delayed, or abandoned.
- On commissioning of this work, the current list of projects considered within scope of the cluster plan includes 32 defined projects, shown on the adjacent map, plus three project opportunities reaching across the whole region, for example, anaerobic digestion, distributed solar portfolio, and geothermal heat projects. This list is not currently in the public domain due to commercial sensitivities.
- As indicated in map opposite, whilst there is a concentration of projects on the river Mersey, the NW Cluster Plan covers the entire NW geography, as well as moving into North Wales. Coordinating activity across 5 LEP areas and a national border presents recognised challenges. Effective management of activity across administrative boundaries is an important element for consideration in supporting delivery of the plan as a whole.

The Projects Portfolio



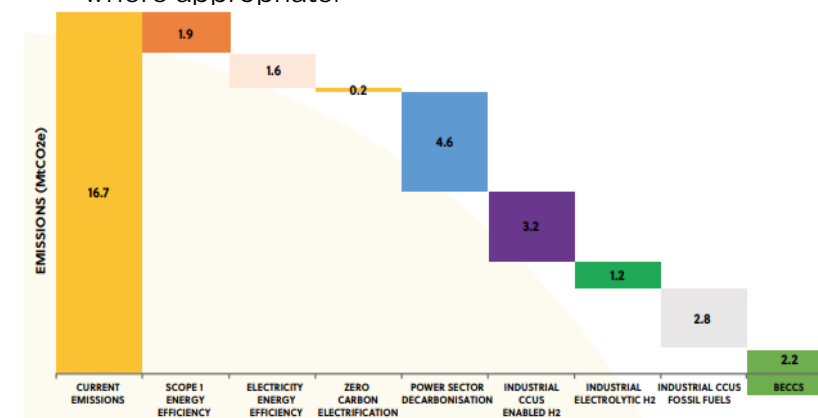
- The NW Cluster Plan details a 'Mixed Net Zero pathway' including a variety of technologies to achieve industrial decarbonisation as indicated in the waterfall diagram detailed here. Each waterfall segment represents a necessary contribution to achieving the 17.1mtCO₂e emissions reductions required to meet net zero across the most carbon intensive industrial emitters. These diverse intervention types, and their anticipated contribution to CO₂ reduction is highlighted here.
- Wide scale **Power Sector Decarbonisation**, is predicted to make the largest contributions to industrial decarbonisation, thought to be capable of realising CO₂ reductions of **4.6mtCO₂** per annum. Capital expenditure in the region of £16.3bn was anticipated in nuclear, distributed onshore wind and solar projects, Offshore Wind, tidal, Biogas, Combined Cycle Gas Power Generation, and industrial energy recovery facilities.
- Hydrogen production and use is also anticipated to make a significant contribution to the required decarbonisation to the sum of **4.4mtCO₂** per annum, divided between **Industrial CCUS-Enabled Hydrogen** responsible for 3.2mtCO₂ (£5bn Capex), and **Industrial Electrolytic Hydrogen** responsible for 1.2mtCO₂ (£3.9bn Capex),
- Implementation of **Industrial Energy Efficiency Measures**, at a capital expenditure cost of £2.8bn to

industry, was anticipated to achieve **3.5mtCO₂** per annum.

- **Bioenergy with Carbon Capture and Storage (BECCS)** is thought to be able to contribute **2.8mtCO₂** per annum, for a development price tag of £0.97bn.
- And finally, development of **Industrial CCUS at Industry Plants** is responsible for capturing **1.8mtCO₂** per annum from the remaining industrial processes which cannot be mitigated or reduced further at a cost of £0.62bn.
- General power sector decarbonisation is anticipated to deliver the greatest standalone CO₂ reductions of all waterfall categories (27%) as well as requiring the largest financial investment at 55% of the total anticipated plan cost.
- Hydrogen production and CCUS can also be considered anchor projects within the cluster plan due to the high degree of interdependency between elements of the Hydrogen Network as later in this report. The development and deployment of a network of Hydrogen production and CCUS projects, many of which are grouped together under the HyNet banner, account for 26% of the industrial decarbonisation required through the cluster plan.
- Industrial energy efficiency is recognised as a

crucial element to achieving decarbonisation. However, it should be noted that the current cluster plan project list does not include any projects within the waterfall categories of Electricity Energy Efficiency and Zero Carbon Electrification.

- To date it is understood that the detailed project list behind the cluster plan has not been published or shared publically, for various reasons including commercial sensitivities. This leads to limited visibility of the projects and their progress. Given the complexity of the plan, the number of diverse projects, and the fluid nature of its scope, it will be valuable for its long-term delivery to consider appropriate levels of ownership and monitoring of progress. This will also enable promotion of successes and knowledge sharing where appropriate.



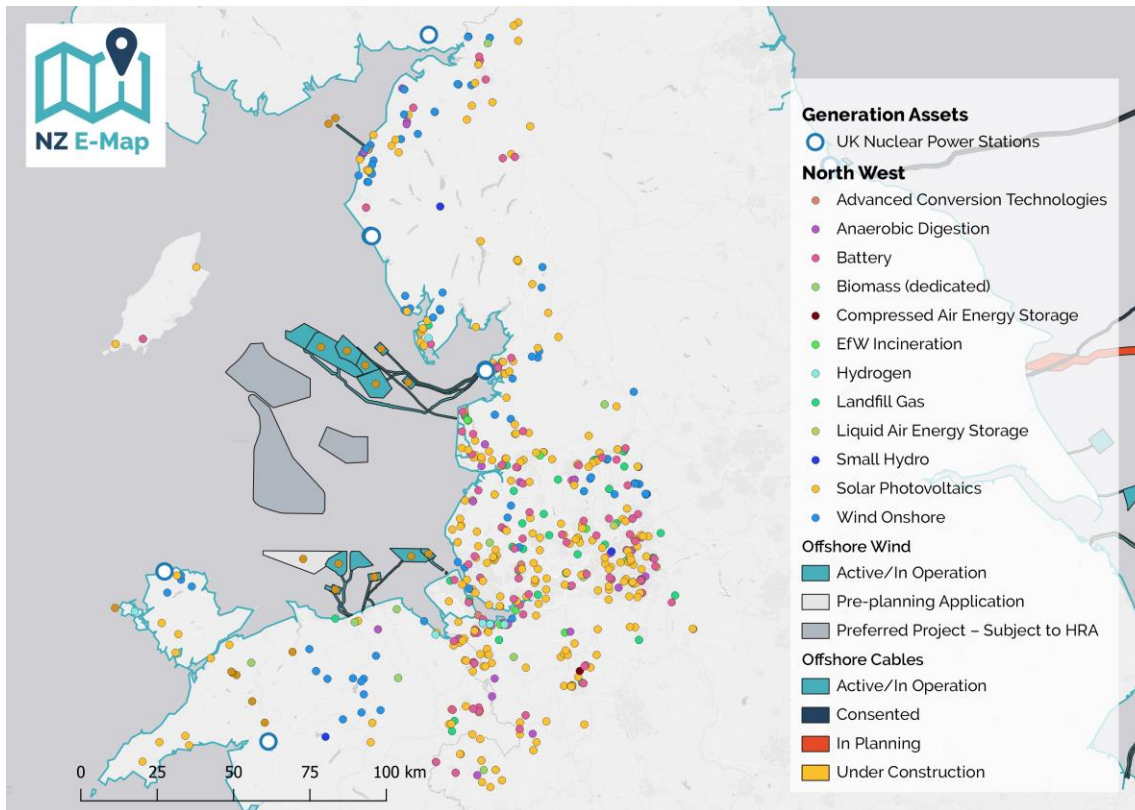
North West Renewable Energy Project Pipeline



Through the cluster plan, Power Sector Decarbonisation is anticipated to make the greatest contribution to industrial decarbonisation. To illustrate the opportunity of this waterfall segment in the NW cluster plan area, the following graphic and table indicate the wide range of renewable energy projects both operational and under construction but also within the planning system across the North West.

Based on publicly available information from the Renewable Energy Planning Database (REPD) (see table below), this indicates a broad range of projects in the development pipeline that could contribute to wider regional decarbonisation.

Nuclear is not included in the REPD, as it is not considered renewable, but is low carbon. However, we understand large-scale new nuclear projects are being considered at Anglesey in North Wales and Whitehaven, Cumbria.



| | Operational | Under Construction | Awaiting Construction | Planning Permission Expired | Revised | Application Submitted | TOTAL |
|----------------------------------|----------------|--------------------|-----------------------|-----------------------------|------------|-----------------------|----------------|
| Advanced Conversion Technologies | 21.5 | 28 | | 61 | 11 | | 121.5 |
| Anaerobic Digestion | 30 | | 4 | | | | 34 |
| Battery | 255 | 332 | 1,267 | 182 | 307 | 2,224.5 | 4,567.5 |
| Biomass (dedicated) | 120 | | 3 | | | | 123 |
| Compressed Air Energy Storage | | | 5 | | | | 5 |
| EfW Incineration | 144 | 95 | 90 | 10 | 45 | 9 | 393 |
| Hydrogen | | | 53 | | | 200 | 253 |
| Landfill Gas | 118 | | 4.5 | 2 | 20.00 | | 144.5 |
| Liquid Air Energy Storage | 5 | | 50 | | 50 | | 105 |
| Small Hydro | | 0.2 | 0.2 | | | | 0.4 |
| Solar Photovoltaics | 220 | 16.5 | 190 | 47 | 69 | 154 | 696.5 |
| Wind Offshore | 2639 | | | | | 576 | |
| Wind Onshore | 46 | | 8 | 7 | 203 | 13 | 277 |
| TOTAL | 3,598.5 | 471.7 | 1,674.7 | 309 | 705 | 3,176.5 | 6,720.4 |

Table indicating the renewable energy development pipeline across the NW (MW electricity)

