INDUSTRIAL TO INNOVATIVE

How the north is reshaping Britain's future

AtkinsRéalis

Contents

Foreword

Once, the north birthed the world's first industrial revolution, transforming Britain domestically and on the world-stage. Now, the north must power another kind of industrial revolution - and this time, the stakes are even higher.

For too long, the heartlands of British industry and manufacturing have suffered neglect. Successive governments have struggled with obsolete industry, lost skills, and widespread unemployment. Despite notable bright spots, the broader story was one of dereliction.

At last, industrial strategy is being taken seriously once more. Geopolitical instability, rising inequality, and the growing pressure to meet Net Zero targets has concentrated minds upon revitalising British industry.

From green hydrogen to carbon capture, the north's legacy skills and infrastructure are being intelligently repurposed in a holistic effort to support transformational change - for locals and beyond. By approaching the challenges holistically, we can create more resilient, better ways of working that level up local industry while making best use of its traditional prowess.

No more isolated policies: joined-up clusters intensify key strengths, spreading opportunities and giving Britain the chance to capitalise on our renewables potential, just as we once capitalised on coal in centuries past. Transport, so often taken for granted, is regaining its place at the forefront of progress. And across the board, every development will be powered by people, pioneering usage of data and novel technologies.

In this brochure, you'll find insights from across the front-lines of this northern transformation. Freeports, nuclear power regeneration, hydrogen pathfinding: our people reveal the range of challenges and solutions that are changing the face of our future. Above all, this is a story of growth - for the region, for its people, and for businesses like Atkins that have long been committed to the north with a proud history of work dating back over half a century. It's why we commissioned our Regional Rebalancing report in 2022, partnering with northern decision-makers to investigate the obstacles and opportunities of levelling up.

But the work has only just begun. If we are to meet tomorrow's daunting difficulties, we must continue to turn decline into development - not as a one-off, but systematically, working together to deliver schemes that are integrated, inclusive, and far-sighted.

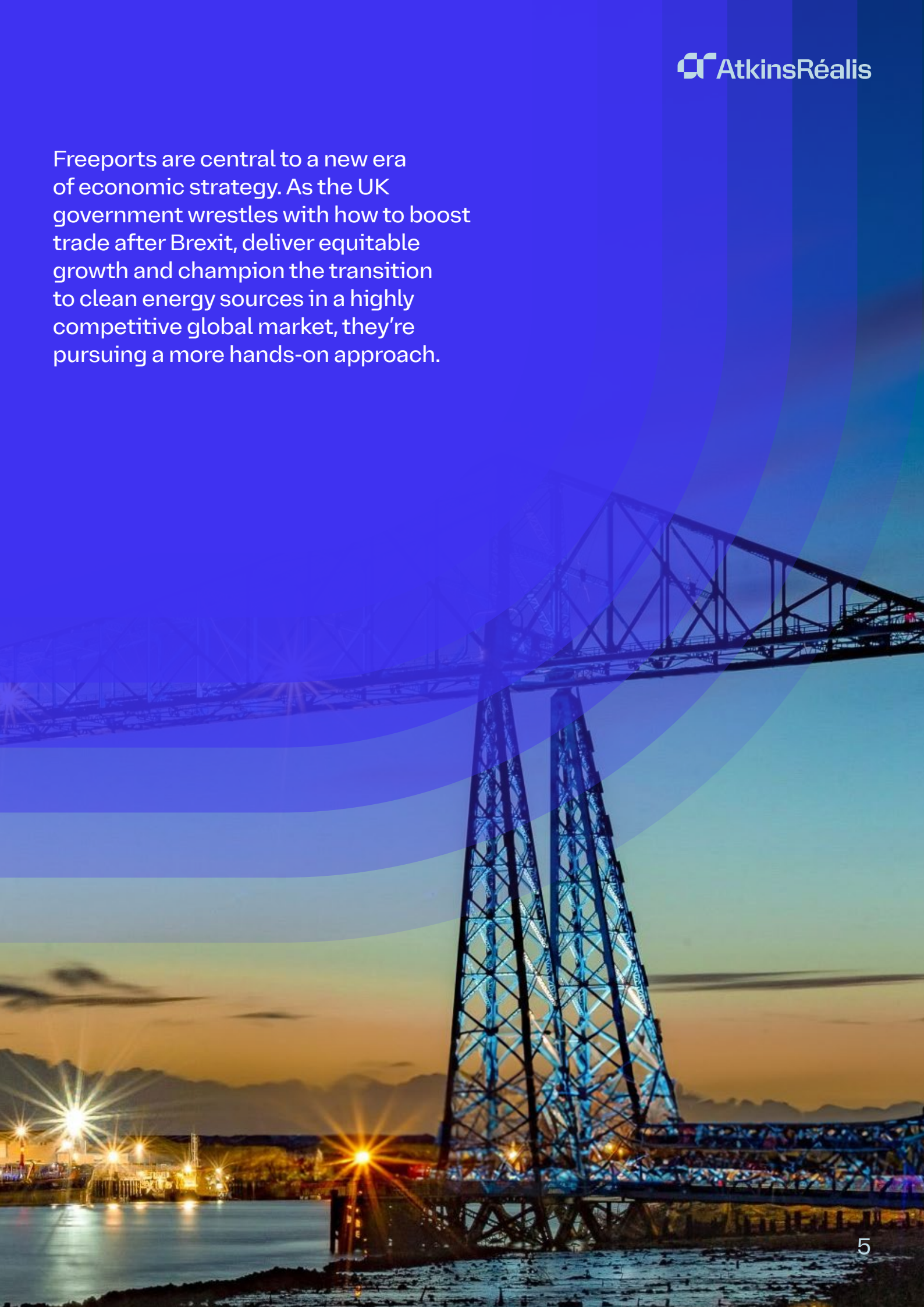
That's what it takes to regenerate towards a green, low-carbon, and prosperous future - not just for the north, but for the next generation.

Richard Robinson
Chief Executive Officer

Another Industrial Revolution: what we can learn from the UK's largest Freeport on Teesside

Richard Gutsell
Client Director

Freeports are central to a new era of economic strategy. As the UK government wrestles with how to boost trade after Brexit, deliver equitable growth and champion the transition to clean energy sources in a highly competitive global market, they're pursuing a more hands-on approach.



