

HUMBER INDUSTRIAL CLUSTER PLAN: SKILLS ANALYSIS & ENGINEERING CONSTRUCTION OPPORTUNITIES

Detailed report

April 2023

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Executive summary

1. Executive summary

Humber Industrial Cluster Plan & Importance of skills provision

The industrial cluster in the Humber is the UK's largest in terms of emissions and a vital component of the national economy whilst providing a source of high value jobs to the region. As the UK economy becomes increasingly carbon-constrained, it will be vital to safeguard the value that the Humber cluster generates by investing heavily in new, low-carbon assets.

The Humber Industrial Cluster Plan (HICP), set up in January 2021, aims to support the transition towards a Net Zero cluster by 2040. The cluster is based on a roadmap of multiple projects (centred mainly around CCS and Hydrogen technology) which are set to commence construction starting in 2024. As such, there is an urgent need for preparation, investment and collaboration in the near future.

This analysis focuses on Lot 8 of the cluster plan – skills demand for the engineering construction sector. In order to ensure that the regional economy maximises benefits from investment it will be vital to have a strong pipeline of engineering construction labour to maximise employment opportunities and meet the demands of planned Net Zero projects. This will ensure projects are delivered on time, prevent the leakage of value outside the region and UK, and help developers manage the economics of their projects.

Purpose & methodology

This analysis presents:

1. High level estimations of the likely demand for industrial skilled labour to develop a Net Zero industrial cluster in the region;
2. Market inefficiencies and opportunities for skills provision on Net Zero projects in the region and their relative drivers;
3. A set of recommendations to prepare the region to meet anticipated demands.

The study is based on evidence obtained from **economic literature reviews** and **stakeholder engagement**, and the work was conducted in 2 iterative phases:

1

Skills analysis – demand for industrial skilled labour

Presenting high level estimations of the likely demand for industrial skilled labour, and identifying initial market factors to skills provision in the region.

Evidence gathered from:

- Economic literature review
- Stakeholder engagement with industrial firms, national and local government and industry bodies.

2

Market inefficiencies

Deeper dive into barriers to engineering construction skills demand - Identifying prominent market inefficiencies in the region, their relative drivers, and current strategies by industrial stakeholders in the region to address this.

Evidence gathered from:

- Economic literature review
- Stakeholder engagement with industrial stakeholders, colleges, training providers, national and local government, and others.

1. Executive summary

Key findings - Skills analysis

A significant surge in demand for skilled labour is set to emerge in the Humber cluster and in the UK as multiple Net Zero projects are anticipated to commence construction from 2024. The projects anticipated in the Humber are estimated to support 22,800 new industrial jobs (upper end estimate based on £6bn CAPEX provided by Element Energy as part of their quantitative modelling in support of the HICP). This is a top-down estimate and stakeholders have not been able to provide 'bottom up' quantitative estimates of the skills demand for Net Zero projects which they are involved in (indicative of the early stage of many projects).

This will require a significant, rapid upscaling of current skills pipelines. The current Engineering Construction Industry (ECI) workforce in the Humber is estimated by ECITB to comprise around 5,400 current engineering construction jobs (lower end estimate from April 2021 during reduced economic activity induced by Covid-19), ahead of a significant increase in skills demand over the next 2 years for Net Zero projects to start and be delivered on time. Even before the wave of Net Zero investment has begun, cluster stakeholders have reported that they are already experiencing significant challenges staffing existing operations, retaining their current workforce, and recruiting experienced individuals.

Stakeholders cited significant opportunities and challenges around meeting the future demand for skilled labour: There was unanimous agreement from all stakeholders that without additional action there will be a critical skills shortage that will make it hard to achieve Net Zero ambitions in a timely fashion without government commitment to industrial decarbonisation infrastructure. Contractors are already finding it hard to maintain a steady workforce, with many workers employed on short-term contracts and a significant proportion reaching retirement age. There are acute shortages in some areas noted by stakeholders including electrical and mechanical engineers, welders, project managers and specialist plant operators.

Stakeholders engaged with cited that the key industrial skills required to develop a Net Zero cluster in the Humber will be largely Engineering Construction Industry (ECI) jobs, and as such, our deep dive focuses primarily on these jobs.

Key findings – Engineering construction opportunities

Informed by economic literature reviews and information gathered from stakeholder engagement, 6 key market inefficiencies pertinent to the Humber are identified and presented.

1. Executive summary

(Continued) Key findings – Engineering construction opportunities

The following lists the inefficiencies, opportunities and associated drivers identified at a high level:

1. Limited training provision capacity in engineering construction (staff and facilities):

Drivers: Drivers include limited industry driven investment; cost of training tutors; lower pay for tutor roles compared to industry benchmarks; resource-intensive training and facilities (expensive specialist equipment and machinery); lack of capital funding allocated by government to drive future capital investments; and short termism (schemes available on a per-trainee basis only).

2. Imperfect information (lack of awareness)

Drivers: Drivers include project uncertainty (reliant on Government decisions and roadmaps); demand uncertainty in the supply chain (unknown scale/volume of projects); short-termism (demand-led and reactive / supply-chain driven market); short term and temporary contracting for industrial projects (although this has worked in the past it may not be adequate to meet the surge in skills demand in the UK driven by Net Zero projects).

3. Potential misalignment between existing training and evolving industry needs

Drivers: Drivers include high costs of expanding training capacity to meet the skills pipeline required; changing industry requirements to deliver Net Zero (and rapidly evolving technology); low awareness and lack of efficient / tailored routes to industry; and limited industry engagement with colleges / training providers.

4. Lack of incentives for training (self-employed / temp workforce)

Drivers: Drivers include competition for the same resources and self-employed workforce (creating a large pool of self-employed flexible workers with different companies without taking on training responsibilities within the organisation); project-based peak demands (incentivising contracting solutions rather than investment in long term resourcing); and lack of direction from employers to Engineering, Procurement, and Construction (EPC) contractors on UK content targets (EPC contractors are not given direction from project sponsors on UK content targets and the costs of this are not included in agreed provisions).

5. Workforce mobility (including geographical constraints and migration)

Drivers: Drivers include competing sectors (such as Oil and Gas) which have a greater financial pull for the same resources; temporary contracting (movement of employees and self-employed workers); and project uncertainty (due to risk of projects not going ahead there is lack of investment into permanent resourcing strategies).

6. Competition between contractors for labour

Drivers: Drivers include limited capacity and experience of larger firms to launch streamlined procurement strategies; competition between contractors (limited incentives for collaboration, smaller contractors given short lead times); and lack of engagement from project sponsors (to direct / support contractors in delivering UK content targets).

1. Executive summary

Recommendations

We have developed a series of recommendations aimed at addressing potential skills shortages and market inefficiencies in engineering construction for Net Zero infrastructure. The common theme amongst the recommendations is the extent of collaboration needed between key stakeholders and therefore we have listed key stakeholders required. As these recommendations are implemented, it will be important to monitor for any overlaps between them and address these.

Table 1: Summary of recommendations

Recommendation	Actions for
<p>R1: Expand utilisation of ‘Learn on the job’ schemes: Industrial companies and contractors can implement this where industrial workers undertake task-based activities with direct supervision whilst learning on the job. This will act as an effective means to accelerate upskilling.</p>	<p>Industry, training providers, colleges, and other accreditation bodies.</p>
<p>R2: Secondment from industry to support training provision: A scheme where industrial companies / contractors provide a secondment offer for their employees to support training providers and colleges. This will help bridge misalignment between training provision and changing industry needs, and ensure the tutors and students have access to relevant industrial experience.</p>	<p>Industrial companies, contractors, colleges, training providers, National Government.</p>
<p>R3: Increase support for SME access to skills: Support SMEs to understand the skill provision funding available (building on local LEP Growth Hubs and Workforce Development services) and manage the associated administrative burden. Where possible, flex existing policy to make support more available to SMEs in civil and engineering construction.</p>	<p>National and Local Government (including LEPs), LSIPs, colleges & training providers.</p>
<p>R4: Government to continue to recognise the importance of key sectors for Net Zero: Government initiatives, such as the establishment of the Green Jobs Delivery Group, must consider the importance of the Engineering Construction sector for Net Zero development.</p>	<p>DfE, Local Government, LSIPs, and Industry bodies.</p>
<p>R5: Capital investment into engineering construction capacity in the region: Training providers, with the support of industry and wider government support schemes, should seek opportunities to increase the capacity of training provision by e.g. developing industry-relevant training facilities to act as central hubs for developing UK content and skills in Net Zero projects to meet future increased demand.</p>	<p>Industrial investors, National Government, colleges and training providers.</p>

1. Executive summary

(Continued) Recommendations

Recommendation	Actions for
<p>R6: Enhance attractiveness of industrial training roles: In parallel with improving the trainer packages available, work can be done to better sell the wider benefits of working in education and training – such as by advertising the favourable benefits and work-life balance that comes with such roles. These careers need to be advertised directly to those skilled workers in industry.</p>	<p>Training providers, Colleges, Local Government, LSIPs, LEP Careers Hubs, IoTs, Industry.</p>
<p>R7: Improve awareness of industrial and Net Zero careers in schools and universities: Build on existing approaches and develop a coordinated Net Zero awareness programme to highlight the decarbonisation agenda and other benefits associated with industrial job opportunities.</p>	<p>Training providers, Colleges, Schools, Universities, Local Councils, LSIPs, IoTs, Industry, LEP Careers Hubs, National Careers Service.</p>
<p>R8 Develop detailed occupational map to quantify the skills availability for Net Zero projects in the Humber and the UK: In addition to existing work, a further study (ideally collaborative and centrally managed) is required to understand, in more detail, the labour market in the Humber and in the UK and outline an occupational map and skills database (with a direct focus on Net Zero projects) to be shared with relevant stakeholders.</p>	<p>General / open action (stakeholders who have carried out studies on skills capacity include AMRC, University of Chester, IDRIC, ECITB, CCSA), LEPs, Humber Principals Group, HEY LEP Skills Network.</p>
<p>R9: Forward plan demand and promote certainty: Government and industry should help develop clearer roadmaps and promote certainty of end-use demand to de-risk investment into skills growth.</p>	<p>National Government, Industrial emitters and contractors.</p>
<p>R10: Review of apprenticeship levy to identify barriers: Stakeholders and government should continue to collaborate and review how the apprenticeship levy is being utilised by the industrial sector and how this can be improved.</p>	<p>National Government (DfE) and LEPs.</p>
<p>R11: Increase investment into efficient manufacturing processes, equipment and machinery: Companies should invest in efficient industrial machinery and equipment (which the Humber and UK lag behind other developed countries in) as this will significantly reduce the demand for labour.</p>	<p>Industrial companies, contractors.</p>
<p>R12: ‘Smart-trainer’ schemes: Colleges, training providers and universities can collaborate with industry bodies and Institutes of Technology to develop schemes where trainers are shared across providers and given more competitive salaries.</p>	<p>Training providers, Colleges, IoTs, Universities, Industry, DfE (policy flex).</p>