Incentivising the Hydrogen Ecosystem

- Second to Power Sector decarbonisation, hydrogen production is expected to make a significant contribution to the industrial decarbonisation of the North West, both through its use as an alternative fuel for carbon-intensive industrial processes as well as to provide a flexible, dispatchable power source to support annual grid balancing.
- Hydrogen projects across the North West cluster plan geography are anticipated to include all forms of low carbon hydrogen production. First to come online will be small-scale dispersed hydrogen production projects such as the Cheshire Green Hydrogen Project, producing 28MW of green hydrogen through electrolysis powered by the existing Frodsham wind farm. These projects are set to produce hydrogen in the short term, several of which are committed to production by 2025 in order to draw down funding agreements. They will require small spans of pipeline to connect to energy sources e.g. wind projects, and transport hydrogen produced to off-takers. Whilst these smaller scale projects could, in time, be connected to a broader network of hydrogen infrastructure across the region, as the initial capacity of these production sites is lower, the requirements in terms of pipeline infrastructure are less complex.
- Larger projects, including those blue hydrogen projects within the HyNet infrastructure, are enabled by and reliant upon a more significant network of carbon capture infrastructure and pipelines for the transport of CO₂ from industrial producers to use as a key component of the wider hydrogen production process, and what essentially makes 'blue' hydrogen low carbon. They also require a network of pipelines to transport the hydrogen produced to a more significant number of off-takers. The anticipated scale of the HyNet infrastructure, whilst offering very substantial CO₂ savings, requires a greater number of different companies involved in bringing this infrastructure forward and creates a greater level of complexity in achieving timely delivery.
- It is currently understood that, in planning terms, this core pipeline infrastructure required to facilitate blue hydrogen production and distribution is still to be granted planning consent. Stakeholder feedback provided indicates that the CO₂ pipeline application was submitted to the planning inspectorate by Liverpool Bay CCS Ltd. (an ENI company) in September 2022 and is currently under examination expecting determination by March 2024. Financial Investment Decision is anticipated in 2024. The hydrogen pipeline being led by Cadent is currently at the pre-application stage will submit its planning application in Q1 2024. The timeframe for receipt of a Development Consent Order is currently anticipated to be in the region of 14 months. Any delays to this process risk knock-on impacts to the delivery and distribution of hydrogen production through the HyNet network.
- The Electrolytic Hydrogen Recommendations Report (EQUANS, 2022) produced for Net Zero North West during development of the cluster plan highlighted the need for this electrolytic hydrogen powered by renewable energy at dispersed sites, alongside the development of HyNet. It indicated that this solution might deliver hydrogen to industrial site further away from the central HyNet network faster and at lower cost.
- Further considerations in the development of Hydrogen infrastructure in the North West are raised by a report addressing grid scale low carbon dispatchable power requirements likely within the industrial cluster plan (Uniper, 2022).
- This report identified that, with the anticipated increase in renewable generation, the dependency upon dispatchable, flexible energy generation increases to enable the power system to react and adjust to peak demands, such as balancing the grid to manage changing seasonal requirements. Mapping requirements against four future energy system models, the report identifies hydrogen and natural gas turbines with carbon capture as the most likely technologies to provide a significant portion of low carbon dispatchable power required to provide energy security within the system.
- To achieve this, the report suggests proof of technology compatibility for both these technologies is needed alongside sustainable business models and regulatory frameworks to secure economic viability and ensure investor confidence. It also highlights that suitable and sufficient infrastructure developments, providing capacity and flexibility, will be required in both hydrogen and carbon dioxide networks to ensure these can supply large volumes in short timeframes. This is a whole systems planning problem that developers may be unable to manage on their own.

Energy Efficiency and Electrification

- The Net Zero North West **Industrial Consumers Report** (EQUANS, 2022), a further report developed during the scoping of the North West Industrial Decarbonisation Cluster Plan, explores the characteristics of different consumers by sector in the North West, before then exploring how to develop sectoral decarbonisation roadmaps looking at future technologies.
- Mapping out the carbon waterfall, it presented grouped emissions savings for the entire region with energy conservation measures (3,463,048 tCO₂e), the procurement of green power (3,845,847 tCO₂e) and the procurement of hydrogen, green gas and carbon capture and storage (8,409,717 tCO₂e) the key measures. Asset conversion (194,542 tCO₂e) and on-site generation (774,143 tCO₂e) also play a role.
- The first key step is decarbonisation through energy efficiency, improving energy performance and cost savings. These can then be used to fund capital projects. Decarbonisation of site processes and heat should be investigated after this, including through different technologies, such as using hydrogen as an alternative fuel. It also pointed out how on-site generation, including wind and solar power, can supply carbon-free power to all sectors in the North West and North Wales. It was noted that this could face constraints, namely planning requirements.
- With the UK government targeting a carbon-free grid by 2035, the North West and North Wales can decarbonise their Scope 2 emissions with no additional costs. Similarly, with the HyNet project providing hydrogen from 2025, most North West sectors will be able to offset their fossil fuel consumption. Hydrogen will be used for combined heat and power or direct-fired systems.
- For **energy efficiency**, it found that all sectors can make achievable carbon and cost savings with an overall payback of 3.3 years, setting the foundations for a pathway to net zero. Refrigeration (4.9%), heating, ventilation and air conditioning (HVAC) (4.3%) and compressed air (4.2%) were found to offer the best electricity savings on average – with HVAC an ample opportunity for the automotive and chemicals, and refrigeration for food and drink and pharmaceuticals. Heat recovery, meanwhile, was found to offer the best gas savings on average for a host of sectors, including automotive, cement, chemicals, iron and food and drink.
- Looking at **electrification**, it is expected to play a critical role in the automotive sector, with the report finding it can satisfy half of the sector's heat demand with no significant change or disruption to processes or production; in chemicals, where it will occur in two forms, the electrification of heat or direct electrochemistry; in food and drink, as an essential part of all bespoke solutions set to be key to the industry reaching net zero; and in pharmaceuticals to electrify space and processes heating.
- Looking sector-by-sector, for automotive, cement, chemicals, glass, iron and steel, paper and pulp, energy conservation measures are responsible for most carbon reduction – 29.3%, 21%, 27%, 17%, 27%, and 20% respectively. Energy efficiency opportunities being prioritised and implemented in a five-year interval leads to a new energy consumption profile for sites, meaning that once low carbon technologies and renewable sources are implemented, the site is at optimal efficiency. In food and drink, hydrogen, green gas procurement, and CCS deliver most of the potential carbon reduction (26%). In pharmaceuticals, greener electricity procurement and energy conservation measures deliver more significant carbon reductions, helping the sector to cut emissions by 26.8%.

Setting the National Policy Context

- A review of the national policy context for this work indicates broad policy support for industrial decarbonisation. The UK legislated for net zero in 2019 and with it launched its industrial decarbonisation drive, with the Industrial Decarbonisation Challenge being launched by UKRI, providing up to £210mn in funding (matched by £261mn from industry) across three workstreams described above.
- The **10 point plan for green growth** released in November 2020 set out how working with industry, the UK will target 5GW of low carbon hydrogen production capacity by 2030 and spoke of hubs where renewable energy, CCUS and hydrogen are able to congregate, putting industrial "SuperPlaces" at the forefront of technological development. It also ramped up ambition for CCUS, pledging to establish it in two industrial clusters by the mid-2020s, targeting four by 2030, capturing up to 10Mt of carbon dioxide each year, providing a starting point for a new carbon capture industry capable of supporting 50,000 jobs by 2030.
- The **hydrogen strategy** followed in August 2021, setting out a vision where the UK is a global leader on hydrogen. It set out how achieving the 5GW target could deliver 9,000 jobs and £900mn in GVA by 2030, leading to up to 100,000 jobs and £13bn in GVA by 2050. It envisaged 38TWh of demand for hydrogen by 2030, rising to 55-165TWh by 2035, including 21TWh in industry, potentially rising to 45TWh by 2035. Under how hydrogen storage will scale up in the 2020s, it does identify cluster projects in development such as HyNet North West, which has identified local large scale underground storage options, as well as drawing on use of hydrogen for heat in buildings in the North of England. It also highlights Project Union's development of a UK hydrogen network that would see industrial clusters joined up around the country.
- The **net zero strategy** was published in October 2021 and set out a whole host of commitments around the net zero ambition in industry, including delivering 6MtCO₂ a year of industrial CCUS by 2030, rising to 9MtCO₂ by 2035, confirming the selection of HyNet and East Coast as Track-1 clusters and supporting an increased requirement for fuel switching to low carbon alternatives, targeting the replacement of 50TWh of fossil fuels a year by 2035, while also setting out a whole host of different incentives, including an Industrial Decarbonisation and Hydrogen Revenue Support scheme to fund new industrial carbon capture and hydrogen business models and an Industrial Energy Transformation Fund.
- The **energy security strategy** came in April 2022 in response to Russia's invasion of Ukraine, within which the government doubled ambitions for low carbon hydrogen production capacity (10GW – with "at least half" from electrolytic hydrogen) and extended the Energy Intensive Industries Compensation Scheme for a further three years, having recognised UK industrial electricity prices to be higher than those of other countries and wanted to address this. It also reiterated the importance of industrial clusters as the starting point for a new carbon capture industry with a substantial export potential, paving the way for new industrial "SuperPlaces" in the UK.
- The most recent publication was **Powering Up Britain** within which it noted the track-1 negotiation project list for carbon capture projects and set out plans to launch a process allowing for the expansion of track-1 clusters, while also launching the track-2 cluster sequencing process to establish another two CCUS clusters. It also highlighted £20bn investment being set out for investment in early deployment of CCUS from the government, while reaffirming an ambition for 20-30mn tonnes of CO₂ a year by 2030.

Setting the National Policy Context

- Since the commencement of this commission, the **National Infrastructure Commission** recently published its **Second National Infrastructure Assessment**, within which it made the point that the UK must modernise its infrastructure both for the economy and the climate. It did acknowledge progress in certain areas, including on the shift to renewable electricity and on electric vehicles, though elsewhere there has been little progress to decarbonise heat and a lack of progress in reducing emissions from transport.
- The Commission made a series of recommendations in this, including 60GW of short duration flexibility by 2035, for a business model to be in place to support hydrogen fired generation by 2024 and for multiple large scale power stations to be deployed for both gas generation with carbon capture and storage and hydrogen fired generation by 2030. It also wants to see deployment of low carbon gas generation sufficiently scaled to provide 30TWh of persistent flexible generation to manage the potential for winter shortfalls by 2035 and for 8TWh of large scale hydrogen storage to be in operation by 2035 as a minimum.
- On industrial decarbonisation, it stresses that government should ensure policy actively encourages it at the speed needed to hit its carbon budgets through a mixture of carbon pricing, other incentives, regulation and shifting public procurement to low carbon products.
- It sets out recommendations to on committing to the development of a carbon transmission pipeline and storage network capable of transporting and storing at least 50MtCO_{2e} a year by 2035, with Grangemouth and North East Scotland, Teesside and Humberside among the key sites proposed by the Commission. It also spoke of a core hydrogen network connecting the most likely initial sites of hydrogen demand, production and storage, with it recommending once more that Grangemouth and North East Scotland, Teesside, Humberside, Merseyside and South Wales should be connected through this network.
- The **Energy Bill** was also recently passed, setting out ambitions to help ensure that energy is affordable for households and businesses, while making the UK more energy independent over the longer term, striving to unlock as much as £100bn in private investment, while scaling up jobs and supporting growth. This includes a licensing regime for carbon transport and storage, something that will help to deliver the UK's first carbon capture sites and support up to 50,000 jobs by 2030.
- The Bill also has created provisions for a hydrogen production business model and hydrogen transport and storage business models too, while establishing a new independent body – the Future System Operator – which will be responsible for overseeing the efficient development of systems in the gas and electricity network.
- Through the Bill, support for energy-intensive industries is also mapped out, with it dictating that it will compensate them for a portion of their network charging costs, helping to ensure key UK industries can maintain and enhance their competitiveness and long-term resilience. This includes steel and chemicals.
- Despite the overall support and funding for industrial decarbonisation, the policy landscape is somewhat choppy. Recent government announcements have altered the route to achieving high-level targets and approaching a General Election before January 2025, the live policy environment leaves some uncertainty around the policy context for delivery of the time-critical projects within the NW Cluster Plan.