Aimed at attracting private investment, regenerating regions, and priming a virtuous cycle of innovation, freeports are an opportunity to plan an optimistic, inclusive future, whilst addressing historic regional inequalities. That's why the work on Teesside, the UK's largest freeport and one of the first to be approved, is so encouraging - it highlights the potential of genuine collaboration to produce transformation.

An unstable geo-political climate, ambitious Net Zero commitments and a widespread clamour to correct regional inequalities: given these challenges, no wonder traditional approaches to infrastructure aren't working. Thankfully, the UK's industrial strategy is recognising this, adapting investment is coordinated to maximise impact. If we're to achieve renewable energy production at scale and develop promising green technologies, investment is not only essential, it must also be carefully targeted.

For the UK, one of the greatest areas of potential is the North Sea; yet already we're trailing Scandinavian countries, who are rapidly developing off-shore wind and hydrogen to exploit the renewable energy opportunity. Worse, the UK's productivity problem is exacerbated by large discrepancies between regions and uneven investment in transport, infrastructure and skills.

Without addressing these underlying conditions, we cannot create thriving industries capable of competing in global markets, transform the economy nor create inclusive growth. It's a complex planning challenge, requiring integrated, sustainable solutions.

That's why Britain's industrial strategy for its east coast matters. Only through effective coordination can we lay foundations for vibrant, green energy hubs. The public sector needs the private sector's technological and financial impetus, and to provide jobs. Yet the public sector must create a supportive regulatory environment, address the long-term upskilling of the workforce, and direct the overall vision. Together, it's possible to create lasting, positive change. And on Teesside, that's beginning to happen.

Green shoots

Almost 50% of investment in renewable energy is targeting the north, and old industrial heartlands of Teesside are ideally suited due to their proximity to off-shore wind generating capacity of the North Sea, manufacturing heritage and connectivity to import and export markets. If we're to transition old world industry, centred around steel and oil, to innovative green production, we need to start understanding the value of our historic assets, repurposing and optimising their potential for the longer term.

Thanks to ongoing investment, Teesside is now the most promising green hydrogen production location in the UK. Although the technology is nascent, hydrogen promises to become a key element of a future energy system, both as an energy storage vector and in decarbonising heavy industries. But it's not just experimental technology - wind turbines are now being manufactured on Teesside, and the cluster of industries that once supported the steel works are now supporting clean energy. As Net Zero targets grow ever closer, the industries on Teesside will only become more important.

Region d'etre

Yet Teesside also stands out for its novel approach to planning and development, showing how regional cooperation can achieve greater goals. Spread across five local councils, who combined together as the Tees Valley Combined Authority in 2016, the Freeport will generate a wider regional boost of 18,000 jobs and a £3.2billion boost to the local economy over the next five years. That would not have been possible without a concerted, coordinated approach to distribute and maximise impact across the area, cooperating rather than just competing.

More widely, it's part of a national strategy to build resilience in the wider economy. By offering targeted tax and customs breaks over the early years of operation, Freeports encourage and de-risk private investment in innovation, nurturing clusters of critical industries that will foster the growth of manufacturing and skills necessary to transform the UK economy. And from battery energy storage to carbon capture technology, there is a long wish list of industries that we need to develop to meet Net Zero targets.

Finding the binding agent

The challenge remains, though, to turn aspirations into an integrated reality. To support the creation of the winning bid for the Tees Valley Combined Authority, Atkins provided a team of subject matter specialists to align the bid responses to the rest of the Teeside proposal and coordinate with the activity already happening within the proposed freeport site.

By putting together a cogent business plan and programme, uniting the various disparate elements and managing the complex security implications of a tax-free zone within the borders of the UK, Atkins not only played a critical role in getting the bid over the line, but helped shape the centrality of the public-private relationships that are necessary to making freeports work. Since then, we've continued to build on those relationships, bringing our multidisciplinary approach to expedite the building and integration of new facilities.

Level up people, not just places

None of this will work without a comparable investment in the skills and the workforce. That's a key part of the work on Teesside too. Engaging with local enterprise partnerships and businesses makes a real difference, for it's the labour opportunities that deliver the real change, kickstarting the virtuous cycle of stable employment and upskilling. That's why it's time for the private sector to be more proactive.

Across the UK, this is a moment of opportunity. There is an increasing appetite to invest around the country to support regeneration, if the right conditions are put in place. Yet finding that balance is complex, and we need to learn the right lessons from where it's working. The success story of Teesside is built on collaborative, cooperative, and integrated efforts - both between local authorities and metropolitan areas, and through public-private partnerships. For a more resilient, equitable and competitive tomorrow, we need to coordinate to see the bigger picture, and deliver it. Fundamentally, that's the path to transformation.

How can the UK decarbonise its heavy industry and overcome the challenge of an ageing power fleet, all whilst levelling up its economy beyond the south-east? A next generation of new nuclear technology could be the answer. By repurposing existing sites we can enable local communities to maintain existing high-skilled jobs, develop sustainable manufacturing and power inclusive growth. But to achieve this, new schemes must be designed around local needs - which in turn requires an industry integrator, to bring disparate elements together for better, joined up outcomes.

AtkinsRéalis

What the Hartlepool Heat Hub reveals about levelling up - and integration

Jason Dreisbach
Portfolio Director

Protecting jobs, strengthening communities, and spreading opportunity: a great deal is expected of levelling up. Yet levelling up is complex. In isolation, building a new road or giving local businesses a stimulus isn't enough. Genuine levelling up requires a far-sighted, joined-up plan tailored to local needs. The relationship between local industry, technology, and government is crucial - and a lack of integration can risk everything.

At the same time, supply and demand for power are changing. Around half of the UK's existing power stations will close in the next ten years, whilst our demand for electricity continues to grow. What we choose to do with the landmark sites that once defined our energy generation landscape will be a key part of our transition to a low-carbon future, and a real opportunity for growth, investment and regeneration.

Welcome to Hartlepool

Take Hartlepool: a town with a thriving local industry, including steelworks, chemicals, and renewables. Since being commissioned in 1983, Hartlepool's nuclear power station has fuelled the local economy with clean power, and over the last three decades enabled the region to amass valuable nuclear expertise. But to protect and grow these jobs, Hartlepool needs a long-term vision, capable of bolstering economic growth and providing cleaner energy.