02

Introduction and methodology

2. Introduction and methodology

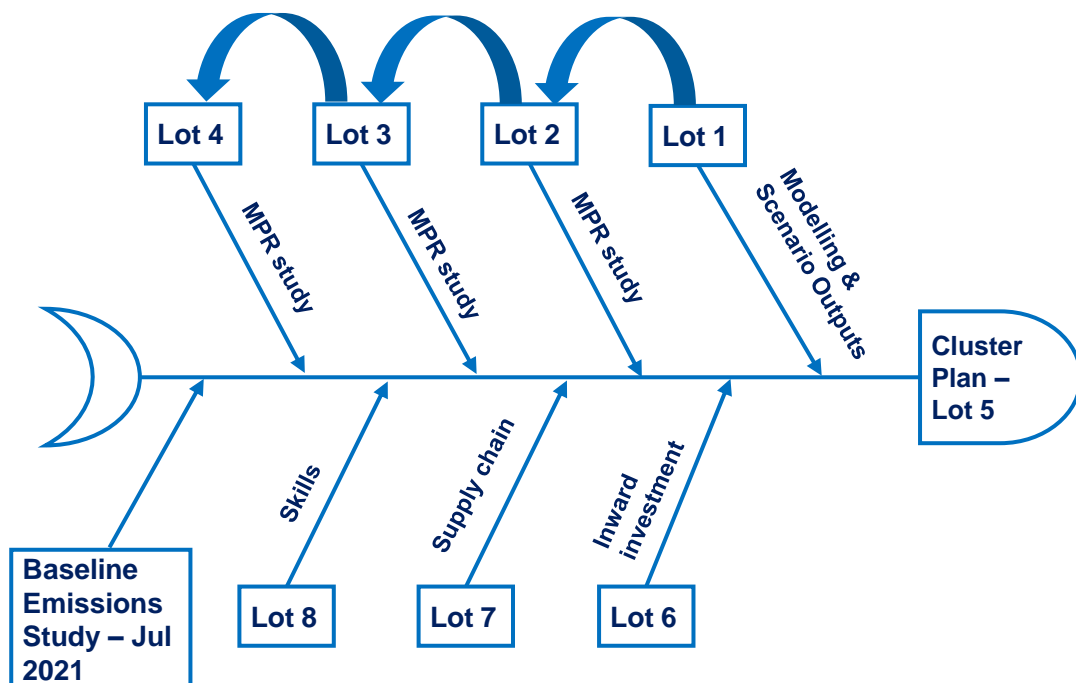
Introduction to Lot 8 – Skills provision

As part of the UK's world-leading industrial decarbonisation strategy, a target has been set to ensure that there will be at least four low carbon clusters by 2030 and at least one Net Zero cluster by 2040. At the forefront of this are plans to decarbonise the UK's most carbon intensive cluster – the Humber industrial cluster.

The Humber Industrial Cluster Plan (HICP), set up in January 2021, aims to support the transition towards the UK's first Net Zero cluster by 2040. It is based upon a roadmap of multiple projects (centred mainly around CCS and Hydrogen technology) set to commence construction starting in 2024 and working towards deployment in 2027. This opens the opportunity for investment into maintaining, upskilling and growing the labour workforce in the region, in turn creating a world leading Net Zero workforce that can benefit the UK as a whole and act as a centre of excellence for global industrial decarbonisation.

This report focuses on Lot 8 of the overall cluster plan and covers skills provision. Figure 1 below illustrates the different Lots and how they feed into the overall plan.

Figure 1: How the Lots feed into the Humber Industrial Cluster Plan



2. Introduction and methodology

Purpose

The purpose of the report is firstly to evidence, through estimating job requirements and conducting extensive stakeholder engagement work, the opportunities available for skills provision on Net Zero projects in the Humber and as assessment of urgency with which current and future shortfalls need to be met. This report then presents an analysis of key market inefficiencies relevant to the Humber cluster that act as barriers to skills provision on Net Zero projects. The report also presents recommendations to address the skills related issues and market inefficiencies identified so that the region is able to meet the upturn in demand for skilled workers to deliver Net Zero projects.

Importance of skills provision in a Net Zero Humber

In order to ensure that the regional economy maximises benefits from low-carbon investment it will be vital to have a strong pipeline of skilled labour to meet the demands of planned Net Zero projects.

The establishment of a strong, world-leading pipeline of skilled labour in the Humber will prevent leakage of value outside the region and UK, and help make the region a centre of excellence where expertise and learnings can be used to support a UK-wide and global transition to Net Zero.

It is equally important to invest in skills provision to ensure that projects are delivered on time, with multiple projects set to commence construction in 2024 towards deployment in 2027. Investment to support a collaborative effort on skills provision for Net Zero projects between employers, colleges, training providers and industry bodies is vital for developers to manage the economics of their projects and ensure timely delivery.

Methodology

The work was undertaken in 2 separate phases:

- 1. Analysis of demand for skills and existing capacity:** Presenting high level estimations of the likely demand for industrial skilled labour (see Section 3 of this report), and identifying initial barriers to skills provision in the region through discussions with industrial stakeholders.
- 2. Assessment of market inefficiencies:** Deeper dive into barriers to skills provision – identifying prominent market inefficiencies in the region, their relative drivers, and current strategies of industrial stakeholders in the region to address this.

Insights are then used to develop a targeted set of **recommended actions**, ranging from policy action and local initiatives, addressed to relevant stakeholders. These recommendations inform how to address barriers to skills provision and prepare the region to meet the anticipated demand on Net Zero projects.

03

Skills demand to develop a Net Zero cluster

3. Skills demand to develop a Net Zero Humber cluster

Overview of section

To provide context for the assessment of skills provision for Net Zero projects in the region, this section presents estimates of job requirements for the Net Zero Humber cluster and compares this with estimates of existing local skills.

A. Job Requirement estimates:

The job requirement estimates were arrived at using ONS employment multipliers and CAPEX estimates provided by Element Energy developed as part of the quantitative modelling underpinning the HICP. The multipliers are drawn from the latest ONS UK Input-Output tables (reference year 2018).

B. Existing jobs estimates:

Stakeholders engaged with (see Section 4) cited that the key industrial skills required to develop a Net Zero cluster in the Humber will be largely Engineering Construction Industry (ECI) jobs, and as such, our analysis focuses primarily on these jobs.

It is noted that the Engineering Construction Industry is not defined by government statistics (no associated SIC code) and therefore regional employment data from ONS is not available (such data is available for broader sector classifications such as construction and manufacturing). The estimated existing jobs figures were instead obtained from a regional workforce survey conducted in March and April 2021 by the ECITB (ECITB Workforce Census 2021).

3. Skills demand to develop a Net Zero Humber cluster

Estimated aggregate jobs requirement by 2040

A. Obtaining a CAPEX estimate

An estimate of the CAPEX required for the development of the Humber Net Zero cluster by 2040 was provided by Element Energy based on 4 cluster development scenarios. For the purposes of our work - a high-level comparison of skills demand and supply - we have used scenario 2 (Innovations and Incentives). This scenario assumes a situation similar to the one in the Humber where there is a high level of policy support initially targeted towards CCS and hydrogen projects, and with a greater focus towards lowering electricity costs and progressing electrolysis routes for hydrogen production. The capex used includes the anticipated cost of developing CO2 and hydrogen transport.

CAPEX estimate: £6bn

B. ONS input-output multipliers

We use the latest ONS UK Input-Output tables (reference year 2018) to obtain employment multipliers that can be used to estimate job numbers from the CAPEX.

The input-output tables include multipliers for different sector groups. Given that the Engineering Construction sector does not have an assigned sector group the following sectors were used instead: Construction, Manufacture of Fabricated Metal Products (excluding weapons & ammunition), Manufacture of Basic Iron and Steel, Manufacture of Other Chemical Products, Other Manufacturing, Architectural And Engineering Activities, and Technical Testing And Analysis. The average of the multipliers for these sectors was then calculated.

FTE per unit input (£m): 3.8

B. Existing jobs estimates:

When multiplied, the CAPEX and multiplier estimates gives an estimated job creation output of **22,800 direct jobs by 2040.**

This is the estimated number of direct jobs created over the lifecycle of projects. It is a high-level estimate which does not take into account the number of jobs required locally and across the UK. However, given that these are direct jobs (direct employment by businesses involved) it can be assumed that a large proportion will be locally based.

3. Skills demand to develop a Net Zero Humber cluster

(Continued) Estimated aggregate jobs requirement by 2040

We assume that these jobs will be largely weighted towards capital infrastructure development as opposed to business as usual Operation and Maintenance (O&M) jobs. This is because only the CAPEX investment figures were used in the model to estimate job counts and because CCS and hydrogen projects typically consist of repurposing existing infrastructure with ongoing O&M demand.

Another assumption is that these jobs will be largely ECI jobs. This is because the investment amounts / CAPEX used in the calculation relate to industrial infrastructure development in the energy and process industries. ECI companies design, engineer, construct and decommission some of the biggest infrastructure projects in the country – and they will be central to delivering Net Zero ¹.

Further, it must be noted that in reality, skills requirements for industrial developments are likely to vary over time depending on project phasing profiles, with some periods of increased demand as multiple projects are developed to similar deadlines (e.g. projects aiming to commission by 2027 as part of the Cluster Sequencing Phase 1 process). Individual projects are likely to see peak employment profiles during construction.

As such, without sufficient investment in local and UK content, there is likely to be lower local job creation which will impact on project delivery timescales. This highlights the precise benefits of presenting such analysis (albeit using high-level estimates) – emphasising the gap in skills supply and the opportunities available to invest in UK content. It must also be noted that the Humber cannot be looked at in total isolation as many engineering construction companies support projects across the UK and beyond.

Current levels of employment in Humber cluster

There are currently approximately 5,400 ECI jobs connected to the Yorkshire and Humber region. This figure comes from a data set collected as part of an ECITB workforce survey in March and April 2021 and therefore reflects the impact of Covid-19 as well as the fact that facilities in the Humber are largely in operational phase meaning manpower requirements are limited. This is therefore likely to be an underestimate of current skills supply.

Whilst this figure (5,400) only comprises of ECI jobs, the anticipated job requirement / creation estimate (22,800 jobs) includes other job categories. Our assumption is that a large proportion of jobs required will be ECI jobs and so there remains a significant step change between current levels of employment and the levels required for Net Zero projects.