National Policy Incentives



The following table indicates the key national policy incentives available to support delivery of industrial decarbonisation activity under each waterfall segment detailed in the cluster plan at the time of writing (September 2023). This does not include all policy initiatives but does highlight those most applicable to the cluster plan. A large number of policy incentives identified but no longer available or currently closed to applications is also included in appendix to this report.

| Categories | Policy Signals / Targets | National Policy Incentive Schemes |
|--|---|---|
| Energy Efficiencies | <ul style="list-style-type: none"> Aim to cut energy demand from buildings and industry by 15% from 2021 levels by 2030 Future Buildings Standard | <p>Industrial Energy Transformation Fund: Supports industries with high energy use cut their energy bills and emissions through investing in energy efficiency and low carbon technologies. IETF Phase 3 incoming in early 2024, with £185mn in funding.</p> <p>Climate Change Agreements Scheme: Extended to March 2025, these voluntary agreements made between UK industry and the Environment Agency to reduce energy use and CO2 emissions. In return, operators receive a discount on the Climate Change Levy (CCL), a tax added to electricity and fuel bills.</p> |
| Power Sector Decarbonisation | <ul style="list-style-type: none"> Fully low carbon power sector by 2035 50GW offshore wind by 2030 + 5GW floating wind; 70GW of ground and rooftop solar capacity by 2035; | <p>Contracts for Difference Auctions: Incentivise investment in renewable energy providing developers with guaranteed wholesale prices for energy generated from renewable sources. Developers must bid for funds through allocation rounds – AR6 due March 2024.</p> <p>The Green Gas Support Scheme (GGSS): Provides tariff support for plants producing biomethane via anaerobic digestion which is injected into the gas grid. Opened to applications in March 2021 and has been extended to March 2028.</p> |
| Industrial CCUS Fossil Fuel | CCUS Investor Roadmap (April 2023) outlines the UK ambition to establish CCUS in two industrial clusters by mid-2020s and another 2 by 2030. these projects will capture and store 20-30 MtCO ₂ / year by 2030. | <p>Carbon Capture and Storage Infrastructure Fund (CIF); Includes £1bn Track-1 clusters (HyNet and East Coast) and projects within them; and Track-2 sequencing process.</p> <p>Dispatchable Power Agreement – contract between carbon emitting electricity generator and government, setting out terms for capturing and storage carbon, and compensation generator will receive in return.</p> |
| Industrial Electrolytic H₂ & Industrial CCUS-enables H₂ | 10GW of low carbon hydrogen production capacity by 2030. At least half expected to be from electrolytic hydrogen. CCUS Industrial Clusters supporting blue hydrogen. | <p>Carbon Capture and Storage Infrastructure Fund (CIF); As above</p> <p>Industrial Energy Transformation Fund: Phase 3 as above</p> |
| Bio-energy Carbon Capture & Storage (BECCS) | Biomass Strategy (Aug. 2023) set out a roadmap for usage of biomass, including short (2020's), Medium (to 2035), and Long-term initiatives (to 2050). | <p>Power BECCS Business Model: Incentivises deployment of power bioenergy and carbon capture (BECCS) within the UK including Dual CfD mechanism ('CfDc + CfDe') which values both the negative emissions and electricity generated is in the pipeline.</p> <p>GGR Business Model: Incentivises deployment of engineered Greenhouse Gas Removal projects (GGRs).</p> |

National Policy Incentives

- Despite broad policy support for industrial decarbonisation and large commitments to provide financial backing to support and incentivise private sector investment, the landscape for financial and other incentives is complex. Furthermore, some incentive schemes for instance for hydrogen and power sector decarbonisation, have been designed in siloes to develop support for individual technology type one at a time.
- The landscape of incentive schemes is very changeable, with a number of recently available schemes closing earlier this year, including the following:
 - *Industrial Energy Efficiency Accelerator*, which sought to help increase the number of technologies available to industry to reduce energy consumption, maximise resource efficiency and cut carbon emissions (closed to applications in 2022).
 - *Energy Efficiency Taskforce*, set up to support a step change in the reduction of energy demand through accelerated delivery of efficiency across the economy (disbanded in September 2023).
 - *Industrial Hydrogen Accelerator Programme*, an initiative providing funding for innovation projects capable of demonstrating end-to-end industrial fuel switching to hydrogen (closed to applications as of February 2023).
 - *Net Zero Hydrogen Fund*, supporting the commercial deployment of new low carbon hydrogen production projects (closed to

applications as of June 2023).

- *Net Zero Infrastructure Portfolio Industrial Fuel Switching*, provided funding for the development and demonstration of fuel switching and fuel switching enabling technologies (closed to applications in 2022).
- A full list of recently discontinued schemes is provided in appendix to this report.
- In addition to this moving landscape of available funding and incentive schemes (dictated in many cases by fixed application windows), indicative feedback from potential applicants to some schemes indicate restrictions imposed on eligible projects can disincentive their use. A recent example was provided by a North West based projects exploring funding from the Local Industrial Decarbonisation Plans Competition. Despite involving a strong collaborative team of industry and the public sector, the application was abandoned due to challenges in meeting the funding requirements. Further publically documented examples of this include the early stage Gigastack and Dolphyn projects, both withdrawn from the UK's first electrolytic Hydrogen allocation round, with developers abandoning applications deemed unfeasible within the restriction of the scheme.
- Business models supporting the development and delivery of new technologies for instance in CCUS and hydrogen production have emerged and provide important support to these sectors, though some challenges in implementation remain.

Business models now considered crucial to progression of the relevant sectors are still outstanding for the following:

- *Power BECCS Business Model*: The government responded to a consultation on this in March 2023 and pledged to continue progressing its development and engagement with interested parties.
- *GGR*: The government has consulted on this and pledged an update before the end 2023 to set out its latest positions on the design of the GGR business model.
- *Hydrogen Transport and Storage*: Published initially in August 2023 but final versions not expected until 2025.
- Feedback from industry suggests that some of the due diligence requirements of national funding calls can add complexity and delay to the planning and delivery of the pipeline of regional projects, including some that could be considered in the NW. This has affected the view of some developers and project sponsors as to whether they should explore government funds or alternative investment.
- Overall, whilst there is a large amount of funding available in a wide range of schemes covering the technologies included in the NW plan, ongoing changes, uncertainty and application and review process requirements together pose barriers and potential delays to delivery at pace of a plan as complex and rich as the North West.

UKRI Insights on Enabling Net Zero



- Launched in October 2023, in parallel with delivery of this work, the UKRI published a report on Enabling Net Zero: A Plan for UK Industrial Cluster decarbonisation.
- The report set out 5 recommendations for enabling Net Zero across the Industrial Clusters:
 1. Provide clear signals to the market to facilitate the transition from interim deployment targets to net zero across all clusters by 2050
 2. Rationalise and expedite permitting for common infrastructure
 3. Formalise a national industrial clusters advocate with strong government connections and ongoing coordination and communication with industrial clusters
 4. Develop actionable measures and timings for jobs and skills needed for industrial decarbonisation
 5. Define and prescribe standardised methodologies for decarbonisation impact estimating
- The role of community is highlighted consistently, including as one of the core outcomes for what the clusters' successful industrial decarbonisation should result in: Clusters that "*engage meaningfully with local communities to drive environmental, social, and economic benefits.*" It also draws on how industrial clusters will pave the way for themselves

and others to position the UK favourably in the global market, serve as a linchpin to economy-wide decarbonisation, generate valuable learnings for industry, and bring co-benefits to communities that revitalise the UK's heartlands and improve outcomes for generations to come.


- The report shows the NW cluster as the biggest in terms of investment required (£30bn), only matched by the South Wales Industrial Cluster. It also has the least number of collaborators highlighted in the plan (10 – matched by Repowering the Black Country, the nearest after that has 19). The 'Future cluster plan owner' identified is Cheshire and Warrington LEP. Given the forthcoming plans to disband LEPs and incorporate their functions into councils, it suggests the plan needs a new owner.
- The report explores each of the Cluster Plans, identifying the best practice from each of the clusters. For the North West, this includes the development and promotion of an investment prospectus for a portfolio of projects across the cluster; assessment of the capacity the electricity system to identify how it needs to develop to support the electrification central to implementing the plan; and the workforce plan.
- Drawing on key learnings for different framework elements, it touches on the relative maturity of key projects within the North West cluster plan such as HyNet when considering how government can cut uncertainty and send market signals through development of suitable commercial business

models. It further emphasises how supply chains are a "vital component" of delivering the plans, highlighting "maintaining momentum and lining up the supply chain will be crucial for this cluster".

- The report also sets out cluster plan management models: a centralised functional body – formed either as a collective or through some independent organisation to manage the different stakeholders and ensure outcomes are achieved; a monitoring body – an interested party monitors project progress and plans of cluster members; and no formalised management – the plan instead becomes a reference guide, though no resource is invested in putting together stakeholders to achieve the outcomes.
- It is noted that whilst the report briefly introduces support for deployment projects under the Industrial Decarbonisation Challenge, with £171mn awarded in funding, as well as match funding from industry, which focus on identifying the technologies and infrastructure needed to decarbonise industrial clusters in a scalable, efficient and comprehensive way, it does not make any recommendations for their continued delivery. This funding comes to an end in February 2024 and currently there is no formalised process for continuing collaboration and governance of these projects beyond this.


Emerging Decarbonisation Clusters

- Delivery of the industrial cluster plans is one part of a bigger picture of industrial decarbonisation across the UK. In parallel with, and since the development of, the 6 large scale industrial clusters, several industrial partnerships or local networks of companies seeking to achieve shared goals of large scale decarbonisation that cannot be achieved by individual companies and sites alone are beginning to emerge. These new, more localised clusters are varied in their size and characteristics and are supported by a variety of public and private resources. Examples of these smaller clusters, as highlighted through stakeholder discussions, are introduced opposite.
- In 2023, Government has extended support for industrial decarbonisation to these smaller industrial groups through an investment of £5 million in place-based Local Industrial Decarbonisation Plans. A competitive grant funding competition was held between June and August 2023. Successful applicants receive a share of the funding pot as well as support from technical advisors to plan for the introduction of low-emissions technologies. The outcomes of this LIDP competition have not been made public at the time of this report.
- These new emerging smaller clusters are also part of a national decarbonisation agenda, as is wider decarbonisation across smaller industrial, manufacturing and commercial settings. Particularly in the case of emerging Local Industrial Clusters, it is important that some level of coordination and communication is achieved between these and the original 6 x industrial clusters. This will avoid unhelpful competition between cluster activity across the region and the UK, allow knowledge sharing and collaboration on similar challenges, as well as ensure visibility and consistency of messaging to government levels.
- Presently the long-term policy commitment and on-going support for industrial decarbonisation projects beyond the original funding for development of plans, both for larger and localised clusters is a little unclear. The recent UKRI report does not go into any detail on the development and delivery of future suggesting a key gaps in the thinking around of management and delivery models for industrial decarbonisation.




PEAK CLUSTER

The Peak Cluster: An innovative cluster centred around industrial collaboration to capture, transport and permanently store CO₂ emissions from the cement and lime manufacturing industry across Derbyshire, Staffordshire and Cheshire. The cluster is anticipated to enable the removal of 3m tonnes of CO₂ emission per year from the peak district from 2030. The technical development of the Peak Cluster is being led by Progressive Energy alongside industrial partners, and could link into the developing wider CO₂ transportation network to transport carbon emissions out of the Peak District for storage in depleted gas reservoirs in Liverpool and Morecombe bay.



MNZ Cluster

Morecombe Net Zero Cluster: Based in Morecombe Bay, this emerging smaller scale cluster in its own right is being led by Spirit Energy. The cluster seeks to provide a permanent decarbonisation solution for industry, driving establishment of permanent, safe and secure carbon storage in the depleted North and South Morcombe gas fields off the coast of Barrow-in-Furness. Under current projections, the project has the capacity to store up to one gigaton of CO₂ - which equates to roughly three years' worth of UK CO₂ current emissions – potentially developing to be the UK's biggest carbon storage facility.



Bacton Thames Net Zero.

Bacton Thames Net Zero (BTNZ): An initiative convened by Eni and involving more than 10 leading industrial partners located in the Thames Estuary and London areas seeking to decarbonise and future proof their activities by capturing, transporting and storing at least 10m tonnes of carbon dioxide emitted from these regions per year into the Hewett depleted gas field, off the North Norfolk coast.

Requirements for Successful Delivery of the Cluster Plan

Based on extensive engagement with industrial, private, and public sector stakeholders across the North West.