The Department of Energy Security and Net Zero (DESNZ) recognised the need to successfully replace the zero-carbon energy from Advanced Gas-cooled Reactor (AGR) nuclear plants - like Hartlepool's – to help decarbonise British industry and catalyse innovation. That's why, together with EDF, we were challenged with the task of helping DESNZ assess different nuclear technologies for the area, understand the specific technical needs of local industry, and develop a feasibility study that will inform future policies and programmes from DESNZ.

Partner up, power up

Hartlepool Power Station was originally to be decommissioned in 2009, only to be thrice extended to 2026 due to Hartlepool's importance to the grid - it provides 2% of the UK's peak power demand. However, Hartlepool is widely recognised as one of the best places in the country for new nuclear power.

Plenty of available land around the existing power station is already designated for nuclear building and the workforce boasts decades of high-skilled nuclear experience and local businesses support nuclear power, understanding its importance to Teesside's industrial output.

The challenge is to transform our systems while repurposing existing infrastructure, maintaining local skills while transitioning to next-generation reactors. High-temperature gas-cooled reactor (HTGR) technology is the proposed solution. Most of Britain's existing reactors are AGRs - so if new reactors also utilise high temperature gas systems, we can capitalise on legacy skills and enable places like Hartlepool to thrive.

Yet building new technology on repurposed industrial sites also generates wider benefits. Sustainable manufacturing, levelling up, and master planning for inclusive economic growth:

a new reactor in Hartlepool will lay the foundations for efficient integration with the needs of local industry and enable the growth of a green economy. But there is also the potential for more. Not only could this new generation of reactors provide the decarbonised heat and steam Teesside so desperately needs (and, in doing so, protect jobs), but it could also drive turbines to generate electricity. That's why it's called the Hartlepool Heat Hub.

But connecting upstream energy generation facilities to downstream end users is complicated. That's why DESNZ and EDF recognised the need for a systems integrator, to analyse the situation, evaluate competing options, and present the insights in a feasibility study.

Making local focal

Beyond independent systems integration, DESNZ and EDF also needed local insight. They had to know how the heat generated by the reactor can be used directly to decarbonise steel plants and chemical manufacturing facilities. These industries are notoriously difficult to decarbonise, but a zero carbon source of heat can remove most of the carbon emissions from the manufacturing process. So, on Teesside, the feasibility study had to demonstrate how to effectively pipe the heat from the power plant to the end user.

Rather than beginning with a specific vendor or technology, our approach started with the end user in mind: local industry in Teesside. By considering those needs from the start, our approach allowed local industry to shape the potential new energy infrastructure around its needs. We surveyed the industry on Teesside, creating a specification for any reactor or project at Hartlepool so that it will genuinely help the region to prosper and decarbonise.

We drew multidisciplinary expertise from across Atkins, channelling insights through our Net Zero Energy business. From nuclear and chemical engineers to costing, scheduling, and change management experts, our teams are all accustomed to working together across disciplines. Moreover, our experience in integrating energy facilities with industry to decarbonise, and on existing gas reactors in the UK, enabled us to anticipate the key challenges ahead. And by considering these aspects from the very start, we helped to de-risk the project.

To the next level

Levelling up is critical to a fairer, more prosperous future - but it's extremely complex. Why one place thrives and another languishes is rarely straightforward, affected by a huge mixture of factors. These must be considered together, and naturally this is very difficult - not only because few organisations have enough knowledge and insight of all areas, but also because collaborating across multiple sectors demands skill, foresight, and vision.

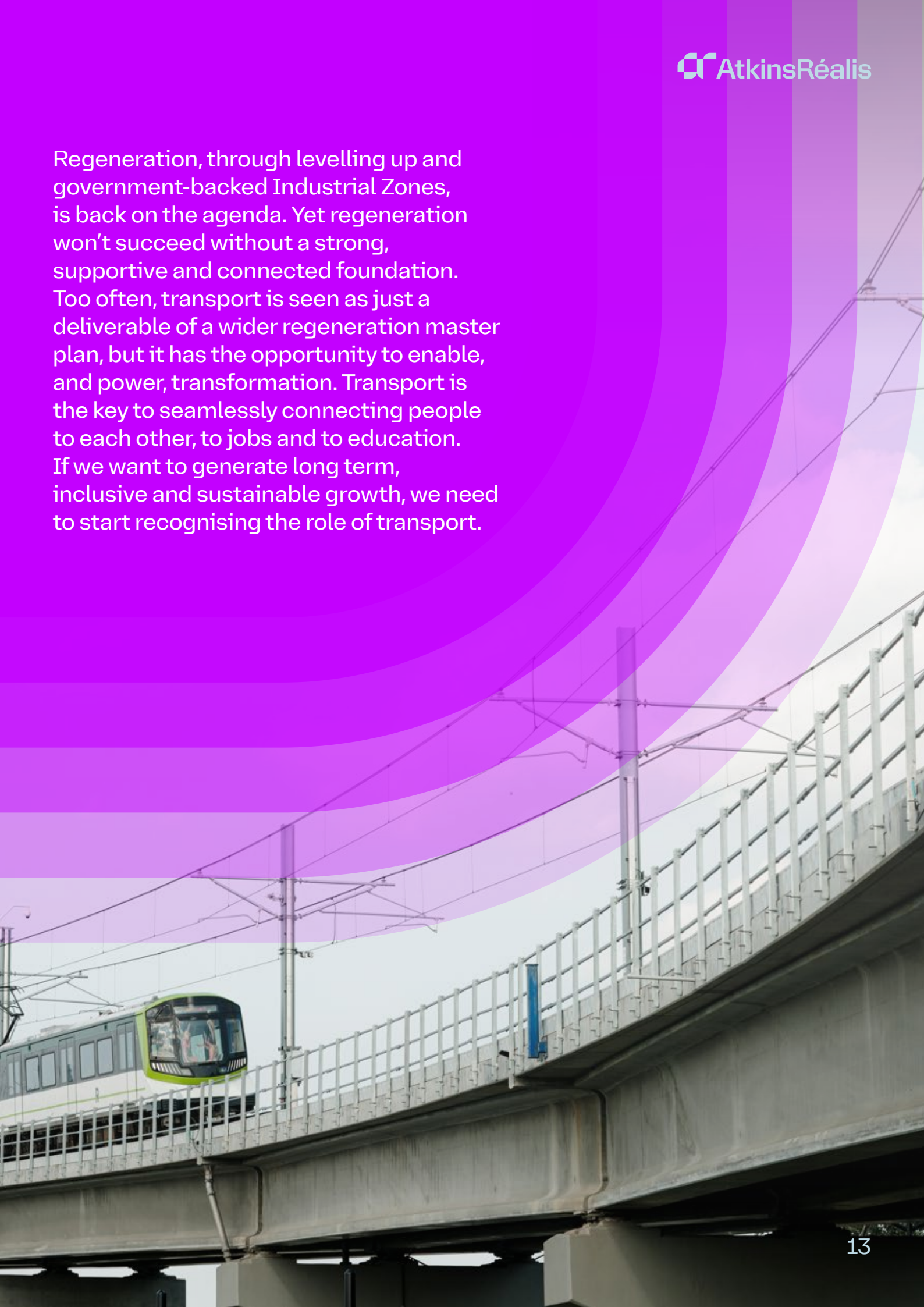
In the meantime, momentum is building to expand and accelerate a transition to clean energy. Repurposing our existing infrastructure is a core part of the answer. That starts with identifying opportunities such as those at Hartlepool, and finding ways of integrating disparate knowledge streams, in order to maximise our efforts and give levelling up the best chance to succeed. The proposed Hartlepool Heat Hub indicates how we can turn potential into reality: bridging technical expertise with social needs to ensure that innovation, sustainability, and local communities work together for a better future. And it starts with better integration - which, in a way, is what levelling up is all about.