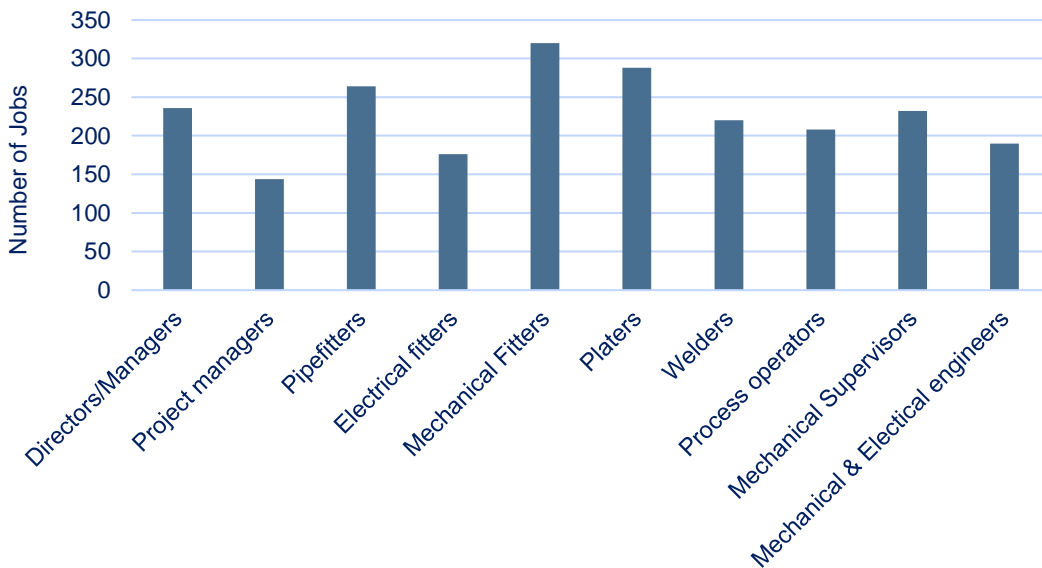
¹ Source: ECITB

3. Skills demand to develop a Net Zero Humber cluster

Split of future skills demand by skills type

Figure 2 below presents estimates from the ECITB workforce survey conducted in April 2021 for 10 key job types identified. In total these key jobs represent around 2,300 (43%) of the total population of 5,400 engineering construction jobs estimated by the survey.

Figure 2: Current jobs numbers (from ECITB workforce survey in 2021) split between 10 Key industrial jobs in the Yorkshire and Humber region



Whilst this data only represents the existing skills in the Yorkshire and Humber region, it can be used as an indicator to illustrate the anticipated key job types required in the Humber based on the following assumptions.

- Stakeholder conversations have highlighted the anticipated industrial skills required will be largely similar to existing engineering construction skills types required in the Humber. We have assumed that the future split of job types will follow the same proportions as the current split.
- The baseline data used only contained 10 key jobs types in engineering construction selected from a total of 50+ job types. Whilst there are other relevant job types, the 10 presented make up 43% of the total job population so have been highlighted for the purposes of illustrating a simplified picture of required jobs types

3. Skills demand to develop a Net Zero Humber cluster

Split of labour demand by skills type

Whilst there will be a similar profile of future skills types to those today, it must be noted that the relative weighting of skills types may vary given that the data is a snapshot of skills at a time when the Humber cluster was largely in an operational phase, in contrast the project-type engineering construction work required for Net Zero.

The disaggregated estimate indicates that there are particular skills where demand will be particularly acute: Mechanical fitters; welders; electricians; and pipefitters. Ramping up to the required levels of demand may prove challenging.

Skills demand validation

Outputs from our skills demand analysis were validated against available information obtained from the literature review (Appendix 1) as well as project-specific pre-FEED and FEED data shared by stakeholders we engaged with.

a. Literature review insights - third party estimates

We noted from a review of literature that there has been minimal analysis performed to quantify the skills demand and capacity in the region. This is partly due to the fact that the ECI industry is not defined by government statistics (no associated SIC code), but also due to projects being early in FEED and stakeholders being occupied with the challenge of resourcing current operations.

One study, conducted in November 2020 by Vivid Economics on behalf of Drax ², highlighted that at its peak the Humber industrial cluster could support a total of up to 25,200 direct jobs – broadly aligning to the upper end estimate used and provided by Element Energy (20,100 jobs).

b. Validation against known project figures

There is scope to validate skills demand estimates against past or ongoing figures from similar industrial projects, extrapolated to a Humber scale using CAPEX or power generation as a baseline. An example candidate project could be the recent Keadby 2 power station build.

² Source: Vivid Economics, Capturing carbon at Drax- delivering jobs, clean growth and levelling up the Humber

3. Skills demand to develop a Net Zero Humber cluster

(Continued) Skills demand Validation

b. (Continued) Validation against known project figures

Given that stakeholders have not been able to provide 'bottom up' quantitative estimates of the skills demand for Net Zero projects which they are involved in (indicative of the early stage of many projects, including those that are due to commission as part of the first group of projects by the end of 2027) it is not possible to cross-check the aggregate demand against Net Zero project figures.

Nevertheless, stakeholders' qualitative views support the key conclusions drawn here, that there will be a significant increase in demand for the technical skills required to deliver multiple Net Zero projects in the region.

Modular construction

It was noted from industrial stakeholders engaged with that, as opposed to traditional stick-build approaches, modular construction techniques will be adopted. Modular construction is a process by which construction is conducted off-site under controlled plant conditions. This creates several benefits as opposed to conventional stick-build approaches, some of these benefits include:

- Significant time and resource efficiency in construction, as work is done under controlled environments designed to suit efficient processes.
- Efficiency in design, as engineers and construction staff work closely together in a controlled environment that supports collaboration.
- Schedule-certainty, as construction can be done in parallel with other on-site work which may otherwise cause scheduling delay.
- Time and resource required for supervision and monitoring around controls such as for Health, Safety, Environment and Quality is reduced in controlled module yards.
- Training of apprentices is more efficient, safe, and cost-effective in module yards than on live sites.

Further, it was noted that within existing modular construction / fabrication facilities, there is significant room for investment in modern and efficient equipment/machinery and processes, with some stakeholders stating that this can boost resource efficiency by up to 400%. The implications of this are that the adoption of modular construction techniques along with investment into efficient machinery and equipment could potentially reduce the demand for jobs and ease the burden on industrial companies and training providers.

04

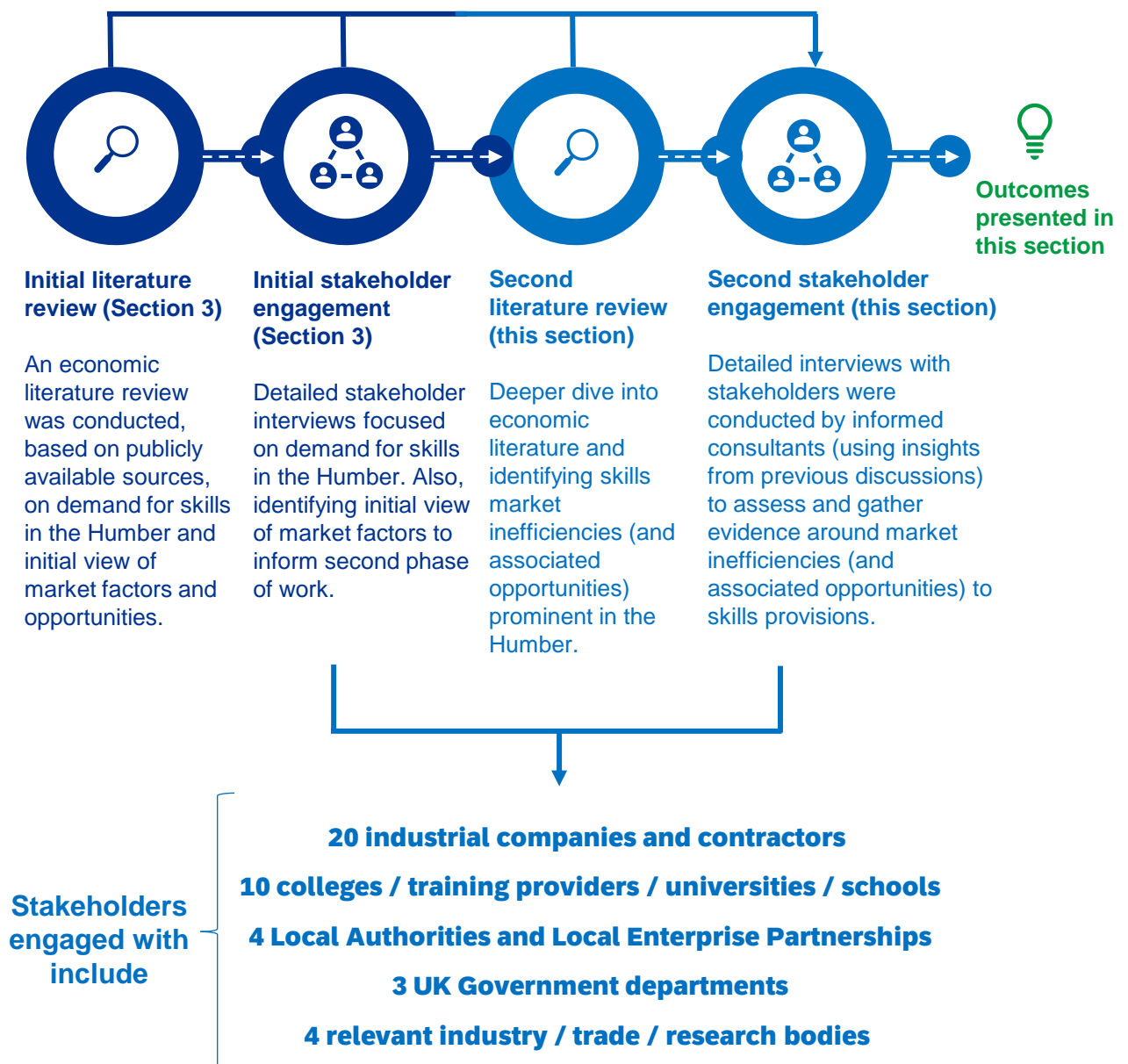
**Engineering
construction
opportunities in the
Humber**

4. Engineering construction opportunities in the Humber

Methodology:

As depicted in the flow chart below, the initial phase of work focused on skills demand (presented in Section 3 of the report), and produced a baseline of insights gathered from industrial stakeholders around barriers to skills provision in the Humber.

Following this, a further deep dive into economic literature around skills market inefficiencies was conducted (with a focus on engineering construction skills), and based on this, a consolidated list of six key market inefficiencies prominent in the Humber region was identified.



4. Engineering construction opportunities in the Humber

List of key skills market inefficiencies identified

Six key market inefficiencies were identified as being prominent in the Humber region, highlighting significant opportunities for engineering construction skills provision.

Table 2: Identified market inefficiencies relevant to the Humber

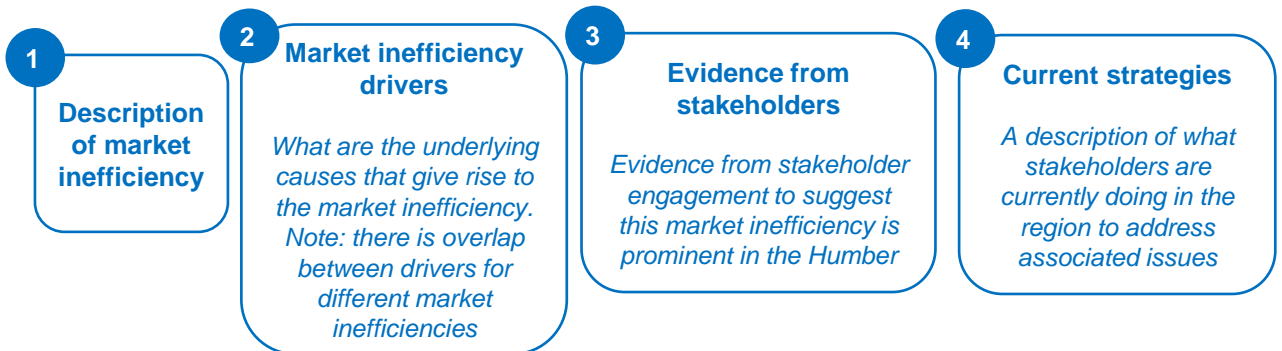
Ref	Market inefficiencies
1	Limited training provision capacity (staff and facilities)
2	Imperfect information (lack of awareness and short-sighted behavior)
3	Misalignment between existing training and evolving industry needs
4	Lack of incentives for training (self-employed / temp workforce)
5	Workforce mobility (including geographical constraints and migration)
6	Disproportionate market power of larger firms

Stakeholder engagement

Detailed interviews with stakeholders were conducted to assess these market inefficiencies and gather evidence around: 1. their prominence in the Humber; and 2. on the current strategies being adopted by relevant stakeholders to address these. The outcomes of these discussions are presented in this section of the report.