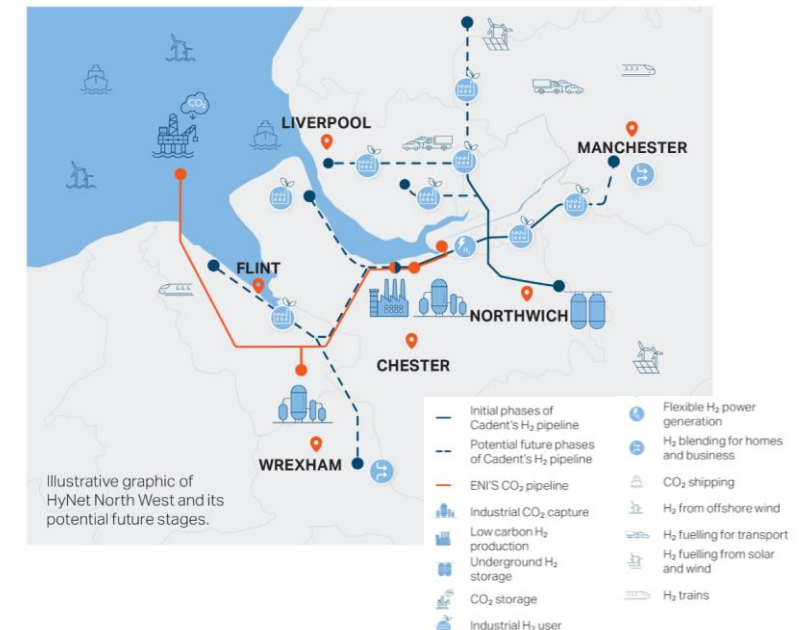
Project Interdependencies and Phasing

- In delivering the evolving portfolio of projects within the cluster plan, it is important to understand the key interdependencies and complexities of between them.
- The energy and carbon intensive industrial sites targeted through the cluster plan, can achieve a certain amount of decarbonisation independently through energy efficiency measures and electrification of equipment and processes in the context of wide scale power sector decarbonisation. However, there remains a reliance on direct fuel use for certain processes on multiple industrial sites. To fully eliminate emissions and become net zero, there is therefore a reliance on a low carbon alternative to conventional fossil fuels, as well as on carbon capture technologies to eliminate the remaining emissions created on site. This creates dependency on availability of Hydrogen as a fuel, as well as on access to a infrastructure to remove and store CO₂.
- The HyNet network has developed as a set of interconnected projects to support the wide scale decarbonisation across the region's industrial sites. The Hydrogen produced from HyNet has become an integral part of the decarbonisation plans for a number of large point source emitters across the North West.
- As well as this dependency from offtakers requiring Hydrogen, the hydrogen process in itself also carries a complex set of dependencies. Hydrogen production through the steam methane reforming process is in itself an energy intensive process. Central to the sustainable production of Hydrogen through this process (known as CCS enabled hydrogen), is the development of a suitable Carbon Capture, Transport and Storage network for CO₂ produced as a result of

the H₂ production process. This carbon capture network also provides an opportunity for permanent storage for CO₂ emissions from industrial emitters across the region. CCUS is a key enabler for both industrial decarbonisation and hydrogen production.

- Due to these interdependencies, the interlinked HyNet projects are generally considered to be the anchor project for delivery of the NW industrial cluster plan, with the critical pipeline infrastructure to transport Hydrogen and CO₂ being a critical enabler for fuel switching and CO₂ capture at industrial sites
- Industrial decarbonisation across the region, as set out in the cluster plan, is reliant upon a large network of companies and stakeholders including CCUS operators themselves, a suitable carbon transport network to take emissions from the site of generation and capture to the storage location, a hydrogen production facility and distribution network, and a number of off takers able to put the low carbon hydrogen produced to use.
- The complexity of managing the supply and demand for both Hydrogen and CO₂ through this network means that both these elements of the system are reliant upon the economic operation of the others. Whilst the conversion of industrial infrastructure and processes to switch to Hydrogen fuel carries advantages to potential off takers, they will require considerable confidence that the supply infrastructure will be in place before making investments. Any delays in the consenting and delivery of this core infrastructure may have considerable impacts on these off takers and their ability to achieve wider decarbonisation.

- Into the future the HyNet network offers the opportunity to expand in future phases. Scaling up this complicated network brings in more complexity as more off takers and potentially hydrogen generators become operational.
- The complex nature of the plan introduced here supports the need for intervention to achieve coordination and support phased delivery across projects. For the HyNet cluster of projects specifically, involved organisation have already come together to collaborate and communicate on moving the interdependent projects across the network forward. Any new intervention focussed on driving delivery of the cluster plan as a whole should engage with HyNet as a key stakeholder group.



Wider Renewables and Net Zero Investment

- As we have explored earlier, an important element of the mixed pathway approach to industrial decarbonisation set out in the cluster plan is the achievement of power sector decarbonisation, through an increase in renewable energy generation.
- Across a variety of technologies there is already 3.6GW of renewable generation capacity currently operational or under construction in the North West. Data available from the Renewable Energy Planning Database indicates that there is a further 5.5GW of capacity currently in the planning system across large commercial scale generation projects as well as smaller scale developments that may be out of scope for the cluster plan. These figures do not capture the additional anticipated investment in Nuclear projects, both on a large scale and in Small Modular Reactors (SMRs) being considered in the North West and North Wales.
- This active renewable energy pipeline indicates significant private sector investment in renewable and low carbon power generation, much of which is supported by government initiatives such as the contracts for difference regime. However, it is well documented that the UK faces major challenges in transitioning to net zero for the power sector, as it requires updating electricity transmission and distribution networks to support current and growing demands, a shift in the timing and location of electricity demands, as well as new requirements such as electric transport, decentralised generation, handling of intermittent small-scale renewable generation, air conditioning, heat pumps, and the growing demand to support the digital economy. The current grid and distribution networks were not designed to handle these demands and were built on the assumption of large coal and nuclear power stations, with no provision for storage at scale or active demand side management.
- On the transmission side, where electricity generated at power stations or produced at renewable energy infrastructure is moved through substations to the grid infrastructure, considerable new capacity is needed to support the development of new renewable power generation identified within the cluster plan.
- The National Grid has estimated that the government target of 50 GW of offshore wind across the UK by 2030 will require six times the amount of transmission infrastructure that was delivered in the previous three decades. This means that project developers alongside local authorities will need to work closely with district operators to ensure project developments can go ahead, and that this can be achieved in a timely manner.
- As well as impacting the development and delivery of power sector decarbonisation, challenges around grid connection can also impact industrial sites seeking to decarbonise their operations through electrification of processes and/or onsite renewable generation. On the distribution side, industrial operators must secure access to sufficient power from the national grid distribution network to power their electrified industrial processes. Large-scale (~100MW+) electrolytic hydrogen production facilities, also requiring a lot of electrical power, will also face this challenge.
- The Distribution Network Operator (DNO) typically manages the electricity distribution network taking power to industrial and domestic sites as well as managing users adding power to the grid at low voltages, for example from small scale power generation sites. There are challenges in terms of the time it may take for industrial sites to receive the required grid connections which can delay project delivery. Currently, DNO licenses force them to manage connections on a first come first served basis meaning they cannot prioritize projects that are ready, over those that are not, as they must follow the order of the queue.
- An additional consideration for the North West regions is that two different DNOs cover the NW cluster plan geography; SP Energy Networks and Electricity North West. These companies must manage and balance grid connections across many local authorities.

Wider Renewables and Net Zero Investment

- In 2023, Opergy and Metro Dynamics were commissioned to deliver an assessment of the barriers and opportunities to improve progress towards net zero across 27 key cities across the UK, including a number falling within the NW cluster plan geography. The project team undertook extensive engagement with local authorities, including in cities across the North West such as Blackpool, Cumberland, Lancaster, Preston and Salford, to identify progress made towards local Net Zero plans, and barriers experienced across industrial, commercial and domestic fields. The experiences detailed in the report are highly relevant to delivery of the cluster plan.
- The final report of this work '[Levelling up, Emissions Down](#)' (March 2023) highlighted a "huge disconnect" between local efforts and national policy when exploring the progress being made towards net zero across the economy as a whole, while taking steps to identify barriers and opportunities for improvements across the UK.
- This report identified some key challenges for local authorities seeking to implement initiatives to meet net zero of relevance at an industrial level. It reinforced the challenges around lack of grid capacity and the aging electricity grid infrastructure causing issues reaching net zero. It also highlighted issues which many local authorities across the key cities found in engaging with DNOs who found this to be a

lengthy process, leading to issues when trying to develop renewable energy generation assets. A lack of data on future energy projects was also cited as presenting a barrier when trying to engage with DNOs.

- A second barrier identified in achieving net zero was the local authorities own limited resource capacity and understanding of the requirements of net zero projects, including in developing investment cases, and managing, commissioning (where appropriate) and monitoring progress of projects.
- It also found that local authorities across the Key Cities experienced particular challenges in supporting wide scale retrofit of domestic and non-domestic buildings. On a domestic scale, insufficient financial resources for the scale of the challenge, and a struggle with low worker capacity within the retrofitting industry, which has been worsened by national policy gaps; and minimal focus on retrofitting non-domestic and commercial buildings was thought to reduce uptake.
- This work made a host of recommendations, including that the government develop targeted financial support initiatives to train and develop necessary staff and skills within local authorities, helping to address the lack of specialist skills and capacity and look to establish new regulations within an investment ecosystem through which DNOs are required to align their plans with local development plans and investment in upgrading the grid to

handle increased renewable energy generation.

- The importance of local authorities developing strong partnerships and working closely with the private sector, as well as collaboratively with one another was highlighted as highly important in achieving net zero aspirations at local and regional levels.
- The full report alongside an accompanying framework for net zero and developed a data dashboard for local authority use is publicly available.



Policy Requirements

- **Policy Certainty** – Since the completion of the cluster plans, policy drive behind Industrial clusters themselves is a little unclear. Beyond the initial funding provided by the industrial decarbonisation challenge to develop cluster plans, which will cease in March 2024, there has been limited discussion on what next since the plans were published.
- Feedback from the stakeholders consulted on this work has suggested assurance from government on their ongoing support for the delivery of cluster plans, and that their development and delivery will inform their thinking on decarbonisation as well as the wider decarbonisation across the UK.
- **Policy Support for Hydrogen and CCUS** – whilst policy and government support has been instrumental in driving the development of projects such as the HyNet network across the North West to date, there is a need for continued policy support, particularly around the hydrogen transport and storage business models and establishing certainty behind the economics around distribution of hydrogen and CO₂ across the region ensuring projects can attract private investment. Hydrogen production business models have, despite some ongoing challenges, been instrumental in supporting progression of the projects in the region. However, feedback through consultation has been that government have indicated that the hydrogen transport and storage business models will not be available in its

final version until 2025. This was communicated as being a real constraint now to progressing some of the critical projects within the cluster plan.

- **Financial Incentives for Industrial Decarbonisation Projects** – For a number of large industrial players in the North West, the road to decarbonisation will require significant investment. Whilst it is recognised by those organisations that there is a moral imperative and legal responsibility to decarbonise their operations, there is also a clearly communicated need for financial investment from the public purse. As suggested earlier in this report, the current funding landscape is considered complicated and there is limited clarity on investment levels and timeframes through future schemes to support business investment planning.
- **Balancing the Price of Hydrogen** – the use of hydrogen as an alternative fuel brings additional costs to businesses not only in the investment that is required to ready their site, equipment and processes to receive and run off this fuel, but also in the cost to purchase the hydrogen fuel which is currently expected to come at a significantly higher cost than conventional fuels, or potentially other renewable alternatives such as bio-gas.
- There is a clear need for pricing incentives to bring the price of Hydrogen down closer to the price of conventional fuels, through mechanisms such as contracts for difference or other incentive frameworks.