The imperative of interconnectivity: why transport needs to play a central role in regeneration

Fayyaz Qadir
Technical Director

Lisa Knowles
Associate Director

Regeneration, through levelling up and government-backed Industrial Zones, is back on the agenda. Yet regeneration won't succeed without a strong, supportive and connected foundation. Too often, transport is seen as just a deliverable of a wider regeneration master plan, but it has the opportunity to enable, and power, transformation. Transport is the key to seamlessly connecting people to each other, to jobs and to education. If we want to generate long term, inclusive and sustainable growth, we need to start recognising the role of transport.



Connectivity is a core element of every successful economy. Goods need to reach markets, businesses need to reach a skilled workforce, education must be accessible - and, if communities are to be resilient, everyday activities such as shopping or visiting friends and family must be straightforward. The backbone of all that connectivity is transport infrastructure: the road and rail networks that enable an economy to thrive. Yet years of underinvestment in transport across the north have instead created a vicious cycle of deprivation, a lack of opportunities and unemployment. Without accessible travel, the cycle is doomed to repeat, deterring talent, business and growth.

We now have an opportunity to break that cycle. For the first time in a generation, there is a growing political will to reinvest and reinvigorate. Armed with a better understanding and technological tools, policymakers and planners are taking on the challenge of how we can efficiently and effectively regenerate ecosystems for the longer term.

However, first we need to recalibrate the importance of transport. It's not merely one of many regeneration deliverables. It's the foundation of regeneration itself. That's why it must be integrated into planning from the start, so that all the other components can function. And as we begin to wrestle with decarbonisation across the nation, we must embed a transport lens into our thinking, addressing not only today's problems, but also tomorrow's.

All roads don't lead to London

The challenges facing regions outside of London and the southeast, though, are numerous and interconnected. At a structural level, transport suffers from its overdependence on connection with the capital, meaning it's often quicker to travel to distant London than it is to travel to neighbouring destinations across the north. This doesn't only affect disconnected local communities; it even warps the employment opportunities for, and investment in, mid-sized regional towns.

Funding is a pressing problem too. The north hasn't had the same investment per capita for many decades. Yet without central government funding that plants and nurtures the seeds of opportunity, much of the country will be destined to remain trapped in unfit infrastructure. And if local authorities remain restricted in their ability to control transport and direct investment, it will continue to be difficult to create holistic investment plans that lead to thriving places.

Boosting the road network, and creating better and faster public transport links can help, but if the people and infrastructure aren't ready, these are unlikely to yield the hoped-for benefits.

To improve local prospects, transport must be enhanced in tandem with other socio-economic drivers. People must be connected to education and training, so that they can take advantage of local job opportunities. Any physical improvements must be likewise integrated with digital connectivity. Without fast, reliable internet, businesses will struggle for productivity - and people will struggle to make a living.

New models

To successfully embed change, we need to first understand behaviours and motivations. We've been engaging with stakeholders across the country to ascertain the precise nature of the challenges they face. Time and again, the same conclusions emerge. The north of England suffers from a flight of younger people due to a dearth of opportunities, and a larger proportion of people commuting long distances because their skills don't match local jobs. That's not beneficial economically or environmentally.

We recently conducted a study in Yorkshire, giving jobs to people on long term unemployment. One of the key findings was that travel time, number of interchanges, and cost directly prohibit access and deter employment. Conversely, where connectivity enables it, people can and will travel. It's clear that people respond to events and different opportunities, and that more often than not, the will to change is there. But to empower people, we must first enable better integration.