Work presented in this section of the report

The analysis around each market inefficiency is structured and presented as follows:



4. Engineering construction opportunities in the Humber

Market inefficiency 1: Limited training provision capacity

1.1 Description: A lack of capacity in training provision exists where training providers and educational institutions do not have an adequate capacity (infrastructure, personnel and financial) to meet the existing and anticipated demand for skills driven by industry.

1.2 Drivers:

- a. Cost of training staff:** In an industry where there is a large demand for skilled labourers, the basic salary of these workers in operational positions will be significantly higher than what education and training institutions can provide. This comes as a result of a standard / baseline level of funding provided by government as well as capped recommendations on pay for further education teaching that is significantly lower than what is available in industry. This is the key driving factor for this market inefficiency as identified through stakeholder engagement.
- b. Resource-intensive training and facilities:** The industrial sector requires handling of expensive and large equipment, and therefore training organisations need to invest in large spaces and facilities to accommodate any increase in training capacity. This is especially the case for Net Zero industrial skills where specialist equipment is needed for practical training (such as for CCS and hydrogen), and this equipment needs to be upgraded frequently to match changing industry needs and specifications.
- c. Limited industry-driven investment – free-rider issue:** Industrial companies are more reluctant to invest in training their own staff due to the free-rider issue (e.g. poaching of employees by larger firms with high current demand), and therefore there is a lower than required intake of trainees / apprentices by industrial companies and key contractors in the region (when measured against the skills required to deliver Net Zero). This also creates a lack of industry-driven investment to support training providers and colleges, which is needed to create competitive trainer packages and produce training facilities that are in line with industry needs.
- d. Lack of industry-driven investment – administrative burden:** Employers often struggle to access the skills system due to the complexity and administrative burden associated with applying for funding and ensuring compliance for individual apprentices (for example, it may take 6 to 8 weeks to become compliant for one position). This is more so relevant for SMEs who lack financial and administrative capacity, but is also an issue for some larger companies.
- e. Short-termism:** Support provided to colleges and training institutions in the form of apprenticeship funding and skills bootcamp funding does not allow for long-term planning. Training providers are required to take on a significant administrative burden on a per-trainee basis throughout the duration of each apprenticeship programme, and there are minimal capital financing options to de-risk long term planning and growth.

4. Engineering construction opportunities in the Humber

Market inefficiency 1: Limited training provision capacity (ctd)

1.3 Evidence from stakeholders

- **Cost of industry-trained staff:** 5 out of 6 training providers cited challenges around paying for and retaining qualified trainers, stating that these trainers could earn significantly higher salaries in industry. It was noted that trainers are usually older individuals from industry who are close to retirement and want to 'give back'. This issue of 'cost of staff' was unanimously cited by these training providers as the main market inefficiency with training provision. As an example of the disparity between salaries in training and in industry – stakeholders informed us that welding trainers (who earn around £30k pa) can earn 2 or 3 times more in operational roles.
- **Resource-intensive training and facilities:** 4 out of 5 training providers mentioned significant challenges around developing industry-compatible facilities to produce the practical training space and equipment required for Net Zero industrial skills development. 5 out of 5 training providers have the Net Zero industrial decarbonization agenda as part of their growth plans, however only 2 have made planning progress with regards to CCS and hydrogen specialist training provision – which may lead to tight timelines considering Humber cluster projects begin their construction phase within the next 2 years.
- **Lack of industry-driven investment:** All industrial stakeholders engaged with emphasised the free-rider issue (risk of workers being poached by other firms) as a key reason for reluctance to invest in training and growth. Similarly, various stakeholders cited the administrative burden associated with apprenticeships as a limiting factor to increasing the volume of training provision – an issue that was particularly emphasised by SMEs (and noted by colleges and training providers as an issue that SMEs are unable to overcome).
- **Short termism:** Various stakeholders engaged with emphasised that there are limited options available to finance long-term planning and investment. It was noted that the apprenticeship support available requires a considerable amount of administrative burden on a per-trainee basis.
- **Courses / programmes at full capacity:** 6 out of 6 training providers and colleges we engaged with in the Humber expressed the view that existing training courses and facilities are full capacity, and that there is a significant demand from applicants (students and adults) for these courses that is not being met by the number of courses available.

4. Engineering construction opportunities in the Humber

Market inefficiency 1: Limited training provision capacity (ctd)

1.4 Current strategies:

The issue of limited training provision capacity to meet the demand for skills and the associated drivers for this are well known by training providers and colleges. However, due to the main market inefficiency cited by stakeholders – cost of staff – there is minimal scope for individual training providers to address this issue alone; due to 1. limited funding; and 2. standardised pay bands for trainers and the implications of changing this for just one cohort of trainer.

Stakeholders are starting to consider wider avenues of support and collaborative efforts to develop bespoke solutions that the region as a whole can benefit from. Examples cited by stakeholders include:

- Colleges and training providers are considering options to collaborate with employers and work together to try and solve staffing shortage issues. Working groups have been created with the Yorkshire and the Humber Institute of Technology to discuss solutions to the issue at hand – and one solution being discussed is the prospect of trainers being shared between multiple providers who contribute on costs. Such discussions however are at an early stage and there is no urgency / wider support to accelerate the progress of developing these ideas.
- Colleges and training providers have been utilising government support from the Strategic Development Fund (SDF) to develop Net Zero capital projects, such as for EV ChargePoint training facilities, and also for Carbon Capture and hydrogen, however this is very early in the process. It was noted by numerous stakeholders that the SDF fund is one which allows for long-term planning due to its flexible nature as a capital funding scheme with minimal restrictions on what developments can be funded; allowing for planning, innovation and adaptation to industry needs.
- Training providers are also considering wider government funding support and industry investment to develop large scale training facilities that have the capacity to significantly help meet the Humber's demand for Net Zero skills, and also to act as an anchor for developing UK content expertise in the Carbon Capture and hydrogen sectors.
 - o Through discussions with training providers, industry and government – there appeared to be a clear appetite for a large capital project which aims to address the shortage of training facilities and provision to help meet the anticipate surge in demand for skills.
 - o Such a project is likely to support the Humber brand and bring about additional scope for collaboration between stakeholders and industry.

4. Engineering construction opportunities in the Humber

Market inefficiency 2: Imperfect information (lack of awareness and short-sighted behaviour)

2.1 Description: Employers and individuals lack reliable information on quality and content of learning opportunities available to them, and the benefits that may accrue from investment in particular types and levels of training. This is particularly the case for SMEs who are often risk-averse and do not always have the capacity to bear the administrative burden of developing apprenticeship programmes. This leads to employers being unable to value the benefits of training in terms of future earnings.

2.2 Drivers:

- a. **Project uncertainty:** Given the novel nature of Net Zero technologies, industrial companies await government decisions such as on support schemes prior to finalising investment decisions on projects and launching commercial and procurement strategies. This can result in a reduced appetite for industrial companies to proactively invest in and understand learning opportunities available until things become more clear.
- b. **Demand uncertainty in the supply chain:** Linked to project uncertainty, there remains a considerable level of uncertainty (and lack of quantitative information) about the expected demand, and in turn, the exact scale of projects and the volume of work required. There is also minimal understanding of the skills capacity in the region due to a reliance on short term contractors and due to a large pool of self-employed workers whose numbers are hard to track. All of this together disincentivises early investment into supply chain growth.
- c. **Short-termism:** Further education provision from colleges and training providers is largely a demand-led and reactive process, with training providers planning on a per-trainee basis and relying on requests from industry prior to investing in growth (reactive provision of training). As a result, there have been few efforts to acquire an in-depth quantitative understanding of future skills needs.
- d. **Short term and temporary contracting for industrial projects :** The ECI industry is one where there is a general reliance on short-term and temporary contracting for industrial projects, and as a result companies are competing for the same resources that are available. This creates competitive behavior which can obscure the broader and longer-term benefits of training internal / permanent staff. This short-term approach is also driven by the urgency of demand for skills, with projects expecting to commence construction within 2 years.
- e. **Lack of student awareness:** Students and adults are often unaware of pathways into industry including apprenticeships. There is also a lack of awareness of the type of university degrees (specialised programmes) available that provide the necessary tailored skill-sets that industry needs.

4. Engineering construction opportunities in the Humber

(Continued) **Market inefficiency 2: Imperfect information (lack of awareness and short-sighted behaviour)**

2.2 Drivers:

- f. **Lack of industry-school engagement:** Whilst there is engagement between industry and schools/colleges, this is often on a one-off basis without continued dialogue. As a result, schools / colleges are less able to signpost routes into industrial jobs to their students.
- g. **Lack of a single voice in the region:** Since the initiation of the Humber Industrial Cluster Plan, there has been a lack of a single voice (political and industry) in the Humber to communicate key events / strategies and develop a joint vision to tackle the skills and supply chain needs the Humber Industrial Cluster will face. This puts the region at a disadvantage to others with a more integrated political structure e.g. Mayoral Combined Authority.

2.3 Evidence:

- **Project and demand uncertainty:** All industrial operators and contractors engaged with emphasised timing of Government support scheme decisions (such as Phase 2 of the Cluster Sequencing Process – announced in Aug 2022) as a key driver for uncertainty and reason for late timelines for commercial and procurement planning. Further, end-use demand uncertainty was cited by stakeholders as a significant barrier to investment and growth, with stakeholders currently not aware of the demand forecasts (due to projects still in FEED design stage) for carbon and hydrogen end-use, and therefore not decided on scales of projects and volume of supply chain content required.
- **Lack of investment into preparation:** 6 out of 6 training providers engaged with were generally aware of the Net Zero industrial decarbonization opportunities emerging in the future, however they all cited challenges around financing limitations that colleges and not-for-profit institutions face. These constraints limit the extent to which these institutions can plan for the future and anticipate future need.
- **Short-termism:** A number of training providers and colleges highlighted that training provision is a largely reactive process which relies on engagement from industry and clearer roadmaps prior to developing training provision strategies focusing on industrial decarbonization opportunities.
- **Short term and temporary contracting for industrial projects:** It was determined through discussions with industrial stakeholders and contractors that there is a general reliance on temporary contracting for industrial projects.
- **Lack of student awareness:** 1 school and 4 colleges engaged with emphasised that students are not well aware of the opportunities available to them in industry and how to access these jobs.