Whilst this is not in place, and there is little clarity on the operational costs of using hydrogen, businesses investment is seen by many as capital at risk. These issues are expected to be addressed through the Contracts for Difference contract structure, and Low Carbon Hydrogen Agreement models, which is yet to be finalised.

- **Prioritising Energy efficiency** – during many of the stakeholder discussions, the importance of bringing energy efficiency to the front and centre of decarbonisation plans for industry at all scales was highlighted. There was a feeling by some consulted that there is insufficient importance placed on this element of decarbonisation, including for SMEs who are not subject to initiatives to apply a cost to CO₂ emissions such as the Emissions Trading Scheme (ETS).
- In summary to this section, stakeholders clearly communicated the crucial role that policy drivers must play in supporting industrial decarbonisation. Furthermore, for the reasons elaborated above it was suggested current policy incentives, are not sufficient to fully drive the delivery of the NW cluster plan at pace. Policy certainty creates and supports investor certainty which will drive projects to completion. Policy certainty and business models need to hold it all up. but these do not always move quickly and can result in significant delays to projects getting started on the ground.

Project Enablers

- Through stakeholder discussions, a number of themes were identified to support the timely delivery of the Industrial Decarbonisation Cluster Plan Portfolio across the North West. These requirements highlight issues experienced by industry in the delivery of their decarbonisation agenda, emphasising where some intervention or coordination would support the overall delivery of the cluster plan.
- **Planning** – Capacity of planning departments across the North West region was cited as a crucial challenge area slowing down the development of projects on the ground. This is an aspect which can affect renewable energy generation projects as well as industrial development and expansion plans alike and can be a particular challenge at times when infrastructure and construction projects are progressing in parallel.
- It was also communicated that a long-term, stable planning environment is crucial to a number of industrial partners working across the region. Support around smoothing the procedure and timeframe for planning application and decision-making was highlighted as a key area where a regional body could support industry in achieving decarbonisation aspirations.
- **Regulatory Permitting** – Achieving required

environmental permits is an integral part of the planning consent for any industrial development (noted that such permits are devolved in Wales). This was highlighted by some consultees in particular sharing their experience of engaging with regulators around minimal negative environmental consequences as a result of initiating decarbonisation projects with considerable benefit in terms of wide scale CO₂ and pollution reductions. Whilst the role of environmental permitting is recognised as important to minimise environmental impacts of even decarbonisation projects, there was a call for practical consideration of the smaller impacts which may result in relation to industrial decarbonisation.

- Health and Safety regulation was also raised by some industrial consultees as adding complexity to the project planning and delivery phases, resulting in delays to project delivery. There was a call for an independent and representative body to engage with regulators to support communication of project messaging, and encourage pragmatic approaches to supporting project delivery. This would be beyond just HSE matters, but could also cover environmental, and other planning bodies where 'cluster thinking' could be advantageous.
- **Grid Capacity** - Presently grid connections, and the pace at which power generation projects can expect

an available grid connection is a major barrier to regional delivery of industrial decarbonisation. One industrial consultee noted facing expected delays of over 10 years to receive a connection to facilitate potential hydrogen production facilities in Cheshire.

- Whilst messages from the government indicate the intention to implement reform in the transmission and distribution power networks, including the creation of a Future System Operator, an Independent System Operator and Planner, taking a whole system approach to planning and upgrade of the national grid, the detail and timeframes of these interventions are unclear and may well be too late for projects taking FID imminently. A regional body would be well placed to communicate the combined grid capacity requirements and timescales across the cluster plan, effectively communicating the scale of the challenge for the North West.
- **Transport** – Transport of both people and freight was cited as a barrier for industrial players across the region in minimising their scope 3 industrial emissions. Inadequacies in public transport, namely trains, across the NW was highlighted by some industrial consultees who highlighted that despite being located next to train stations, no staff using this form of transport for their commute.

Project Enablers

- Industries located in the NW are active on an international stage and provide manufactured goods and components for export. They compete with competitors on an international stage. Freight transport of raw materials and goods into and out of the region is important in manufacturing and delivering products in a timely fashion, and in some cases feedback from international customers has been that UK made products are too expensive and too slow. Efficient freight transport into and out of the region is crucial to accelerating the UK's competitive edge and will ultimately deliver nationally significant economic growth.
- **Utilities (Water) Capacity** – green hydrogen needs a secure water supply. Increased demand for water at future Hydrogen production sites, in addition to other current and future Industrial users is a key consideration in planning for and delivering the cumulative requirements of the industrial cluster.
- **Delivery of Hydrogen and CO₂ Pipelines** – many industrial stakeholders communicated on the timescales for the availability of Hydrogen through the HyNet project. Some potential off-takers are ready to receive hydrogen now and have to explore alternative sources of hydrogen, including considering moving operations out of region. For many others, there is a cyclical investment in the upgrades/replacement of critical industrial

equipment such as furnaces or boilers. Therefore, upgrade of this infrastructure to hydrogen-compatible alternatives would ideally fall within this cycle of infrastructure upgrade as existing equipment reaches the end of its efficient operational life, avoiding additional cost of infrastructure upgrades. These examples demonstrate the potential risks of delayed production of hydrogen by the project.

- Whilst it was recognised that the lead time is due to development of hydrogen and carbon-dioxide pipelines as key enablers for the anchor projects and decarbonisation which industry cannot achieve independently, a regional body to play a lobbying role and drive the development of this pipeline infrastructure at pace is considered valuable.



Communication

- Communication, engagement and education has an important role to play in the streamlined delivery of the NW cluster plan. There is a real opportunity to present a hugely positive message around the opportunities associated with industrial decarbonisation across the region and the contribution this can make to achieving national decarbonisation targets. However, there is a broad range of audiences and a number of actors currently seeking to reach them at both project and regional levels with limited efforts to coordinate these.
- **The General Public** – Stakeholders highlighted a level of general scepticism within a portion of the general public around industrial decarbonisation. The University of Exeter and IDRIC developed research exploring how the sense of place of host communities shapes people's views on net zero industrial clusters. This highlighted negative perceptions of industrial activities and impacts, and the idea industry provided more benefit to host communities in the past, whereas now they take more than they give back. It spoke of the importance of a step changes in engagement activities with host communities to build long-term relationships and trust. This suggests a need to communicate on the move to decarbonisation and the importance of this to meet national targets to combat climate change.
- **The Local Audience** – At a project level, particularly during the planning process, clear and positive communication is needed around likely impacts and benefits to local communities. The example of the negative community reaction to the proposed Whitby Hydrogen Village was highlighted as an example of the risks associated with poor engagement and communication with local communities.
- In some cases, for instance in adaption of industrial processes to enable fuel switching to Hydrogen, industrial decarbonisation initiatives may have a recognised beneficial impact locally in terms of safeguarding of jobs or reducing local pollution. However, for other projects and in terms of enabling infrastructure, the local benefit may not be recognised.
- It was also noted by some consultees that communication with local communities should be approached as an opportunity to learn something and improve local delivery. Often it is treated as a necessary requirement or box ticking exercise.
- **The Regional Audience** – There is a requirement at a regional level to incorporate messaging by project teams and share this on a wider level developing a positive picture of the wider value of decarbonisation activity across the region.
- Success stories of regional companies achieving significant carbon reductions, improving the local environment and safeguarding local jobs should be maximised and can act as best practice case studies demonstrating what is possible for others operating at similar scales.
- It was recognised that better visibility of project progress and knowledge sharing across the cluster plan delivery partners would be an advantage. Beyond the HyNet cluster where there is a clear effort to communicate on project timescales and progress, there is limited common understanding on the progress or otherwise of other elements of the Cluster Plan.
- Stakeholders recognised that the NW is a diverse region, and all regional communication should consider the different needs and perspectives across the NW, from North to South and into North Wales. Communication to all parts of the geography is important but should be appropriately tailored including for example using Welsh language.

Communication

- **The Government Audience** – Delivery of the cluster plan requires industry and public sector stakeholders from the North West to maintain regular engagement with central government around promoting regional projects, attracting investment and support. Industrial decarbonisation is not the responsibility of singular government department, but rather will involve input from across Whitehall.
- Engagement and effective communication with national government should include a means for open engagement and feedback from both sides to enable communication of key challenges and requirements for support, as well as clear translation on emerging government policy and direction and what this means for the NW as a region.
- **Sharing success stories across the region – Showcasing leadership and expertise across the NW** – the stakeholder discussions highlighted that as a region the North West could be much better at showcasing the technological expertise and leadership on the net zero agenda being demonstrated locally. there is a need to communicate and raise awareness of the significant economic, growth and prosperity opportunities that decarbonisation offers to the NW, and champion the cluster as a leader in this field.
- It is understood that there is a wider piece of work underway across the NW industrial Cluster Partners addressing the requirements around communications and messaging of industrial decarbonisation activity across the region.



Energy Efficiency Measures

- One key point that emerged from stakeholder engagement was around wider energy efficiency measures for businesses, particularly small to medium-sized businesses, which often form part of the supply chains for large projects, and are a key aspect in addressing Scope 3 emissions.
- In exploring the broader challenge of industrial decarbonisation, beyond the current cluster plan and across the whole region, it is essential to approach the issue with a pragmatic and localised strategy. This requires an understanding of regional specificities that influence emissions and energy use within business and industry sectors
- The 'Made Smarter' initiative, a UK government-backed program, has played an important role in supporting the manufacturing sector's transition to advanced digital technologies. It aims to enhance productivity and foster sustainable practices. Leveraging such technologies is often a critical step in reducing industries' carbon footprint, as it can lead to more efficient processes and reduced energy consumption.
- Building upon the foundation laid by 'Made Smarter', it has been proposed that a similar or complementary 'Made Greener' initiative could be developed to address gaps in the current business and industry support landscape around energy and carbon efficiency, particularly in the context of region-wide industrial decarbonisation.
- It is recognised that the decarbonisation challenge extends beyond technology adoption, encompassing the need for strategic planning around the recycling of industrial by-products and wider circular economy models, supply chain emissions management, and the integration of renewable energy sources.
- Such a program could serve as a catalyst for region-specific decarbonisation efforts. By integrating this as part of a regional focus on collecting data and providing evidence-based recommendations, a 'Made Greener' or similar initiative could help influence future funding allocations and policy-making to support interventions tailored to the region.
- Local/Regional brokerage of funds, such as the Industrial Energy Transformation Fund, could be explored or similar initiatives to the newly launched South West Wales net zero industry Launchpad fund with InnovateUK, which is investing up to £2 million to support business to grow activities in the net zero industrial cluster including fuel switching, hydrogen production, and energy efficiency measures.