Glimpse of a different future

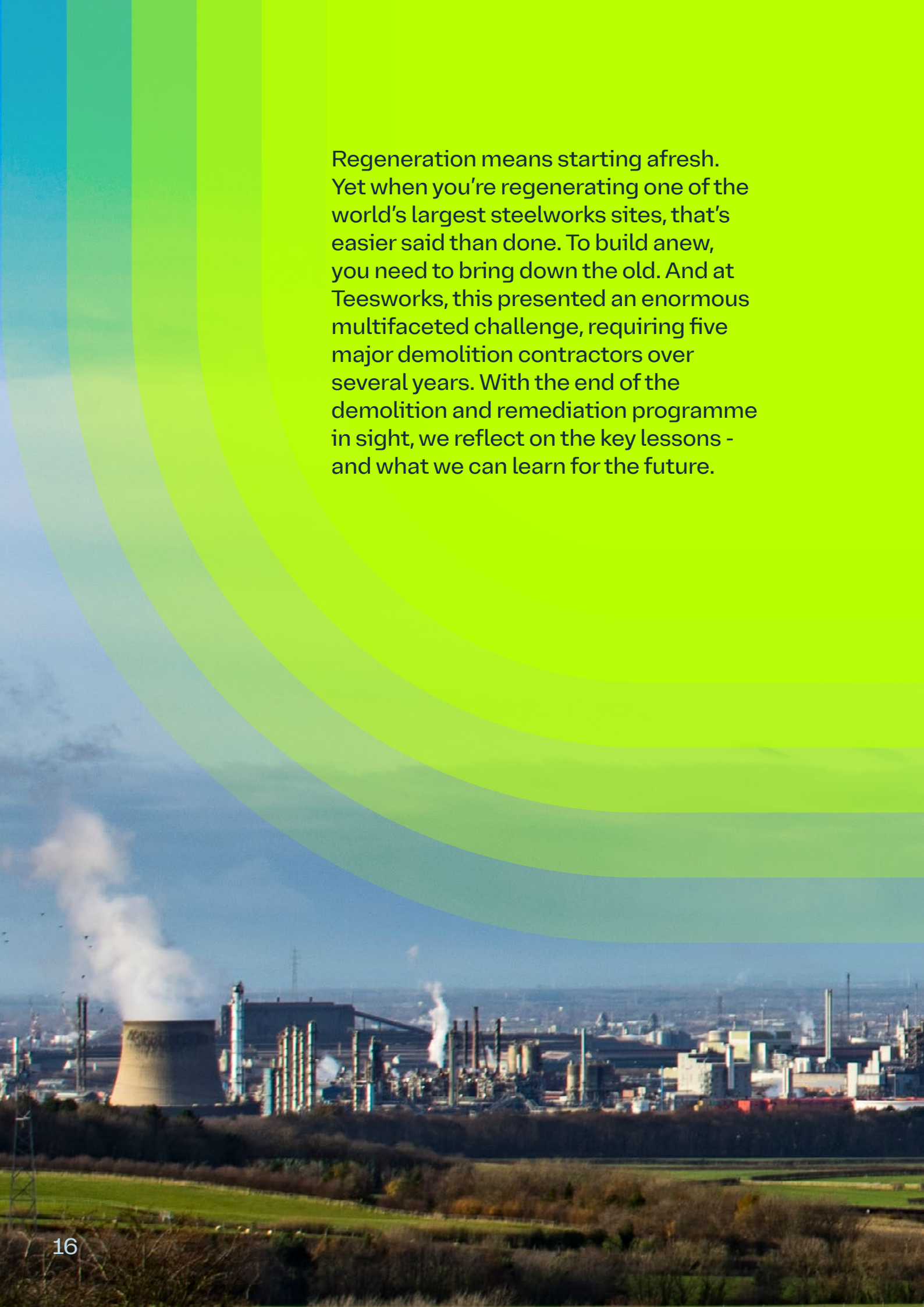
By collaborating across local authority boundaries, and with the private sector, we can more easily address the structural challenges.

Instead of always retrofitting transport to meet existing problems, can we plan ahead more to reduce the need for travel? Through mixed-use developments, can we foster the right skills in the right places, and make those jobs attractive and well-rounded? Regeneration is a chance to start afresh - it's critical we don't make the same mistakes.

Transport cannot solve every problem, but it needs to be a core part of every solution. By seeing the bigger picture, we can deploy master plans that address multiple targets, and design places so that the pieces fit seamlessly together. Uniting our infrastructure investment and planning, and using all forms of transport to match supply to demand, we can shape communities with connectivity in mind, allowing local actions to create regional success.

Fundamentally, there are no quick wins when it comes to regeneration. Instead, long-term planning creates the conditions for a positively reinforcing cycle, with each turn incentivising the next. That's why social value must be baked in from the start, ensuring that the least privileged communities get the maximum benefits from improved connectivity, through access to skills, training and jobs. Only by building paths that lead to a different future, can we break the paradigm of the 'left behind', levelling up people as well as places. To face the generational challenges of Net Zero and regional rebalancing, it's vital that we begin the task of establishing interconnected ecosystems that prioritise mobility, connectivity and sustainability. These are the pillars that support growth, and will build momentum on the journey to continued prosperity. But that journey, like so many others, starts - and ends - with transport.

Regeneration means starting afresh. Yet when you're regenerating one of the world's largest steelworks sites, that's easier said than done. To build anew, you need to bring down the old. And at Teesworks, this presented an enormous multifaceted challenge, requiring five major demolition contractors over several years. With the end of the demolition and remediation programme in sight, we reflect on the key lessons - and what we can learn for the future.



AtkinsRéalis

Steeled for a new start? 5 lessons from the demolition work at Teesworks

Ian Kirkpatrick
Associate Director

There are high hopes that Teesworks will be the success story of Teesside Freeport. The 4,500 acre site is a central element of the North East's industrial regeneration, transforming the UK's largest industrial zone into a centre of innovative and sustainable industry. Getting there, though, is a long journey. Much of the Teesworks site has sat empty since 2015, when the former Redcar Steelworks went into receivership and 2,500 jobs were lost. After years of steady decline, it's since taken detailed master planning to rekindle this beacon of employment and opportunity.

Demolishing the old steelworks began in March 2021, with a c.£150 million demolition programme across ten major assets, each in its own right a sizable project. Nearby operations had to remain unaffected by the works throughout, and its sheer scale demanded five major demolition contractors. Originally scheduled to take four years, the programme was successfully reduced to just over two.

As we turn to the wider task of regeneration across the country, re-investing in areas long neglected, demolition will often be the starting line. So if we can tangibly reduce programme delivery timescales, risks and costs, boosting the business cases for and accelerating regeneration investment, the impact on communities and regions will be huge. Yet realising that ambition requires us to not only problem-solve and reduce inefficiencies - we need best practice to evolve. And a project like Teesworks could set a blueprint for those that follow.

01

Old industry dangers need new solutions

Like any complex, long-standing industrial site, decontamination is a major challenge. Miles and miles of industrial piping criss-crossed the site. Alongside the usual contaminants you might expect - asbestos and heavy fuel oil (HFO) - the team also had to deal with large amounts of coke oven gas. To mitigate the programme risk, and ensure that our methodologies were consistent across the site, our technical teams were involved from the outset, and helped inform the project's plan, safe approach and to de-risk delivery.