4. Engineering construction opportunities in the Humber

(Continued) Market inefficiency 2: Imperfect information (lack of awareness and short-sighted behaviour)

2.3 Evidence:

- **School/college collaboration with industry:** It was noted by schools/colleges that there is a lack of continuous engagement from industry (engagement is often ad hoc rather than sustained) to generate and embed awareness of training opportunities available. Similarly, several industrial companies engaged with expressed concerns around the need for more interest from school/college staff whenever they did visit.
- **Opportunities available to SMEs:** Eight relevant colleges, industry bodies and SMEs engaged with noted that SMEs are not able to make use of funding available for apprenticeships or funding for bespoke training. Whilst this is partly due to a lack of awareness of opportunities available to SMEs, a key reason for this is the significant administrative burden on smaller companies who do not have the capacity to recruit staff for managing the pursuit of Government or other avenues support, something that larger companies and levy contributors are able to do.
- **Lack of a single voice in the region:** Stakeholders cited that there has historically been political disagreement and a lack of collaboration in the Humber region from a planning and marketing perspective. Further, it was noted that as a result of Government's decision to streamline 'Overlaps' in local authority areas (where an area is covered by more than one Local Enterprise Partnership), the Humber LEP was replaced in 2021 by the Hull and East Yorkshire LEP and the Greater Lincolnshire LEP, both parties of which cover key land areas within the Humber Industrial Cluster.

2.4 Current Strategies:

There are various avenues being considered by stakeholders to improve awareness and transparency of opportunities available and promote collaboration.

Forward planning of demand by Industrial companies:

- It was clear that there is some forward planning of demand being done by industrial companies to prepare for projects, however this is at an early stage and minimal tangible work on actual training of staff (such as launching large-scale apprenticeship programmes) is being done in the industrial decarbonisation space, particularly for CCS and hydrogen production. Work in this space is prioritised by industrial companies prior to launching procurement / training strategies.

4. Engineering construction opportunities in the Humber

(Continued) **Market inefficiency 2: Imperfect information (lack of awareness and short-sighted behaviour)**

(Continued) **2.4 Current Strategies:**

Engagement with education and training providers:

- Employers are engaging with schools and training providers through visits and open days in order to share opportunities and courses available for students and adults. This has been working better for some sectors than others, for example - more established Net Zero sectors such as offshore wind have been collaborating closely with colleges and training providers to develop bespoke courses for existing and new employees.
- There is significant room for more work to be done in the collaboration space, and Institutes of Technologies (collaborations between further education (FE) providers, universities and employers) are being used as a tool to support collaborations between training providers and employers, and encourage innovative ideas to solve issues – such as creating more competitive packages for ‘shared trainers’ (see recommendation 12) or allowing trainers to be seconded from industry to schools and colleges.

Careers Hubs

- Careers Hubs (funded by DfE) have been established by the Hull and East Yorkshire and the Greater Lincolnshire LEPs. Careers Hubs offer support to schools and colleges in implementing ‘world-class’ standards of careers guidance and developing strategic careers plans. Through this, schools and colleges are partnered with Enterprise Advisers (senior volunteers from business) who help to develop relationships with local businesses. The Careers Hub can also help raise awareness of businesses and labour market information with education providers, provide high quality resources to improve careers provision, and support careers leaders.
- For example, the Hull and East Yorkshire Careers Hub is currently engaged with 36 schools and colleges with over 40 Enterprise Advisers, representing a range of sectors volunteering to support these schools and colleges.

Establishment of working groups to improve awareness

- The HEPLP has an apprenticeship and technical education working group to generate ideas and actions on how to address issues. They HEY LEP also have a workforce development business advisor who actively engages with local businesses to support the use of the levy and levy transfer.

Awareness and utilisation of funding and support schemes available:

- There are various government support schemes available to companies and education/training providers. These schemes are generally well-known by larger industrial companies and colleges / training providers, however some stakeholders have been more able to utilise these than others, with SMEs and smaller companies often missing out due to the lack of capacity to understand these schemes and take on the administrative burden of applying and monitoring compliance against scheme rules. The table on the following page summarises various support schemes available to companies, colleges and training providers.

4. Engineering construction opportunities in the Humber

(Continued) Market inefficiency 2: Imperfect information (lack of awareness and short-sighted behaviour)

(Continued) 2.4 Current Strategies:

Type	Detail	Observations
Traditional Apprenticeship	<p>Framework: Standard apprenticeships that last between 1-5 years with the same employer. Levy-paying companies are able to draw down on funding to create and finance apprenticeship roles.</p> <p>Non-levy paying firms: Funding is also available to SMEs and smaller companies, who are not paying the levy, those companies can pay 5% of the cost and the Government will cover the remaining 95%.</p> <p>Eligibility requirements: Open to anyone over the age of 16, not enrolled in full-time education.</p> <p>Administrative work required: There are administrative tasks that companies must comply with when hiring a new apprentice. Often it takes up a significant amount of time (6-8 weeks) to employ a new apprentice.</p>	<p>Helped to create large volume of apprenticeships, utilised mainly by larger companies with dedicated resource to manage admin.</p> <p>The administrative burden is high on SMEs.</p> <p>There is a lack of awareness, mainly among SMEs.</p> <p>The framework is not flexible, apprentices have to commit long term to a company, which often constrains their ability to work on other, short term jobs which are common in the industry.</p>
Flexi-Apprenticeship	<p>Framework: An agency employs the apprentice directly for the duration of their apprenticeship but arranges placements for the apprentice with host businesses.</p> <p>Timeframe: The flexi-apprenticeship has a minimum length of 1 year.</p>	<p>It provides more flexibility than traditional apprenticeships.</p> <p>The engineering sectors' short term contracts and projects can be challenging and may not be compatible with traditional apprenticeships and this scheme provides an alternative.</p> <p>Contractors however are not incentivised to commit to apprenticeships without sufficient work streams.</p>
Portable-Flexi Apprenticeship	<p>Framework: The apprentice is able to secure multiple short employment contracts directly with businesses that support the requirements of the apprenticeship.</p> <p>Timeframe: Supported by their training provider, the apprentice takes their learning and progress with them as they move between employment contracts. A minimum 3 months of employment is required per apprenticeship at a firm.</p>	<p>This scheme is early in development and only those who had participated in the pilot testing phase may make use of the regulatory changes which allow the 3-month minimum contracts.</p> <p>Offers the most flexibility and has substantial potential to ensure the necessary skilled labour enters and gets employed in the engineering construction sector.</p>
Skills Bootcamps	<p>Framework: Bootcamps provide an intensive training up to 16 weeks in the selected discipline and upon the completion of the course there is a guaranteed interview with a local employer.</p> <p>Funding: If a firm uses Skills Bootcamps to train existing employees it may be able to access funding for up to 90% of the training costs.</p>	<p>Whilst this is a useful concept, training providers are limited by their existing capacity (staff and facilities) and the support provided for bootcamps does not help with this.</p>

4. Engineering construction opportunities in the Humber

(Continued) **Market inefficiency 2: Imperfect information (lack of awareness and short-sighted behaviour)**

(Continued) **2.4 Current Strategies:**

Type	Detail	Observations
Strategic Development Fund	<p>Framework</p> <ul style="list-style-type: none"> - The SDF is an innovative approach to improve collaboration in the region between colleges and training institutions to achieve economies of scale, share resources and allow for new ideas and approaches. <p>Funding</p> <ul style="list-style-type: none"> - The Hull and East Yorkshire region has an approved funding of £2,719,168. with a sectoral focus on Agri-Tech, Carbon Capture, Electric and Hybrid Vehicles, Engineering and Advanced Manufacturing and Green Energy. 	<ul style="list-style-type: none"> - Colleges and training providers have been utilising Government support from the Strategic Development Fund to develop Net Zero capital projects, such as for EV ChargePoint training facilities, and also for CCS and hydrogen however this is very early in the process with minimal engagement and investment from industry.
UK Shared Prosperity Fund (UKSPF)	<p>Framework</p> <ul style="list-style-type: none"> - As the UK Government's domestic replacement for the European Structural and Investment Programme, the UKSPF (launched 13 April 2022) provided £2.6 billion of new funding for local investment by March 2025 <p>Funding</p> <ul style="list-style-type: none"> - All areas in the UK receive allocation via a funding formula as opposed to a competition <p>Skills provision</p> <ul style="list-style-type: none"> - The UKSPF is intended to support the UK's commitment to its level up objectives including the following objectives: <ol style="list-style-type: none"> 1. Boost productivity, pay, jobs and living standards by growing the private sector, especially in those places where they are lagging 2. Spread opportunities and improve public services, especially in those places where they are weakest 3. Restore a sense of community, local pride and belonging, especially in those places where they have been lost 4. Empower local leaders and communities, especially in those places lacking local agency 	<ul style="list-style-type: none"> - Each 'place' given allocation of the fund will be asked to set out measurable outcomes that reflect local needs and opportunities, informing the interventions they wish to deliver. These interventions will be set out in an investment plan submitted to the UK government for approval.

4. Engineering construction opportunities in the Humber

Market inefficiency 3: Misalignment between training and evolving industry needs

4.1 Description: This market inefficiency occurs where training providers and universities may not be turning out adequately skilled graduates such that a significant level of further training is required before they meet the needs of employers. This market inefficiency is exacerbated further where an employer's skill requirements are fast-evolving over time as firms adopt new production processes, meet new regulatory requirements, or respond to changing consumer demand.

4.2 Drivers:

- a. High cost of training facilities:** There are financial constraints with developing industrial training facilities at a large enough scale to meet the volume of demand. The industrial sector is one which requires handling of large and expensive equipment / machinery, which needs to be considered when developing tailored and practical training programmes which rely on the development of similar-scale plants and equipment for trainees. Colleges and training institutions do not typically have sufficient public funding to develop facilities at a large enough scale. Further, inward investment from industrial firms is difficult to attain due to competition and a low guarantee of return.
- b. Changing industry requirements:** Whilst the core skillsets for industrial decarbonisation are largely similar to existing industry skills, there is the requirement to train workers on handling specialist Net Zero equipment for CCS and hydrogen production, transport and storage. For example, traditional steel gas pipes are not fit for transporting hydrogen due to the penetrative properties of the gas. These changes are often rapidly evolving which requires significant continuous investment – often leaving colleges and training institutions lagging behind industry, and requiring long periods of time to adapt due to the lengthy and administrative process of funding.
- c. Awareness in schools:** Whilst this is not a driver of misalignment from a curriculum perspective, a lack of student awareness in schools on the direct / most efficient routes to industry creates a larger pool of students who opt for more general degrees that are not tailored to current industry needs. Direct routes to industry (apprenticeships and tailored courses) may also be overlooked by students due to the perception that employment prospects are inferior when compared with academic or general professional university degrees.
- d. Limited industry engagement with colleges/training providers:** Whilst there is engagement between industry and colleges/training providers, this is often on a short-term or ad hoc basis lacking a long term vision and continuous collaboration which required to launch bespoke industry-relevant programmes.