Skills, Workforce and Systems

- There is well documented research on skills shortages for the delivery of the Industrial Cluster Plans across the UK. The evidence is compelling that industrial businesses, particularly those looking to decarbonise and electrify, will struggle to compete and grow if the skills challenge is not addressed successfully.
 - IDRIC has two dedicated projects devoted to building understanding and quantifying the workforce capacity needed to deliver industrial decarbonisation, the first "*Development of competence, skills and training for the transition to hydrogen*", identified the ageing workforce and lack of new recruits into the process industry as significant challenges, as well as a need for data scientists, engineers, technicians, fuel cell engineers and hydrogen pipeline fabricators, specialised skills in areas such as marine import and export, storage and industrial use of hydrogen, and upskilling the workforce to help with the repurposing of existing networks for hydrogen transport and distribution.
 - The second report from IDRIC - "*Enabling Skills for the Industrial Decarbonisation Supply Chain*" - suggested £515bn CAPEX to 2050 and a workforce of 353,155 jobs a year will be needed to deliver industrial decarbonisation. The scale of demand for construction workers and civil engineers is noted in the report as a "significant challenge" because of labour market tightness in the UK economy generally, as well as construction and civil engineering especially. It warned there is not enough workers in the sector to meet this extra demand right now, meaning action is needed.
- Issues also arise when it comes to the demand for STEM skilled employees in the UK market and especially the decarbonisation industry too.
- The challenge around skills development is not just around developing new skills through the education system. A large amount of the requirement for skilled workers is also anticipated to be serviceable by individuals with skills sets already held by the workforce in the region. The challenge is the quantum of jobs required, particularly at pinch points in delivery of the cluster plan where other industrial decarbonisation, construction or other infrastructure developments across the North West may also have a requirement for the same skilled labour.
 - There are local, regional and national approaches to training which all have an important role in ensuring the workforce and skills are in place to deliver the Industrial Decarbonisation Cluster Plan programme across the NW in the coming years. Local training of personnel, for example through apprenticeships may be delivered in partnership with a local college. However, it may be more effective to attract a wider pool of individuals into a particular industry or skills discipline through programmes at a regional and national level. Government intervention could support development of training provision to support investment from industry and academia.
 - In the context of a shortage of labour, be that consistently or at particular pressure points during
- delivery of the cluster plan, the challenge of securing the required workforce with the right skills, at the right location, at the right time, must also consider the ecosystem in which the workforce is needed. There must be adequate attractive housing for this workforce and their family's locally for longer term projects, suitable transport links for workers to travel to where they are needed form a feasible catchment area, and suitable employment benefits to encourage uptake of the required roles.
- The skills issues in relation to industrial decarbonisation are mirrored across the wider economy in terms of supply of skills and workforce for a net zero future. It is being addressed at multiple levels for instance by local skills improvement plans. This topic may be best dealt with as a general challenge not specific to industrial decarbonisation.
 - The challenges associated with the supply of skilled workforce with sufficient capacity to deliver the requirements of the NW Cluster Plan is a challenge replicated across the economy it is affecting all industrial clusters, including the original 6 as well as the smaller localised industrial decarbonisation clusters in due course. This issue is not unique to the North West, and cannot be solved by a cluster representative body in isolation. However, the cluster must engage across other clusters and with national partners e.g. DESNZ and DfE on meeting regional and national skills demands in the short to medium term.

Leadership, Oversight and Assurance

- **Complex and evolving nature of the cluster plan** - As previously stated, the nature of the North West plan, in relation to other cluster decarbonisation plans, is more complex, with several different waterfall segments of major projects focusing on emerging and innovation technologies, and business and community level efficiency initiatives.
- For major projects, given the level of innovation and technology development, there is a greater need for overall oversight and assurance to ensure that the required projects are delivered on time, to target and that sufficient projects are brought into the plan where there are gaps or changes.
- Stakeholders have argued that the efficiency projects require limited intervention, as there is general consensus amongst the business community behind the need for energy efficiency improvements and individual decarbonisation. However, given funding and policy to support this part of the picture continues to evolve, a case could be made for some level of oversight to manage future commercial opportunities from this work.
- **Facilitating multiple projects** - The plan is characterised by groups of similar and interdependent projects. Considering delivery from the perspective of individual projects in isolation, or even from a network level (for example the Hynet related projects and infrastructure), might overlook wider scale issues or opportunities in

delivering the whole cluster plan. Delivery of all projects will result in competing demands for similar resources, as well as similar disruption to local communities, which may need to be facilitated as a set, to ensure successful and efficient delivery.

- **Cross border and cross locality working** - Affecting the change that is required, and given the dependency on activities that cross local authority boundaries, it is important that any solution to this challenge of delivering the cluster plan should be able to work within and across the whole cluster geography in different ways. Several consultees drew the comparison with the historic structure of the Regional Development Agencies offering a regional level governance that could achieve coordination at the correct level.
- Clear definition of the geography of the cluster plan is very important. The North West is a large region with a large range of infrastructures. The name North West Industrial Cluster Plan suggests a broad and cross local authority roadmap, in reality most of the industrial decarbonisation projects of the scale considered within scope of the cluster plan are located in a specific area, bordering the river Mersey, with wider areas across the region from Liverpool city region to greater Manchester, and including into North Wales, Lancashire and Cumbria connected to this core zone.
- As such, local partners approach the plan in

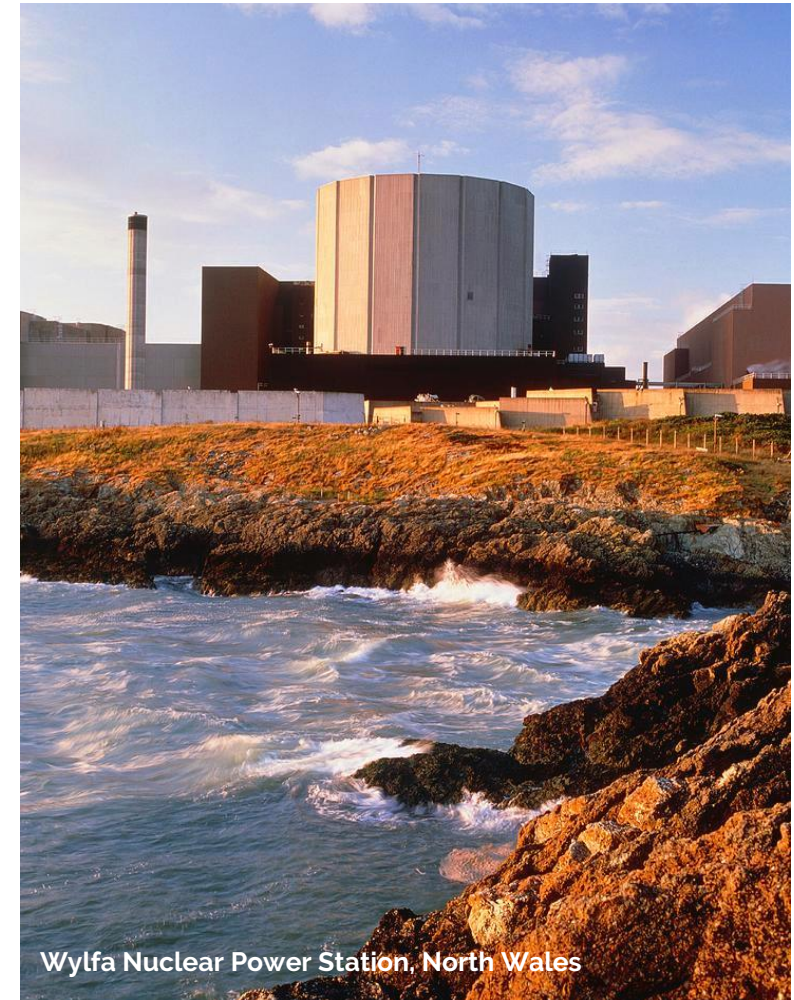
different ways and from different perspectives, which will require a level of oversight and understanding to maintain appropriate alignment. This is particularly true in working successfully across the English and Welsh administrations which at times have different delivery paces and policy priorities.

- Through consultation and background research it was clearly articulated that the Industrial Decarbonisation picture is one part of the whole North West decarbonisation challenge.
- **Heavy industry leading industrial decarbonisation by example** - Supporting the decarbonisation of smaller industrial and manufacturing operations across the North West is vital to achieving decarbonisation at scale. There are lessons that can be learned from the larger scale industrial decarbonisation projects, for example Siemens site in Congleton that could be used as a case study of what is possible at individual sites.
- It is out of scope of this project to consider how support to smaller scale industrial decarbonisation can be achieved. However, it is important that lessons from the decarbonisation of heavy industry are communicated and leveraged across the wider industrial community across the North West localities, to contribute to total industrial decarbonisation.

Regional vs National Lever and Influence

- This research has clearly highlighted that some barriers to development can be addressed at a regional level. The delivery of regional infrastructure, supporting efficient decision making in local planning, and delivering on skills through local interventions including Local Skills Improvement Plans are examples of this.
- However, some areas of challenge have been identified as common across other industrial decarbonisation clusters.
- Furthermore, other challenges are reliant upon decisions and administration undertaken at a national level are more difficult for regional actors to influence. Key examples of this are around policy drivers and incentives, grid connectivity and topics such as deployment of nuclear projects.
- As has been highlighted in some the earlier section of this report, there is an emerging strong case for collaboration and coordination with the other industrial decarbonisation clusters to find solutions, approaches and best practice to addressing challenges at a regional level, and coming together to develop clear messaging to UK government on common issues and challenges.
- Some government Policy, and particularly support provided through some existing funding schemes, can create a level of competition between projects and clusters. Despite this, there is huge value in

cooperation and knowledge sharing across clusters, and any new intervention should consider how to support collaboration within this landscape.





Operry
Group

The Case for Intervention

This chapter highlights the case for intervention through summarising the requirements for intervention. Later stages of this work will examine and explore how these functions could be delivered.

Working in partnership with **Metro — Dynamics**

Revisiting the Management Case

- The detailed investment case behind the NW Industrial Cluster Plan included a breakdown of the management case for its delivery. This has been used as a starting point for this work, and as such, we are revisiting its key messages here.
- The management case argues that market forces alone are insufficient to achieve change at the scale and pace required to meet regional and national decarbonisation targets. Given the complexity of the mixed-pathway decarbonisation programme, the implementation of new technologies with inherent interdependence under a changing regulatory regime, the message is that this really requires coordination, communication and drive. Coupled with the North West's ambition to be a first mover in achieving industrial decarbonisation, the need for some form of coordination and management body was promoted.
- The management case highlighted key challenges in delivering the plan – where a level of coordination across local geographies is needed – where perhaps taking a regional or national perspective might help:
- **Navigating the Planning process:** highlighting the lengthy and complex planning regime for Nationally Significant Infrastructure projects and Energy projects that are integral to the cluster plan. The management case suggests support to de-risk the planning process would be beneficial.
- **System-wide thinking around enabling infrastructure:** highlighting the need for cross-government investment into and planning of enabling infrastructure e.g. grid connections, transport links, water utilities. National government and local government coordination in this regard.
- **Securing financing for projects:** Innovative financing models and securing funding to enable clean energy projects are vital. The scale of funding schemes available at the local level was highlighted as an issue.
- **Managing complex supply chains:** cumulative impacts of production, logistics and transportation on supply chain availability may cause delivery delays, as well as the price of steel and raw materials, raising costs for development.
- **Upskilling and future workforce:** fundamental gaps in engineering and technical skills highlighted.
- The case advocated for a group or body bringing together the right stakeholders to oversee/drive delivery of the plan – providing strategic oversight/vision. It explored key considerations in the delivery of this requirement – presenting a range of options for consideration in terms of management and governance structures for any NW Industrial Cluster Plan 'delivery model':
- **Business as usual:** utilising the existing NZNW ecosystem to be the voice of industry and lobby government
- **Establishing a regional lead:** described as a "Special decarbonisation unit" (suggested this was hosted within LEPs or CA at the time) to manage and oversee the pipeline, represent the region and have a dotted line link to the government. Could have an executive director from the industry report to a board, and DESNZ.
- **Regional Energy Agency:** Overhaul the NWNZ Hub, giving it greater authority and powers to deliver decarbonisation
- **Industry Led Body:** an evolution of the NZNW organisational structure, working closely with industry and LEPs/ local government and central government, bringing together all energy projects.
- **National Energy Agency:** an agency with statutory responsibilities under DESNZ to take ownership of the England-wide decarbonisation programme, likely evolving out of an existing government department structure.