02

Continuity of knowledge counts

When the Redcar Steelworks owner (SSI) went into receivership in 2015, a skeleton crew of 100 staff was kept on site to keep it safe. That team proved crucial to feeding qualitative knowledge into the demolition approach, ensuring an accurate procurement phase, and informing the delivery of works on site. Although data and technology are clear drivers of innovation, Teesworks provides a clear reminder that human knowledge and experience is also irreplaceable, and that intelligent insights are central to real impact. However, this siloed knowledge also provided a challenge - how do you filter real world know-how into usable and transparent documents and systems? It took an enormous amount of work, patience and time, but the overall result was a programme enriched by expertise, leading directly to a speedy and smooth programme delivery.

03

Digital makes a difference

Digital technology has already changed demolition. Using aerial drone surveys, we were able to map the whole site to generate a topographical database, which then fed into all the programme documents. Likewise, at the outset of the project, a lot of painstaking work went into tagging all the site data, to inform an accurate procurement and provide robust information through to contractors. Although we had a cache of historic information, the data standards were poor, which made access difficult and time-consuming. But the benefits of those early efforts proved enormous.

With clear, accurate reporting and scheduling updates, client and stakeholder engagement was streamlined and the project was able to exceed its programme. One particular highlight of the project was our structural inspection of the historic Dorman Long Tower using drone technology. We created a 3D model of the structure using the collected data, and used this to inform the structural inspection, removing the need for inspection by steeplejacks and storing the generated model as a record for posterity.

04

Multidisciplinary approaches are more likely to succeed

Due to the project's complexity, Teesworks has required a wide range of commercial and technical expertise. The site's scale is vast, and everything is interconnected, from the blast furnaces to the miles of coal conveyors and junction houses, coal and ore bunkers to the by-products plants, and steelmaking to the casting.

We've brought in experts from across our business to ensure we're planning efficiently and operating safely. And from our involvement in the strategic demolition framework at the planning stage, and then through our role as demolition delivery partner, we've been able to maintain continuity, exploiting the work we've already done to integrate our knowledge base to maintain a golden thread of multidisciplinary understanding.

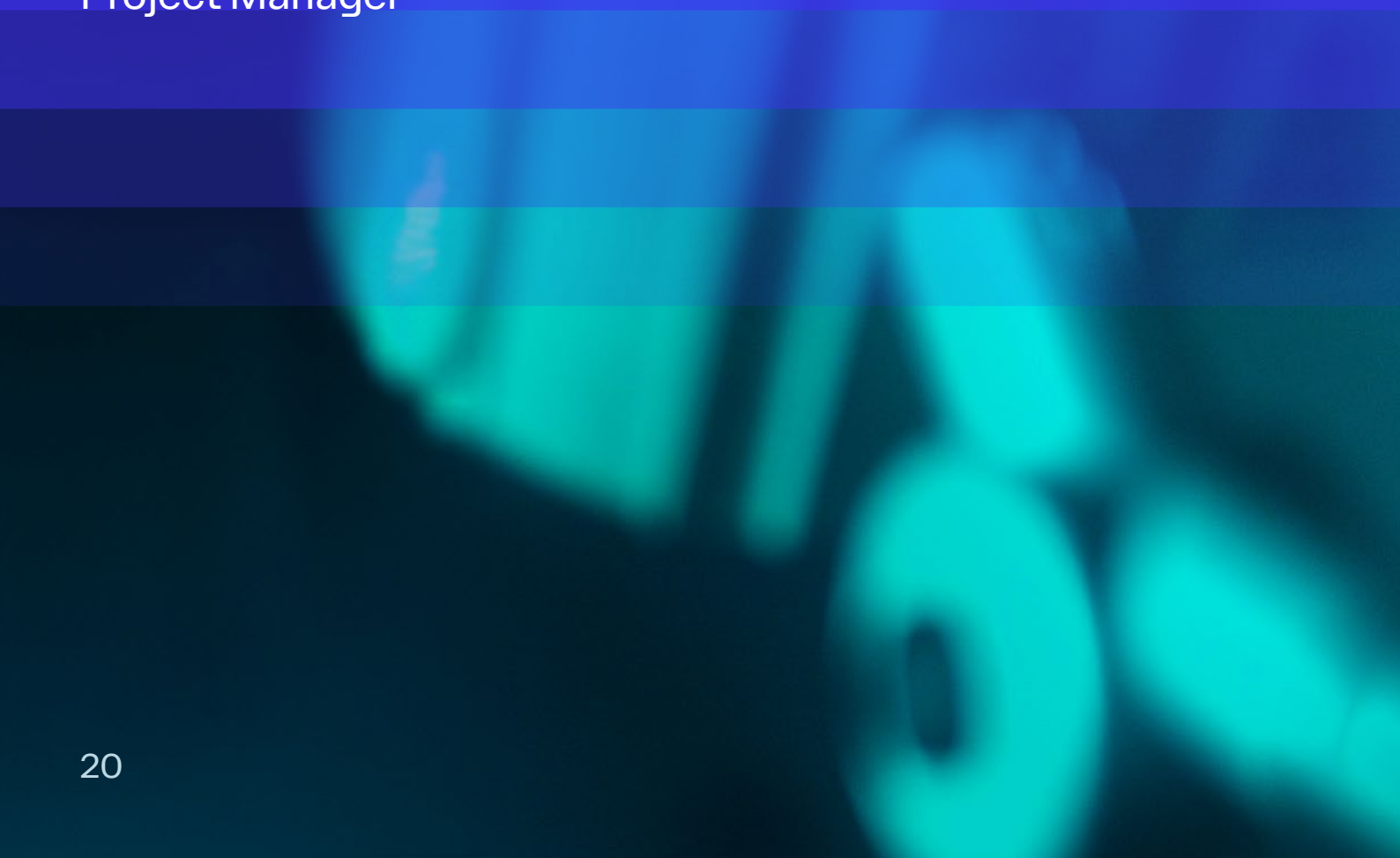
05

Open communication is crucial

Teesworks is a sensitive site - so we've consistently respected its historical and local importance. A big part of the demolition framework was social value. That's been achieved through local staff, working with local universities and local businesses. Moreover, we've kept a transparent, open approach with the press and local communities, not just for health and safety, but also to celebrate updates, and the blowdowns of landmarks that have been a feature of the skyline for over a century. And within the project, we've run weekly simultaneous operations meetings to ensure clear visibility between contractors, clients and local authorities, feeding in the knowledge of our local experts to transform this from a standard delivery, to a standout delivery.