4. Engineering construction opportunities in the Humber

(Continued) Market inefficiency 3: Misalignment between existing training and evolving industry needs

4.3 Evidence:

- **High cost of training facilities:** 6 out of 6 training providers and colleges engaged with emphasised the relatively high cost of purchasing industry-relevant equipment for training. It was noted that for the industrial sector, having up-to-date equipment specification is key for training but difficult to finance.
- **Changing industry requirements:** It was noted through discussion with training providers and colleges, and confirmed through engaging with various industrial companies and engineering contractors, that there will be a change in product specifications and specialist skills required as the industrial cluster transitions towards Net Zero technologies. It was noted through discussion with colleges and training providers that various employers have sought upskilling courses for their employees such as through continued professional development courses.
- **Awareness in schools:** 1 school and 4 colleges engaged with shared that students are not fully aware of the opportunities and prospects available around pursuing direct routes to industry through apprenticeships and specialised degrees.
- **Limited industry engagement with colleges/training providers for some industrial sectors:** 2 colleges engaged with shared examples of where industry partnerships with offshore wind providers have worked well to support the development of bespoke industry-relevant courses. These colleges noted that more of such engagement is needed for other industrial sectors such as CCS and Hydrogen.

4. Current strategies:

Industry engagement with schools/colleges/training providers:

- Industry has been in engagement with schools / colleges through one-off or annual visits to promote apprenticeship or similar opportunities. These are usually open days where students have the opportunity to speak with employers to find out the opportunities available.
- There are apprenticeships / technical programmes supported by additional funding from industry that colleges and training providers are offering, and these aid different purposes such as upskilling of existing employees. These courses are usually developed by institutions in partnership with industrial companies for a specific need / demand. However these are less extensive for the Net Zero industrial sector compared to other specialist sectors (such as pharmaceuticals and electric transport).

4. Engineering construction opportunities in the Humber

(Continued) Market inefficiency 3: Misalignment between existing training and evolving industry needs

(Continued) 4. Current strategies:

Strategies of colleges:

- Colleges are looking more into alternative routes to industry such as specialist apprenticeship programmes, with some institutions who previously (~10 years ago) had relatively low uptake of apprenticeships now offering them to their high-scoring students.
- We noted that whilst further education providers have intensified strategies to increase the uptake of apprenticeships and similar courses, the vast majority of graduates from these courses are going into university to study non-technical degrees – which is the case even when students are graduating from technical courses such as an engineering vocational course.

Strategies of employers to fund further education of apprentices

- It was noted from discussions with a training body that some companies are employing students on apprenticeships (often students who have graduated from technical courses) and offering them day release to accommodate higher education up to a degree or further. This is often funded by the company or if possible by a degree apprenticeship.

Collaborations between training bodies and universities

- An example of a recent strategy involving collaborations with universities is the Energy Transition Leadership Programme developed by the ECITB in association with the University of Strathclyde. This is a modular university course aimed at engineers and managers which introduces learners to innovative technologies, organizational strategies and business models.

Careers Hub and LEP strategies

- Careers Hubs established by the Hull and East Yorkshire and the Greater Lincolnshire LEPs offer support to colleges in developing strategic careers plans. Enterprise Advisers (senior volunteers from business) help develop relationships with local businesses and help raise awareness of evolving businesses and labour market information.

Provider Access Legislation

- Updated Provider Access Legislation has been enacted in Jan 2023. It now specifies the requirement for schools to provide at least six encounters with approved providers of apprenticeship and technical education for all their students. This new legislation is aimed to further help learners understand and take up apprenticeships but also wider education options such as T-Levels and Higher Technical Qualifications.

4. Engineering construction opportunities in the Humber

Market inefficiency 4: Lack of incentives for training (self-employed / temporary workforce)

4.1 Description: In a system where companies rely on short term and temporary contracting solutions, skilled workers (whether self-employed or recruited from overseas) are not incentivised to train the upcoming workforce as they benefit from competitive freelance packages. As such, companies are not able to lock down on enough skilled workers to facilitate structured training programmes for their future workforce.

4.2 Drivers:

- a. Competition for the same resources and self-employed workforce:** Given the high demand for industrial workers, companies are competing for resources and offering premium temporary contracts to meet peak demand. This helps create a freelance pool of workers who move between companies and projects based on where there is a high demand for work and more competitive packages. Asking these freelancers to train staff in addition to their core responsibilities may be seen by employers as reducing the attractiveness of vacancies.
- b. Project-based peak demands:** Industrial development, and in particular ECI work, is a typically project-based process where different skills are required at different stages of a project. As such, skilled workers are employed on contract terms during peak demand where work is intense, allowing less time / capacity for training inexperienced workers.
- c. Lack of direction from employers to EPC contractors:** Industrial energy operators and project sponsors are relying on EPC contractors to deliver capital works for industrial Net Zero projects planned. Without clear direction on UK content and financial support from emitters and Net Zero infrastructure developers to their EPC contractors (including costs of UK content investment into provisions), there is limited scope for investment in training / upskilling of local workers and in turn overseas resources are preferred where possible.

4. Engineering construction opportunities in the Humber

(Continued) **Market inefficiency 4: Lack of incentives for training (self-employed / temp workforce)**

4.3 Evidence:

- **Competition for the same resources and self-employed workforce:** Through engaging with multiple industrial employers, recruitment specialists and industry bodies, it was clear that there is a large self-employed workforce that benefit from short term and temporary contracting work whose number is hard to estimate. This was also seen through the existence of various professional networking groups (such as on LinkedIn) and industry associations for job types such as welding, fabrication and engineering.
- **Project-based peak demands:** Various industrial stakeholders engaged with have expressed challenges with long term planning of projects due to demand uncertainty, and as a result, contract-based resources are needed on short notice-periods during peak demand.
- **Lack of direction from employers to EPC contractors:** Stakeholders engaged with, including recruitment specialists, had emphasised a clear movement in employees from permanent contracts with operators to contracting with EPCs. It was noted that operators are not yet providing concrete guidance around training / local content requirements, and as a result, EPCs are only doing this to a limited extent due to perceived competitive disadvantages that come with this.

4. Current strategies:

Through engagement with 20 industrial companies and contractors, it was noted that, until recently, there has been a significantly low volume of training for jobs pertaining to industrial development, and that where training / apprenticeship programmes have been launched, these have largely been for operations and maintenance jobs. However, stakeholders had informed us that there has been a recent shift in strategy with more industrial companies and contractors launching training programmes and anticipating the long term returns on investment that this will generate. In terms of specific strategies and solutions that companies are adopting to address the lack of incentives for training, we note the following:

Forward planning of demand:

- Forward planning of demand allows industrial companies and larger contractors to understand where it is profitable to invest in a permanent workforce which has the capacity to train new entrants. A number of stakeholders have mentioned that their current strategy is to better understand demand prior to investing in training and adopting strategies to ensure knowledge is transferred to the new and upcoming workforce.

4. Engineering construction opportunities in the Humber

(Continued) **Market inefficiency 4: Lack of incentives for training (self-employed / temp workforce)**

(Continued) **4. Current strategies:**

Including training requirements in job specifications for temporary workers and foreign workers:

- Requiring contractors to train / share skills with inexperienced workers is a common recruitment strategy adopted globally by countries investing in local content skills growth. In effect, self-employed workers or overseas workers must agree to contracts where they are given additional responsibilities to train / transfer knowledge to other workers. Whilst no evidence was found to suggest this is being done commonly to support the UK industrial market, recruitment providers outlined that this is slowly starting to be adopted by industrial companies, and especially EPCs who deliver many industrial projects in the Humber.

4. Engineering construction opportunities in the Humber

Market inefficiency 5: Workforce mobility (including geographical constraints and migration)

5.1 Description: Movement of workers between companies within the industrial sector, and between similar sectors (such as Nuclear and Oil and Gas), is a very common occurrence. Companies who have invested in training / upskilling of employees have found that these resources are often poached by larger firms or firms with more competitive packages / contracting opportunities. Further, the Humber region is one which has largely relied on local communities for permanent workers. This, coupled with the temporary / contract-based nature of ECI work, disincentivises companies from investing in skills growth and encourages the use of non-UK resource on a temporary contract basis – a loss for UK content.

5.2 Drivers:

- a. Competing sectors:** There is a significant overlap of net-zero industrial skills with traditional industrial skills. This is often with sectors such as the Oil & Gas sector and the Nuclear sector that have a greater financial pull to retain employees. This creates a risk of industrial workers moving to other sectors, and reduces opportunities for the Net Zero industrial sector to benefit from transition of skills from traditional industrial sectors.
- b. Short term / temporary contracting:** There is a huge demand and shortage of supply of industrial skills in the UK. The engineering construction industry is one where there is a general reliance on short term and temporary contracting for industrial projects to meet peak periods of demand, and as a result companies are competing for the same resources that are available. There is also a larger pool of self-employed workers who work on a temporary contract basis, moving from company to company based on where suitable opportunities become available.
- c. Project uncertainty – lack of investment into permanent workforce:** Industrial companies rely on certainty signals from Government (such as announcements on support schemes) prior to finalising investment decisions. Further, a lack of end-use certainty in the Net Zero sector (particularly for hydrogen), leads to delays in investment. This increases the risk of early investment in permanent resources to meet the anticipated surge in demand on Net Zero projects.
- d. Geographical limitations:** The Humber region has largely been reliant on local communities for its permanent workers, and as such there are geographical constraints to be addressed prior to attracting new workers to the region. For example, public transport limitations such as unreliable trainlines may cause issues in the future. Further, in terms of attracting overseas workers where needed and where appropriate, the IR35 legislation reversal will make resourcing particularly difficult for companies.

4. Engineering construction opportunities in the Humber

(Continued) Market inefficiency 5: Workforce mobility (including geographical constraints and migration)

5.3 Evidence from stakeholders:

- a. **Competing sectors:** Multiple industrial companies and contractors engaged with expressed challenges around retaining a permanent workforce linked to competing sectors with similar skills demand. Stakeholders mentioned that the training of a skilled engineer takes a substantial amount of time, which is the reason that companies opt to poach workers at times of high demand and investment from each other rather than investing in the necessary training and upskilling.
- b. **Short term / temporary contracting:** Industrial companies and contractors engaged with all expressed that they are finding it difficult to retain a permanent workforce and therefore rely on short term contractors (often non-UK). Further, it was noted from various stakeholders that a large proportion of workers in the Humber region are aged above 50 and are acculturated to this way of working.
- c. **Project uncertainty – lack of investment into permanent workforce:** All CCS stakeholders engaged with (for interviews held prior to the Government's announcement of the Cluster Sequencing Plan in August 2022) emphasised that this decision is decisive in determining investment into resource planning and implementing strategies. Hydrogen stakeholders engaged with noted that a lack of end-use certainty for the fuel is leading to delays in investment. This increases the risks associated with early investment into resourcing strategies that involve creating a permanent workforce, delaying progress in this area.
- d. **Geographical limitations:** Various stakeholders cited possible geographical challenges around transport into the region. Further, it was noted through discussions with stakeholders that due to relatively affordable prices for rent, property developers are less incentivised to see the Humber region as a good opportunity for investment.