Lessons from Other Clusters

As part of the research for this project, there has been engagement with other industrial decarbonisation clusters, primarily in England. The examples shown below are intended to showcase the barriers, needs and opportunities faced by other similar clusters and the functions and approaches taken to address these and work towards the successful delivery of the cluster plans. It should be noted that although working towards the overall goal of industrial decarbonisation, each cluster researched is different in its business composition, core deployment projects and administrative landscape.

The Solent

- Decarbonisation centered around the Fawley Refinery – more simple
- Core hydrogen infrastructure led, delivered and funded by Exxon Mobil
- Solent LEP acting as key partner focusing on attracting new businesses to build the cluster
- Exploring commercial opportunities for carbon transport by sea, energy from waste and aviation fuel

The Black Country

- Unique cluster as a land-locked area with mostly SMEs and no planned major hydrogen or core infrastructure project
- Prioritising deep energy efficiency measures as the key route to decarbonise
- Predicated on circular energy infrastructure for businesses located in zero carbon hubs
- Exploring national collaboration and coordination with other clusters to secure hydrogen fuel and SME supply chain opportunities

The Humber

- Cluster boundaries sit across LEP areas
- Industry led working groups e.g. Humber Energy Board and East Coast Cluster instrumental in driving delivery, alongside appointment of a regional ambassador
- Seeking inward investment to support industrial decarbonisation & addressing skills gaps as a priority through Catch
- Strong advocates for policy drivers for Whole System Thinking (the Energy Bill, Future Energy System Operators, RAB incentive models)

Key lessons:

More complex plans require a greater level of facilitation | National coordination across the clusters is key | Skills and workforce requirements critical for all
Hydrogen pricing certainty is essential to secure the business model | Collaboration at 'Regional' level seen as important, and greater than any one LEP or CA.

Requirements Built on Research & Engagement



In conclusion, drawing together the sum of what is required to successfully deliver the North West Net Zero cluster plan provides a picture of a varied and potentially complicated set of issues and enablers at different levels, geographies and scales. The graphic below summarises the requirements in this section, which are explored in the next section in terms of their combined impact on the case for intervention to deliver the cluster plan.

| | |
|---|---|
| Timely delivery of core infrastructure | Decarbonisation of the largest emitters in the cluster is dependent on the timely delivery of the entire HyNet ecosystem, both hydrogen and CO ₂ pipelines being in place, which is itself a linked portfolio of complex projects. Any future barriers must be mitigated to avoid any potential slowdown in progress. A body, whilst not being part of the detailed delivery of HyNet, could play a key role in mitigating barriers, as it could for other projects. |
| Policy incentives and certainty | The plan requires some key policies to be in place, such as hydrogen price subsidy to secure demand, and overall policy certainty not only in Government support for this approach to industrial decarbonisation but also to provide a certain investment environment. |
| Project brokering and facilitation | Individual projects are faced with a multitude of barriers from planning permission, environmental permits, public consultation and communications and utilities connections that risk slowing down progress/ may require different approaches to unlock. Projects may have competing demands, e.g. for grid connections. Projects also do not exist in isolation and in some cases exist in a wider local cluster with dependencies on local business change. |
| Progress visibility and assurance | The cluster plan is evolving, with projects coming in and moving out with no clear point of visibility. Furthermore, each waterfall segment of the plan contains projects that are varied in nature, from business and community level schemes to further major projects. Ownership and visibility of delivery of all projects is currently not clear, and a role in identifying potential gaps and/or missed opportunities will be important. |
| Regional support and alignment | As the current plan only covers part of the North West industrial sector (the heaviest emitters), work is required to maintain support from public sector stakeholders from the whole region, so that investors are reassured by clear alignment, the opportunity of decarbonisation is promoted and the learnings from the plan can support further industrial decarbonisation across the region and build supply chains. |
| National coordination and collaboration | The plan is part of six existing decarbonisation clusters with more coming forward. Coordination and collaboration across all clusters is required so that the North West is not competing unnecessarily for policy focus, commercial interest, investment and future funding that could undermine the overall objective for UK industry to decarbonise. |
| Addressing medium term enablers | Although not a current and pressing requirement for the delivery of the cluster plan, there is general consensus that there will be a skills and labour supply gap as the UK transitions to a green economy. This, along with other medium-term requirements such as regional system design, may need to be brokered at a regional level. |

The Case for Intervention

In the previous section, a number of requirements for delivering the cluster plan were highlighted. To test the case for intervention to manage these requirements, this section will examine a do-nothing counterfactual and explore case studies from other industrial decarbonisation clusters. The table below reviews each area of requirements and assesses the risks to delivering the plan without any intervention. This assessment has been done agnostic of any existing organisation or any pre-conceived notions of structures that will be put in place.

| Area of requirement | Do nothing scenario | Risks to delivery of the plan | Case for intervention |
|--|--|--|---|
| Timely delivery of core infrastructure | HyNet continues to take a coordinated approach to delivery, ensuring timely delivery to each project and addresses any barriers | Potential delays to HyNet could delay the decarbonisation of heavy industry, posing a possible risk to leveraging further commercial opportunities from being the first to decarbonise | High – need for ongoing engagement with Government and agencies (in collaboration with HyNet) to unblock delays |
| Policy incentives and certainty | Continued uncertainty over hydrogen price subsidy and wider policy support from Government | Ongoing uncertainty over price subsidy poses a risk to the ability to secure offtaker demand at the potential scale of the cluster, with wider policy uncertainty undermining investor confidence which could risk investment at the required pace | High – need for ongoing engagement with Government and other clusters to influence policy |
| Project brokering and facilitation | Projects attempt to secure approvals, permits and enabling infrastructure on a case-by-case basis, incurring delays to progress | Delays to projects poses a risk to delivering the plan at the pace and within the timeframe desired, risking further delays to dependent projects | High – convening stakeholders around the overall ambition of the plan could unblock barriers |
| Progress visibility and assurance | Relevant projects are not all visible and so do not move into the plan and less high profile, more local projects are not delivered on time | Not delivering the full range of projects or bringing in new projects as required risks not meeting the overall objectives, pathway and targets of the plan within the timeframe | High – facilitating a dynamic and varied plan requires grip and management |
| Regional support and alignment | Regional public sector partners prioritise and support the plan to varying degrees, communicating a lack of alignment and buy-in externally | Varied political and organisational support risks presenting an uncertain environment to investors and will prevent projects and businesses in the wider geography being part of or benefitting from the plan over time. | Medium – facilitating and maintaining buy in and managing benefits requires plan-wide effort |
| National coordination and collaboration | Current and emerging clusters compete for Government attention, investment, enabling infrastructure and funding | Risk of creating a 'zero sum' scenario leading to uncertainty and confusion that undermines the North West's ability to implement core infrastructure and projects, as well as the progress of other clusters. | High – collaboration and communication across clusters requires a clear point of accountability |
| Addressing medium term enablers | As skills, system and other requirements become more pressing, there is a lack of clarity as to where responsibility and accountability lies for managing and brokering them | Key enablers, such as sufficient labour supply, are not addressed resulting in new risks to delivery of future planned projects and investments, that could cause delays or non-delivery | High/Medium – clear responsibility for maintaining an ongoing review of future requirements and facilitating solutions is required |

Benefits and Opportunities of Intervention

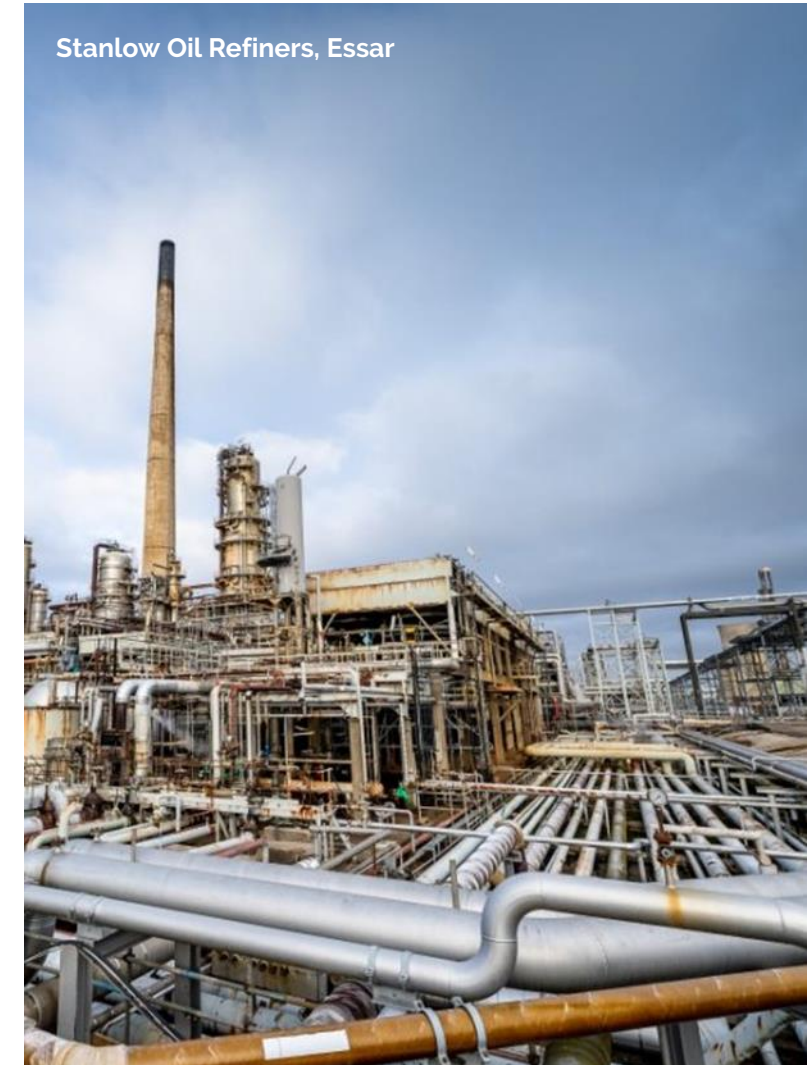
As set out, intervention to address the requirements for delivery highlighted will manage risks that could slow down or prevent delivery of the cluster plan. However, intervention could also mean that further opportunities for innovation, knowledge sharing and policy influencing could be unlocked, which should also be considered in tested the case for intervention.

The intervention highlighted so far can be described as convening stakeholders, overseeing and facilitating progress and fostering collaboration, all of which could have spin-off benefits and opportunities, as summarised below.

- **Knowledge sharing** - Intervening to support the delivery of current and future projects will enable knowledge sharing, problem-solving and better use of learning across the whole plan. Insight from stakeholders has highlighted that projects are facing similar obstacles, such as planning, consenting, and other processes, and sharing different approaches to addressing these challenges could help to accelerate progress, increase efficiency and reduce duplication.
- **Forming new and deeper partnerships** - The geography covered by the plan, North West of England and North Wales, has historically operated as a group of functional economies with collaboration at the centre. Intervening to convene stakeholders from local authorities, government agencies and businesses to solve problems or unblock issues facing decarbonisation projects across the plan could further strengthen and

deepen partnership working, building further local capacity and capability for future delivery.