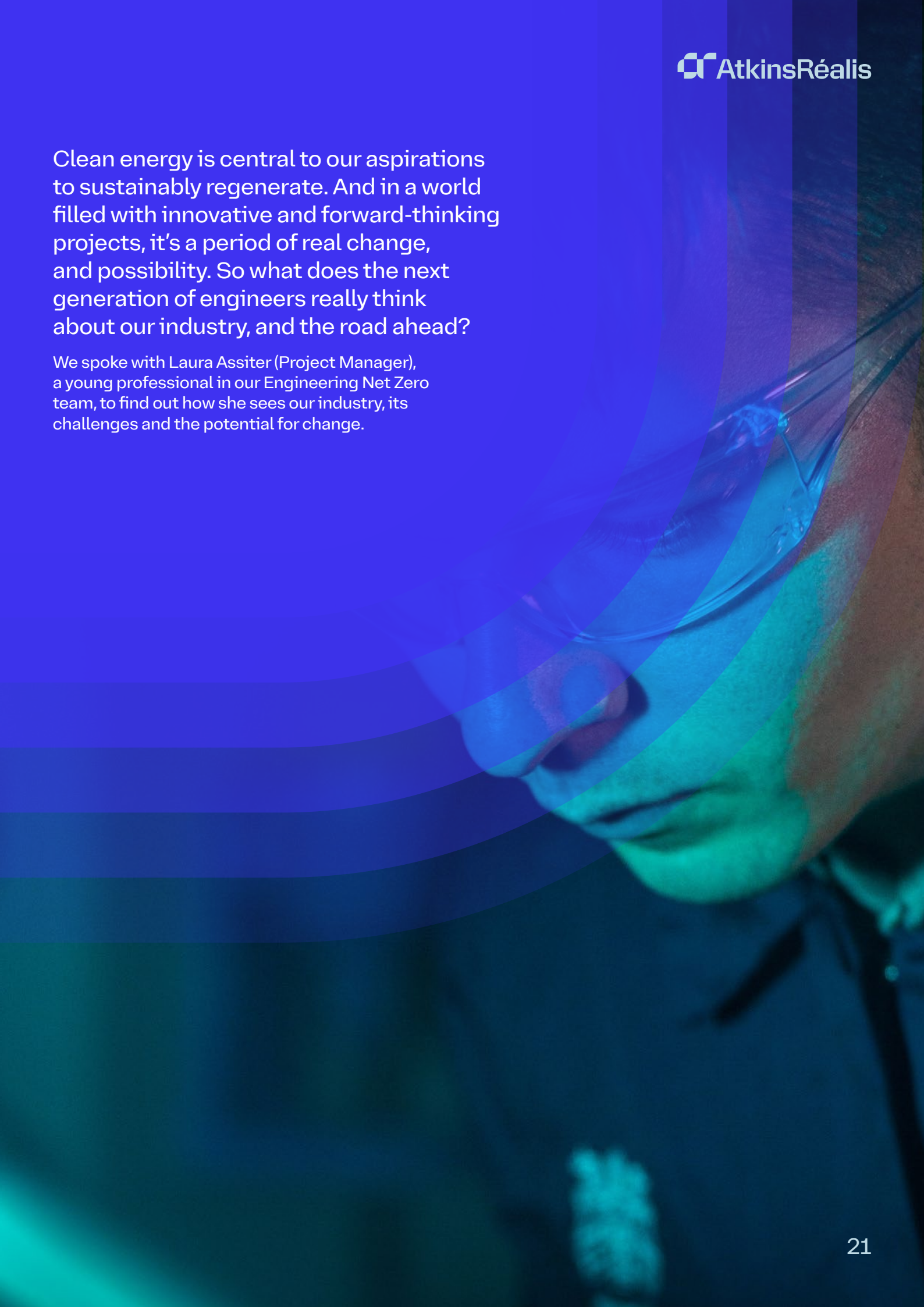
‘It’s slightly terrifying - we need to get a move on...’. What the next generation really think about our industry

Laura Assiter
Project Manager



Clean energy is central to our aspirations to sustainably regenerate. And in a world filled with innovative and forward-thinking projects, it's a period of real change, and possibility. So what does the next generation of engineers really think about our industry, and the road ahead?

We spoke with Laura Assiter (Project Manager), a young professional in our Engineering Net Zero team, to find out how she sees our industry, its challenges and the potential for change.



What are the main challenges for younger people coming into the industry?

I think it's hard to get that first step on the ladder. Getting into university is a challenge in itself and now being able to afford university is particularly hard too. But then after, even with a good degree, finding that first step of experience with companies, getting your foot in the door, it's incredibly difficult. Most companies tend to ask for previous experience, and it's really competitive even though there is a lot going on.

Another aspect is relocation. Are you in the right area for the jobs you're going for? I've moved around the UK quite a bit, and I've been lucky because Atkins has been really flexible, but a lot of companies wouldn't, even with remote working opportunities.

What perspectives can this generation bring?

The amount of energy and enthusiasm they have towards net zero and to protecting the planet and the climate is really interesting. So many younger people are taking steps to reduce their carbon footprint in their own lives and they can bring that enthusiasm into engineering too.

And there's also the diversity of thought - young people have fresh perspectives. Perhaps it's because they haven't yet been channelled in one direction by working in a certain industry for a long time. The work we're doing is a bit disruptive, changing a lot of things, so it's really important to not be afraid to challenge established ideas.

What's your main focus?

I think of my role as mainly about building the relationship with the client and translating their requirements to the engineering teams, and making sure those deliverables, and the timescales and budgets, are met.

It's the joined up connection, the constant communication and collaboration with the client to ensure we're actually working together to achieve the big picture objective.

My personal focus is clean energy projects in the North-East. I've been working with SSE Thermal on several projects, like the Aldbrough Low Carbon Hydrogen facility, and I'm involved with net zero innovative work going on in the Teesside region too, like the Whitetail Clean Energy project.