5.4 Current strategies:

Due to the complex nature of workforce mobility issues, and the inherent limitations associated with this, there was minimal actions noted from stakeholders that are being done to address some of the underlying drivers behind this market inefficiency. Some work was noted however around strategies to develop a more permanent workforce (and rely less on temporary workers).

A number of industrial companies and contractors informed us of existing and planned strategies to post more graduate level and apprenticeship opportunities, conceding anticipated difficulties with relying on existing or overseas contracting (due to IR35 legislation reversal and anticipated UK local content recommendations that are expected to pressure more companies into investing in local strategies).

4. Engineering construction opportunities in the Humber

Market inefficiency 6: Disproportionate market power of larger firms

6.1 Description: The engineering construction sector for large scale industrial developments is dominated by larger firms and EPCs. As a result, local and smaller companies have minimal visibility over the supply chain and resource demands and are therefore disincentivised to invest in growth and preparation. Large firms typically (due to challenges they themselves face) provide short notice periods to smaller contractors when work is required.

6.2 Drivers:

- a. **Limited capacity of larger firms:** Larger emitters, infrastructure developers and project sponsors have limited capacity to launch streamlined procurement strategies for project-based work, and as a result are acculturated to relying on EPC contractors.
- b. **Competition - contracting:** Larger EPC contractors are in competition to win projects and therefore there is minimal incentive to collaborate and invest in forward planning to ensure subcontractors receive adequate lead times to prepare and invest in growth.
- c. **Lack of engagement from project sponsors:** Project sponsors are competing for the same resources and those larger firms with larger financial power can afford to pay premiums to contractors in order to undertake all FEED studies, design work and construction work. This 'distanced' approach from project sponsors creates barriers to increased UK content and fairer procurement strategies, as the larger EPC contractors are not given direction or funding required by the project sponsors.

6.3 Evidence from stakeholders:

- a. **Limited capacity of larger firms:** Some larger firms stated that they are looking to implement more streamlined procurement approaches, but their existing procurement strategies suggest that they are employing the larger or 'popular' contractors on an EPC / turnkey basis.
- b. **Competition - contracting:** All smaller / local contractors engaged with emphasised that they are awarded work on short lead-times and are therefore unable to invest in preparation and growth.
- c. **Lack of engagement from project sponsors:** EPC contractors engaged with emphasised the need for direction (and funding) from project sponsors / operators in order to accelerate UK content strategies and involve local contractors more proactively.

Current strategies are not listed for this market inefficiency as none were noted in our conversations other than the abovementioned plans by some project sponsors to launch more streamlined procurement strategies.

05

Recommendations

5. Recommendations

Overview

The previous section of this report identifies the key market inefficiencies in skills provision prevalent in the Humber region, describing the drivers for each in detail and outlining evidence of their prevalence from stakeholder engagement.

This section focuses on solutions to addresses these failures, combining insights that are drawn from the stakeholder engagement and literature review element of work performed. Recommendations presented in this section are in line with and in addition to what some stakeholders have mentioned are part of their current and future strategies (listed in Section 4).

Table 4: Recommendations to address issues and blockers

Recommendation	Detail / Rationale	Actions to implement
<p><i>R1: Expand utilisation of ‘learn on the job’ schemes</i></p>	<p>A scheme where industrial workers undertake task-based activities with direct supervision whilst learning on the job will act as a means to accelerate upskilling.</p>	<p><u>ECITB</u>: The ECITB has a leadership role to play in setting the standards and developing programmes and routes to obtaining recognised accreditation for these workers.</p> <p><u>Emitters and contractors</u>: Companies in the region should develop ‘learn on the job’ schemes. This is best achieved through investing in experienced workers (many of whom are self-employed / temporary contractors) who are willing to support the maintenance of such schemes. Companies should engage with the ECITB to ensure a route to appropriate qualifications.</p> <p><u>Colleges and training providers</u>: These should consider collaborative efforts to deliver any academic training / add-ons where required for trainees to obtain qualifications.</p>

5. Recommendations

Recommendation	Detail / Rationale	Actions to implement
<p>R2: Secondment from industry to support training provision</p>	<p>This would provide a willing group of suitably qualified trades/ professional individuals that would supplement the colleges and training centres to ensure the tutors and pupils have access to current and live industrial sites.</p>	<p><u>Colleges/training providers:</u> Include the prospect of this approach in multilateral discussions with other training providers and industry bodies / government to generate interest.</p> <p><u>National government:</u> Consider the development of funding schemes to incentivise and support employers willing to help facilitate this.</p> <p><u>Industrial companies / contractors:</u> Companies should consider facilitating secondment opportunities to their employees to support training.</p>
<p>R3: Increase support for SME access to skills: Support SMEs to understand the skill provision funding available and manage the associated administrative burden. Where possible, flex existing policy to make support more available to SMEs in the engineering construction sector.</p>	<p>Unlike larger companies, SMEs do not have the dedicated resource or know-how required to manage the administrative burden required to set up new entrant schemes including apprenticeships. This is especially relevant given the Humber region is one with a large proportion of SMEs. Work should include Continued Professional Development sessions for employability professionals – developing the knowledge and expertise of people giving careers advice.</p>	<p><u>LSIPs:</u> In designing the Local Skills Improvement Plan, Employer Representative Bodies should ensure there is dedicated resource to 1. facilitate collaboration between SMEs and training providers, and 2. support SMEs to access and manage the associated administrative burden of new entrant schemes.</p> <p><u>LEPs:</u> Continue and increase support for SMEs through existing initiatives such as the HEY LEP Growth Hub and Workforce Development Business Advisor dedicated role.</p> <p><u>National government:</u></p> <ol style="list-style-type: none"> As part of existing efforts to engage with industry, ensure SME feedback is proactively considered. Where possible, adapt existing legislation to reduce administrative burden on SMEs. <p><u>All stakeholders:</u> Relevant stakeholders such as LEPs, LSIP partners, colleges and industrial stakeholders should collaborate to engage with SMEs through communication channels such as bespoke webpages in order to to direct them to where support is available.</p>

5. Recommendations

Recommendation	Detail / Rationale	Actions to implement
<p>R4: Government to continue to recognise the importance of key sectors for Net Zero: <i>Government initiatives, such as the establishment of the Green Jobs Delivery Group, must consider the importance of Engineering Construction sector for Net Zero development.</i></p>	<p>The green industrial revolution is a major part of the Government’s plan for growing the economy, and is expected to unlock up to £100 billion of private investment by 2030. Further, Government has published that the Green Jobs Delivery Group will support the delivery of up to 480,000 green jobs.</p> <p>The importance of key industrial sectors such as engineering construction must be considered as part of these plans in addition to more ‘mainstream’ green jobs such as; renewables, EV installation, and domestic insulation.</p>	<p><u>National Government (DfE):</u></p> <ol style="list-style-type: none"> Feature engineering construction as a key agenda item as part of the Green Jobs Delivery Group, considering industry feedback from industry on the relative importance and needs. Assign specific targets for supporting job creation for key sectors <p><u>Local authorities, LEPs, LSIPs, Industry bodies:</u> Ensure the engineering construction sector is featured in growth plans and marketed to national Government where appropriate.</p>
<p>R5: Capital investment into engineering construction capacity in the region</p>	<p>There is significant value with the prospect of developing large scale training facilities that have the capacity to help meet the Humber’s demand for skills, and also to act as an anchor for developing UK content and expertise in the CCS and hydrogen sectors. If such a facility is developed, it will act as a ‘centre of excellence’ to significantly boost UK capability in the Net Zero industrial development space.</p>	<p><u>Training providers:</u> Develop strategies to expand and build large scale training facilities. Seek capital investment and launch marketing campaigns where possible to drive momentum.</p> <p><u>Industrial investors:</u> Seek opportunities to invest where possible, and support training providers with provision of industry-relevant training equipment/facilities.</p> <p><u>National Government:</u> Extend capital support schemes to consider industrial training projects.</p>

5. Recommendations

Recommendation	Detail/Rationale	Actions to implement
<p>R6: Enhance attractiveness of industrial training roles: <i>In parallel with improving the trainer packages available, work can be done to better sell the wider benefits of working in education and training – such as by advertising the favourable benefits and work-life balance that comes with such roles. These careers need to be advertised directly to those skilled workers in industry.</i></p>	<p>Our stakeholder engagement work has identified that the larger proportion of trainers fall under the demographic of older workers, often close to retirement, who wish to ‘give back’. A clear lack of appetite to train by younger and middle aged workers in industry exists in engineering construction.</p> <p>Whilst this is partly due to financial uncompetitive salaries, there is scope to attract workers into education and training by selling wider benefits.</p>	<p><u>Colleges and training providers:</u></p> <ol style="list-style-type: none"> To increase the level of marketing for trainer roles and to emphasise wider benefits associated with careers in training (such as benefits and work-life benefits). To share ideas on what is / isn’t working during any collaborative meetings. For example, ‘marketing for trainers’ should be added as a regular agenda item in the post 16 partnership group (group established by the 16 education and training providers in the region) the Humber Principles Group. To establish joint agreements with employers who use college/training resources so that they support by advertising the benefits of careers in education to their internal workforce, and the different opportunities available (such as secondments). <p><u>LEPs, Local authorities, LSIPs and IoTs:</u></p> <ol style="list-style-type: none"> Continue existing work (such as through the LEP Careers Hubs) to support schools and training providers access employers where possible, so that they are able to reach out to a wider audience when advertising training careers. Create incentives for employers / contractors in the region to launch awareness programmes where they advertise training careers – highlighting the net benefit this creates for the sector. <p><u>Industrial employers in the region including agencies:</u> To engage with training providers and support by advertising the benefits of careers in education to their internal workforce and providing them with the flexibility to combine their day job with training roles.</p> <p><i>Note: given the engineering construction sector is highly demand-driven and adaptive to movement of employees depending on project cycles – there is likely to be less employee ‘protectiveness’ and willingness to engage.</i></p>

5. Recommendations

Recommendation	Detail / Rationale	Actions to implement
<p><i>R7: Improve awareness of industrial and Net Zero careers in schools and universities through pushing the Net Zero agenda and demonstrating the career progression of such jobs.</i></p>	<p>As determined through engaging with training providers, colleges, emitter companies, engineering contractors and industry training bodies, a low appetite for industrial career paths is being seen in schools and universities. This is partly caused by a drive away from the Oil & Gas industry and a lack of understanding of the Net Zero agenda in modern industrial career paths. Further, the opportunities to progress as an industrial skilled worker (both apprentices and graduates) is not well-known.</p>	<p><u>Local authorities, LEPs:</u> Local authorities and LEPs (through the LEP Careers Hubs) can offer support for companies in the region looking to engage with schools and facilitate engagement days where apprenticeships and school leaver programmes are advertised to students.</p> <p><u>Schools:</u> Schools should proactively engage with students and support students who are interested in green jobs by creating awareness of Net Zero industrial career paths. Where schools have knowledge gaps on the available apprenticeship careers, schools should take steps to fill these gaps for their students by appointing more careers leaders, liaison officers and ‘teacher champions’ to inspire students with technical aptitude.</p> <p><u>Emitters and contractors in the region:</u> To create apprenticeship and graduate programmes, and engage proactively with schools and universities to share these opportunities and demonstrate the Net Zero benefits of such careers and the success stories of those who followed the same path.</p> <p><u>National government:</u> To encourage schools and universities to advertise the Net Zero agenda in the emerging industrial sector.</p> <p><u>Industry bodies:</u> Professional sector representatives such as the ECITB should build on existing work to develop training pathways and communicate these within school environments. Bring learnings from other sectors (e.g. Oil and Gas) on running effective apprenticeship engagement programmes to drive up entrant levels.</p>