- Coordinating across clusters and presenting unified cases to Government across the group will also serve to create networking opportunities across the clusters, opening up the possibility for further knowledge sharing, problem-solving and even new commercial or innovation opportunities at the national level.
- Actively and consistently intervening to communicate challenges to and influence Government policy similarly presents an opportunity to strengthen and optimise partnership working with the Government. Regular and consistent communication of insight and intelligence to Government departments could support central policy development and action whilst also unblocking barriers experienced in delivering the plan. In this way, the Government can continue to work with the North West as a valued partner for this and future phases of decarbonisation.
- **Securing benefits for the region** - Another benefit of intervening to facilitate enablers such as skills and infrastructure, is that there is scope for alignment with the wider objectives and ambitions of the North West. For example, on skills, early intervention could ensure that skills funding and programmes are used to create a local skills pipeline for the high-value jobs that will be created.



Conclusions and Recommendations

- The research and stakeholder engagement undertaken during phase 1 highlights an alignment from all stakeholders on requirement for some form of intervention to support delivery of the NW Industrial Cluster Plan. It was well recognised that intervention is needed to drive momentum, address delivery risks as they occur, and ensure the plan is delivered at maximum benefit to the region, and in time to meet commercial, climate, and policy imperatives.
- Whilst several of the plan projects might happen without intervention in time, it is likely to take much longer, and may not occur in the right sequence which would lead overall to missed opportunities to achieve decarbonisation and economic growth in the North West.
- This interim report concludes that the following core functions are required to deliver the cluster plan:
 - **Oversight and monitoring of cluster plan delivery:** An entity taking strategic ownership of delivery of the cluster plan on behalf of partners across the North West and North Wales. From a technology agnostic position, and with a whole system approach to managing delivery of the cluster plan, this function would effectively keep track of projects moving into and out of the plan scope, monitor progress of all projects within a programme identifying dependencies and sequencing, delays to progression of different elements, forecasting pinch points in delivery where resources or finance is limited, and identifying risks / barriers to plan progression.
 - The size and scale of future projects included in future revisions or updates of the cluster plan may offer an opportunity to engage smaller projects or 'micro-clusters' of aggregate demand, contributing to the wider industrial decarbonisation of the region.
 - **Engage effectively across regional partners:** Having an ability to engaging across 5 LEP areas, across administrative boundaries including local and national boundaries, managing relationships and working across industry and the public sector.
 - **Support consistent and strategic communications** and messaging around delivery of industrial decarbonisation activity across the North West and North Wales: this should include strong messaging to communities and the public, to industry across the region, as well as to industry and government nationally.
 - **Engagement and collaboration with other industrial clusters:** collaboration across the clusters will allow sharing of knowledge and best practice, as well as allow for clusters to identify and come together on common challenge areas such as big picture decision making in planning terms, securing improved capacity in grid infrastructure, Hydrogen pricing mechanisms and business models for hydrogen and CO2 transport and storage.
- **Brokering the relationship with national government:** Achieving visibility of regional challenges and their impacts across government and regulatory bodies as well as supporting engagement on key industrial requirements and how government policy impacts the NW cluster geography.
- **Supporting inward investment:** Assisting project delivery teams to receive investment for deliver through supporting consistent messaging from the region, ensuring the North West remains a competitive place to invest across the UK and internationally.
- **Managing risk to delivery:** A final function is to monitor ongoing risks to delivery of the cluster plan as a whole as it develops, provide a level of risk management including identifying proactive actions where necessary to mitigate risks to delivery, as well as contingency planning in the event that key projects are delayed or discontinued

Conclusions and Recommendations

- Whilst it is beyond the scope of this interim report to assess and recommend the form and governance of such an intervention, it is recommended that the scale of intervention required is able to work at a regional level, working closely with national counterparts from other industrial clusters as well as with government representatives. The scale of intervention must balance local knowledge of the plan area and projects, and be able to represent the technical issues and challenges of the plan adequately, translating these to the audience effectively.
- In delivering the above functions, three geographies must be considered and covered – Local, Regional and National
- Functions considered out of scope:
 - **Support for smaller scale industrial and manufacturing decarbonisation:** whilst it's recognised that the cluster plan covers only the highest emitting clusters and there is a need for smaller scale decarbonisation in parallel, this is not a core function required for delivering the cluster plan and should be provided for elsewhere.
 - **Skills and Workforce development:** Whilst it is recognised that a focus on skills is vital to ensure suitable interventions are pursued in the short to medium term to increase workforce supply into the future, it is not considered a specific function for delivery of the cluster plan. Skills supply is an

economy wide issue addressed (or solved) by interventions including project level skills plans and Local skills policy.

- Whilst there is a functional need for the management of the cluster plan to liaise and engage with this activity and feed into the wider discussion in terms of messaging on the combined skills requirements for skills and workforce across the cluster plan, and the opportunities for local employment for the region, but finding the solutions is not the responsibility of the body.

Key Recommendations:

Developing Options for Implementation

- The case for intervention shows a clear need for further coordinated support across private, public, and academic partners.
- It will require an approach that works across the whole of the North West region and North Wales, and is able to communicate and engage with national partners, including Government bodies and departments.
- Stage 2 will scope and develop options for delivery of the interventions set out in Stage 1.
- Existing organisational structures will be assessed, including those within the North West which may require some adaptation.

- Cluster bodies and options being explored by other Industrial Clusters will also be mapped to explore and understand what, if any, aspects may be relevant for the North West.
- Emerging recommendations from the recent UKRI report – Enabling Net Zero – will be explored in detail, with direct engagement with both UKRI.
- Stakeholder engagement with national trade bodies, such as the Carbon Capture and Storage Association, will also be undertaken.
- Stage 2 options for delivery will include assessing areas such as geography, level and scale of intervention, and priorities over the short-medium-longer term.
- Areas of intervention that can be best be delivered or influenced at the regional levels will be explored, and those that may require national engagement and could be strengthened by collaboration with one or more UK industrial clusters that may share similar barriers or challenges.
- Workshops with key stakeholders in late November 2023 will help to test the options, interventions, and support the final conclusions and recommendation for this work which will be reported in the final report of this commission in December 2023.



Operry
Group

Appendices

Working in partnership with **Metro—Dynamics**

Recent Policy Incentives no Longer Available



| Waterfall Category | Initiative | Funding | Reason Initiative is No Longer Available | Link |
|---|--|---|--|---|
| Industrial CCUS-Enabled & Electrolysis Hydrogen | Industrial Hydrogen Accelerator Programme: Launched to support projects generating evidence on end-to-end industrial fuel switching to hydrogen. | Up to £10mn in grant funding per project in Stream 1: Demonstration Projects; Up to £400,000 in SBRI funding per project through Stream 2A: Feasibility Studies; and up to £7mn available per project through Stream 2B: Demonstration FEED Projects | Completed, all funding stream competitions closed to applications as of February 2023 | Industrial Hydrogen Accelerator Programme (competition closed) - GOV.UK (www.gov.uk) |
| Industrial Electrolytic Hydrogen | Industrial Fuel Switching Competition: Ran two phases – first providing funding for the development and demonstration of pre-commercial fuel switching and fuel switching enabling technologies; second providing funding for the development and demonstration of fuel switching and fuel switching enabling technologies | £55mn in total First phase = £50,000 to £400,000 per application Second phase - £1mn to £6mn available per project | Closed to applications as of December 2022 | Industrial Fuel Switching competition Phase 1: feasibility studies (closed to applications) - GOV.UK (www.gov.uk) Industrial Fuel Switching Competition Phase 2: demonstration projects (closed to applications) - GOV.UK (www.gov.uk) |
| Bio-energy Carbon Capture & Storage (BECCS) | Hydrogen BECCS Innovation Programme: Supporting technologies that can produce hydrogen from biogenic feedstocks and be combined with carbon capture, seeking to support innovative hydrogen BECCS technology solutions across three categories of feedstock pre-processing; gasification components; and novel biohydrogen technologies. | Carried out in two phases: Phase 1 saw multiple projects supported to scope and develop a feasible prototype demonstration project, with a budget of £5mn; Phase 2 built on the first phase and took projects from innovation design through to innovation demonstration, with a total budget of £25mn. | The first phase closed to applications in March 2022, the second phase closed to applications in February 2023 | Hydrogen BECCS Innovation Programme (closed to applications) - GOV.UK (www.gov.uk) |

Recent Policy Incentives no Longer Available



| Waterfall Category | Initiative | Funding | Reason Initiative is No Longer Available | Link |
|---|--|---|--|---|
| Bio-energy Carbon Capture & Storage (BECCS) | Direct Air Capture and Greenhouse Gas Removal Programme: Providing funding for developing technologies that enable the removal of greenhouse gases from the atmosphere in the UK. | Part of a £100mn drive in research and development funding to develop direct air capture technologies in the UK. The first phase saw projects receiving up to £250,000 each for design and feasibility. The second saw the most promising designs from the first phase move forward to pilot key components or further develop the design of new direct air capture and other greenhouse gas removal technologies. | The first phase completed in 2021, with successful projects announced that May. The second phase closed to applications in January 2022, with winners then announced in July of the same year. | Direct Air Capture and other Greenhouse Gas Removal technologies competition - GOV.UK (www.gov.uk) |
| Energy Efficiencies | Industrial Energy Efficiency Accelerator: Aiming to increase the number of technologies available to industry to reduce energy consumption, maximise resource efficiency, and cut carbon emissions | <p>Phase 1 and 2, running between 2017 and 2021, saw up to £8mn made available to support innovations that improve energy efficiency and cut carbon emissions in industry.</p> <p>Phase 3 saw more than 70 technology ideas screened and over £3.6mn in grant funding committed to 8 successful projects – applications closed in February 2022, having opened in October 2021.</p> <p>The fourth phase opened in May 2022 and closed September 2022. 7 successful projects elected based on energy, resource and carbon savings potential. £4.8mn awarded.</p> | All four phases closed to applications as of September 2022 | Industrial Energy Efficiency Accelerator (IEEA): successful projects - GOV.UK (www.gov.uk) |

Organisations Consulted

The following organisations have provided strategic input to this study to date:

- Black Country Industrial Cluster
- Cadent
- Cumbria Local Enterprise Partnership
- Cheshire and Warrington LEP
- Cheshire West and Chester Council
- Deeside Decarbonisation Forum
- Department of Energy Strategy and Net Zero (DESNZ)
- Encirc
- Essar Oil
- Greater Manchester Combined Authority
- Humber Industrial Cluster
- Hydrogen East
- Industrial Decarbonisation Research and Innovation Centre (IDRIC)
- INEOS
- Lancashire Local Enterprise Partnership
- Net Zero North West
- North West Net Zero Hub
- North West Business Leadership Team
- North West Hydrogen Alliance
- North Wales Mersey Dee Business Council
- Peel Group
- Progressive Energy
- Siemens
- Solent Industrial Cluster
- South Wales Industrial Cluster
- Tata Chemicals Europe
- The Mersey Dee Alliance
- UK Research & Innovation
- Uniper
- Welsh Government

Key Contacts



Key contacts relating to this commission:

Johnathan Reynolds, Project Director, Opergy

+44 (0) 7787 518643

Johnathan.Reynolds@opergy.co.uk

Alex Gardiner, Project Director, Metro-Dynamics

+44 (0) 7414 581867

Alex.Gardiner@metroynamics.co.uk



Opergy
Group

Creating Opportunity
with **Innovation**
and **Energy**.

Working in partnership with **Metro—Dynamics**

@OpergyLtd.

Manor Farm Barns, Fox Road, Framingham Pigot, Norwich, NR14 7PZ

www.opergy.co.uk