What really excites me is seeing projects through from start to finish. So being there from the feasibility stage, from the very beginning, and then bringing that knowledge all the way through - that's really incredible. I'm looking forward to saying: 'I was part of that.'

What are your thoughts on the future of energy in the UK?

The key is a diverse mix of solutions - it can't just be one solution that fits all. Nuclear is going to be a big part of it, because if it's not windy and sunny then zero carbon nuclear energy baseload is essential. Then we also have to think about storage options for when there's peak demand, say, in winter. So how do we go about that? Well, we're not just talking about batteries, we're looking at gas storage, pumped hydro and then there's the real potential of hydrogen storage too. There are so many new technologies out there right now and in development. You don't really know which direction it's going to go in the next 5-10 years - it's such a fast moving space right now. So it really is an incredible time to be an engineer.

What advice would you give someone starting out?

Now is the time to say yes. Having that wide variety of experience across a range of different projects when you first start out is incredibly important.

It helps you determine which direction you want to go, and also helps build a strong, broad foundation of knowledge. So when you get an opportunity, say yes to it. Get stuck into everything and jump right in.

How is digital technology changing your role?

We're doing some really interesting work using digital tools to boost engagement. So at Aldbrough, we put together a detailed 4D visualisation of the actual construction sequence to clearly show what's happening over the project, factoring in time. That's great for clients, because they can really interact with the project, and also use it for their stakeholders and for public perception.

How does it feel to be working to regenerate old industrial areas?

We all know that working in these projects means working to change the fabric of the country. These areas are also so important to our future energy system; we need to think about the big picture and not just target our investment down south, but across the UK.

Looking forward, what's the biggest challenge?

I don't think I realised the extent of the issue we have with our build rate, and how much energy we actually need moving forward - especially since the recent energy and security of supply crisis. Atkins conducted a report highlighting the UK must achieve a clean power capacity build rate of 12.2 to 15.6 gigawatts per year in order to meet our 2035 net zero targets. So far, we've not even constructed 3.2 gigawatts per year. That's slightly terrifying - we need to get a move on. I know there are lots of plans in development, and the government is putting in a huge amount of investment, but we need decisions quicker and funding faster for us to move forward, vastly increase that build rate figure and then sustain it.

Hydrogen could be one of the central technologies in a low-carbon future - decarbonising heavy industries, capitalising on excess renewable power generation and stabilising mismatches between supply and demand in a clean energy system. But question marks remain about how to integrate and scale up the technology. At Aldbrough Gas Storage facility in East Yorkshire, those questions are being answered.

AtkinsRéalis

How the Pathfinder project at Aldbrough is determining hydrogen's future in a Net Zero energy system

Robbie McCreath
Mechanical Engineer

Hydrogen is vital to the success of decarbonisation. Unlike other clean energy technologies, hydrogen can play a unique role in sectors, such heavy industries, where green alternatives to fossil fuels are limited. Likewise, hydrogen could meet the grid demand for longer duration energy storage during the fluctuations of wind and solar energy production.

So if the technology can be proven to work, and work at scale, it could be a springboard for across-the-board transformation of the way we use and produce energy.

Yet despite the growing momentum, hydrogen is still surrounded by so much uncertainty that building a compelling business case and strategy for investment is very challenging. There's a lot of hype, but also confusion about how best to use the promising technology. With so much in the air, demonstrations of the technology at scale are desperately needed. That's why the Pathfinder work at Aldbrough Gas Storage facility is critical.

The challenge / Blazing a trail

The Pathfinder project aims to demonstrate the integration, scale up and operation of green hydrogen technology. If successful, this will inform the development and execution of other large projects with similar infrastructure requirements. And unlike grey and blue hydrogen - made from natural gas without (grey) or with (blue) carbon capture technology - this will be a crucial and precedent-setting proof of concept of how to create a zero carbon energy production system, entirely free of fossil fuels.

When fully operational, the facility will produce hydrogen using renewable energy in a 35-megawatt electrolyser which will be stored in an underground salt cavern. The stored hydrogen will then be used to fire the Open Cycle Gas Turbine OCGT to export power during periods of high grid demand, similar to the role natural gas currently plays.

The future green hydrogen economy needs to connect with both supply - surplus renewable energy production, and demand - large industrial sectors. In many of those sectors readily available grey hydrogen is already being used, but due to the unabated carbon emissions, pressure is growing to switch to cleaner forms.

Adjacent to the industrial areas close to the mouth of the River Humber, filled with transferable skills from chemicals through to steel, and situated just off the North Sea, a key development arena for off-shore wind, Aldbrough is the ideal location for hydrogen innovation.

Our approach / Just in time delivery

Working in collaboration with SSE Thermal and Equinor, we needed to develop the feasibility and concept design of the integrated production, storage and power generation facility. A key element of the project was to support and input into the client's application for the Department of Business, Energy and Industrial Strategy's (BEIS) Net Zero Hydrogen Fund. But the timescale was exceptionally short to pull everything together.

Against the clock, we completed a series of high-level optioneering exercises to integrate the project within the existing operating asset and development. That work informed the basis of design along with key deliverables for the application to BEIS' Net Zero Hydrogen Fund. Throughout, Atkins complemented the expertise of the client with our substantial technical knowledge, industrial know-how and our experience in putting together other feasibility studies for pioneering technologies.

And across our own business, from salt cavern capabilities to creative visual design, we leveraged a range of skill sets to make that application as impactful as possible.

The secret ingredient

We're still in the infancy of the hydrogen economy, and the exact shape and size of the hydrogen market is only slowly coming into focus. But what we do now will determine the impact of what comes next, and we must meet that challenge at the systems level, developing the right solution for the right problem to maximise the efficiency of our limited resources. In the global race to meet Net Zero commitments, research and development into promising avenues will continue to be crucial.

Yet innovation cannot succeed without integration, and complex infrastructure development can only happen by bringing together a rich diversity of thought. Cutting edge technology enables and empowers, but it doesn't replace the expertise, creativity and problem-solving needed to embed and deliver real change. So as we move forward with next-generation technologies, we must not forget that whatever the challenge, a low carbon future will also be powered by collaboration and coordination.

AtkinsRéalis

Working together to engineer an inclusive future

atkinsrealis.com