5. Recommendations

Recommendation	Detail / Rationale	Actions to implement
<p>R8: Develop detailed occupational map to quantify the skills availability for Net Zero projects in the Humber and the UK: <i>A study (ideally collaborative and centrally managed) is required to understand the labour market and outline an occupational map and skills database.</i></p>	<p>Whilst some estimates of the skills demand in the Humber cluster have been made, there is no clear understanding of the supply capacity for Net Zero projects. Further, there lacks a Standard Occupational Code for key sectors such as the ECI sector.</p> <p>The development of a database / occupational map of skills / labour availability will help identify specific Net Zero skills needs and drive early collaborations to address these through supply – demand mapping exercises.</p>	<p>It was noted that separate initiatives by different stakeholders have been launched to better understand the existing skills capacity in the UK and the Humber (stakeholders include AMRC, University of Chester, IDRIC, ECITB, CCSA and some industrial partners / contractors). As such, the following is recommended to all relevant stakeholders:</p> <p><u>All relevant stakeholders:</u></p> <ol style="list-style-type: none"> Collaborate and ensure knowledge / findings of any studies are shared between different parties. Consider appointment of a central body to manage a virtual skills database and occupational map across the UK or in the Humber. Ideally this will focus on industrial skills needed to deliver Net Zero projects.
<p>R9: Forward plan demand and promote certainty: <i>Government and industry should help develop clearer roadmaps and promote certainty of end-use a resource demand to de-risk investment into skills growth.</i></p>	<p>Until the phase-2 results of the CCS Cluster Sequencing Process, a lack of certainty around whether CCS projects will go ahead had slowed down project timelines and investment decisions.</p> <p>As with CO₂, hydrogen end-use demand currently remains an uncertainty and barrier to investment into growth.</p>	<p><u>National government:</u></p> <ol style="list-style-type: none"> Continue engagement with industry and establish clearer signalling on end-use demand for CCS and hydrogen. Provide more regular updates to business models and incorporate feedback from industry where possible. <p><u>Industrial emitters and contractors:</u> As early as possible, communicate the anticipated need for skills to contractors, colleges and training providers so that they are preparing for future needs.</p>

5. Recommendations

Recommendation	Detail / Rationale	Actions to implement
<p><i>R10: Review of apprenticeship levy to identify barriers:</i> <i>Stakeholders and government should collaborate to review how the apprenticeship levy is being utilised by the industrial sector and how this can be improved.</i></p>	<p>Funding from the apprenticeship levy has proven useful when used, however it is not being utilised to the extent required. Our stakeholder engagement identified that this is largely due to the administrative burden required on a ‘per-trainee’ basis – which disincentivises long-term capital growth.</p>	<p><u>National government:</u></p> <ol style="list-style-type: none"> a. A review of how the apprenticeship levy is being used will help to identify how the system can be improved to increase the number of apprenticeships in the industrial sector. b. Consider the Humber region as part of plans, such as investment zones and enterprise zones, to introduce regulatory innovations and flexibilities (e.g. tax-breaks and easing of planning).
<p><i>R11: Increase investment into efficient manufacturing processing, equipment and machinery</i></p>	<p>It was noted through discussions with stakeholders around construction facilities (including visiting a modular construction fabrication facility in the Humber) that the current portfolio of equipment and machinery being used is relatively old and lagging behind modern advancements in technology, the adoption of which would allow for reduced labour demand and more efficient processing.</p>	<p><u>Industrial stakeholders:</u> Companies should consider capital investment into more efficient manufacturing processes to reduce the demand for skilled labourers.</p> <p><u>National government:</u> Government should consider extending support for energy efficiency schemes to support the industrial sector and market such opportunities to stakeholders.</p>

5. Recommendations

Recommendation	Detail / Rationale	Actions to implement
<p>R12: ‘Smart-trainer’ schemes: Colleges, training providers and universities can collaborate with industry bodies and Institutes of Technology to develop schemes where trainers are shared across providers and given more competitive salaries.</p>	<p>Training providers and colleges are not able to provide competitive salaries trainers that compare with industry rates which disincentivises prospects for potential trainers. This is due to funding limitations as well as pay bands that cannot be adapted due to parity of pay issues. A scheme where stakeholders collaborate to co-fund ‘smart-trainers’ would help address limitations.</p>	<p><u>Training providers and colleges:</u> Collaborate with industry and other relevant bodies, such as Institutes of Technology and universities, to design and develop smart-trainer schemes. Such a scheme can be managed by a central body where trainers are shared across training providers and offered competitive salaries.</p> <p><u>Institutes of Technology:</u> Consider employment of smart-trainers in collaboration with training providers and industry – acting as (or assigning) a central body to manage logistics and offer competitive packages to skilled labourers who would otherwise be incentivised to be in industry.</p> <p><u>Universities:</u> Consider utilising the flexibility of the university staff model to support the development of such a scheme - acting as an anchor to enable sharing of staff and flexible timetables.</p> <p><u>Industry (Project sponsors and EPC contractors):</u> Consider sponsoring the development of such schemes and advertising smart-trainer roles to existing staff.</p>

Further work

We note that the scope of work presented in this report is limited by the two phases of work conducted (analysis of demand for skills and assessment of market inefficiencies) as well as by the cohorts of stakeholders engaged with. There remains significant scope for future streams of work that would significantly support the skills transition in the Humber Industrial Cluster including the following:

- **Deep-dive into specific skills requirements for Net Zero projects**– A deeper dive will be possible once FEED studies for projects are completed, and will allow for a more accurate assessment of skills required throughout the cluster.
- **Ongoing monitoring of skills shortages as the cluster develops** – This will be key in ensuring efficient investment and targeted support as well as preventing major bottlenecks in skills provision as projects commence. This must be an ongoing stream of work managed by a central / nominated body in the cluster.
- **Engagement with recruitment agencies and individuals acting in the role of recruitment agencies** – Such engagement will be key in order to develop a comprehensive understanding of employee flow and balance of incentives.
- **Further work with secondary education providers** – Engagement in this report was limited to 1 school and 4 colleges; a more comprehensive view of secondary education needs is required.

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Appendix 1 - Literature review

Appendix 1- Literature Review

Document	Author	Summary
Green Jobs and Skills Analysis report	HEY LEP	The HEY LEP commissioned Energy & Utility Skills to produce an analysis of the “green” jobs and skills requirements likely to emerge across the HEY LEP region and the surrounding area over the coming years.
Humber Energy Board Skills Paper	CATCH, HEY LEP	The report provides an overview of local intelligence on energy relates skills issues in the Humber, with recommendations to provide the Humber Energy Board with a starting point for progress.
ECITB Workforce Census 2021	ECITB	A Workforce Census report of ECITB’s in-scope companies to collect and analyse the number and location of people in the Engineering Construction Industry and supporting roles.
Capturing carbon at Drax-delivering jobs, clean growth and levelling up the Humber	Vivid Economics	This report sets out the direct and wider economic benefits of the Drax carbon capture project, along with an analysis of skills and labour required.
Green Jobs Taskforce report	BEIS	Findings and recommendations from the Green Jobs Taskforce
Enabling Skills for Industrial Decarbonisation	IDRIC	This report provides an evidence base on which local partners, training providers, businesses and investors can base decisions regarding employment and skills moving forward.
Provision of analysis of current and future skills demand and supply in North Lincolnshire	North Lincolnshire Council	The study presents an innovative proposal to reduce CO2 impact in the UK, a country rich in coal, which requires reduction of CO2 emissions from flue gases as the easiest and best performing solution.
Further education and skills inspection report	Ofsted	GC Business Growth Hub (GC BGH) in Greater Manchester commissioned Gyron LLP (Gyron) to research and prepare a report about hydrogen supply chain opportunities, with a focus on Greater Manchester businesses. The national context for hydrogen is presented first, including economic data on current UK hydrogen activities.
Supply Chains to Support a Hydrogen Economy	BEIS	This report analyses supply chain requirements for hydrogen production, transmission, distribution and storage and the manufacture of fuel cells over the period to 2050 and identifies economic development opportunities for the UK.
Further education and skills inspection report	Ofsted	A skills inspection report of further education such as apprenticeship effectiveness summarising key findings and recommendations on how to bring about improvements.
Supply Chain Excellence for CCUS	CCSA	This report describes the importance of CCUS supply chain readiness in Net Zero and sets out recommendations to maximise this impact by developing supply chain strategies to deliver long-term growth.
Supply Chains to Support a Hydrogen Economy	BEIS	This report analyses supply chain requirements for hydrogen production, transmission, distribution and storage and the manufacture of fuel cells over the period to 2050 and identifies economic development opportunities for the UK.
Optimization of CCUS supply chains in the UK: a strategic role for emissions reduction	Leonzio et al	The study presents an innovative proposal to reduce CO2 impact in the UK, a country rich in coal, which requires reduction of carbon dioxide emissions from flue gases as the easiest and best performing solution.
CCUS supply chain intervention Strategy	AMRC	This report describes the opportunity to increase UK manufactured content in the emerging carbon capture sector, creating economic growth and export potential while helping achieve the UK’s commitment to Net Zero emissions.
A Green New Deal UK And Build Back Better Report	Green Jobs For All	The reports provides UK-wide estimates for potential job creation from a programme of investment across the country.

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Appendix 2– Stakeholders engaged

Appendix 2- Stakeholders engaged

The following table lists all stakeholders engaged with (referred to on page 20) via interviews on Microsoft teams throughout the different phases of the project.

Various stakeholders were engaged through multiple interviews and ongoing discussions which allowed for more comprehensive insights to be obtained. Interview responses were anonymised and the agenda for each interview was tailored based on stakeholder relevance to the different areas of analysis.

List of stakeholders engaged	
BEIS	Orion
Department for Education	Equans
Department for International Trade	British Steel
ECITB	Uniper
Carbon Capture and Storage Association	National Grid
Green Jobs Delivery group	Phillips 66
Industrial Decarbonisation Research and Innovation Centre	SSE
Hull and East Yorkshire LEP	Drax
North Lincolnshire Council	Equinor
North East Lincolnshire Council	OLG UK
East Riding of Yorkshire Council	Worley
CATCH	Wood
Humberside Engineering Training Association	Able UK
DN Colleges Group	Shell
John Leggott College	BP
Engineering UTC	VPI Immingham
University of Chester	Pensana
Hull college	Siemens
Grimsby Institute	Harbour energy
Selby college	SSE
EIC	Bilfinger