AtkinsRéalis

INDUSTRIAL DECARBONISATION

Engineering Net Zero™

Engineering Net Zero

THE CHALLENGE

UK Government targets for Net Zero 2050 represent a major challenge, a key component of which is accelerating the reduction of industrial sector carbon emissions.

Industrial companies are under increasing pressure to make commitments to a Net Zero target, and to do this they require a roadmap of activities that will underpin the commitments. For industrial companies Net Zero commitments are likely to require significant engineering and infrastructure changes, which will be implemented over many years and require access to public and private finance.

AtkinsRéalis can help develop a robust, implementable route to Net Zero, through a strong understanding of industrial processes, engineering and technology solutions, permitting requirements and financial support available.

We start by measuring, mapping and understanding your energy demands and greenhouse gas emissions, then select bespoke engineering and technical solutions with timelines and costs for implementation, which will be summarised on a roadmap. Within AtkinsRéalis we have all of the required skills and capabilities to help deliver the projects and site changes identified on the roadmap to help you meet Net Zero by 2050 in the most economical way.

HOW WE DEVELOP YOUR NET ZERO ROADMAP

- **Data discovery:** This takes input data such as energy (heat and electricity) demands for each process, energy supply from onsite assets, primary energy consumption, asset capacities, ages, process heat, carbon emissions etc. This is combined with other data such as site layouts and technical documentation.
- **Data gathering and analysis:** We then take your data and convert it into a consistent timeseries data set, so all data is put into an hourly timeseries for a baseline year. This output profiles in graphical format and allows an initial review of the data to identify gaps and inconsistencies. We can then implement sub-metering to fill any gaps in data to ensure the baseline is fully understood.
- **Options review:** We will then undertake an options review where appropriate technologies are applied to modify the time series data to estimate the impact on energy consumption and carbon emissions. We can automatically estimate CAPEX, OPEX, footprint and permitting requirements based on an internal dataset built from our technology research. The options will be evaluated in line with the site requirements and constraints to deliver the lowest cost of carbon abatement.
- **Roadmap development:** The most suitable options will be converted into a roadmap, detailing the key steps to achieving Net Zero. The roadmap will identify the extent of carbon reduction and the CAPEX and OPEX costs over time.

We are proud to be working at the forefront of developing a Net Zero Energy system in the UK and Canada.

View our Engineering Net Zero reports

OUR SERVICES

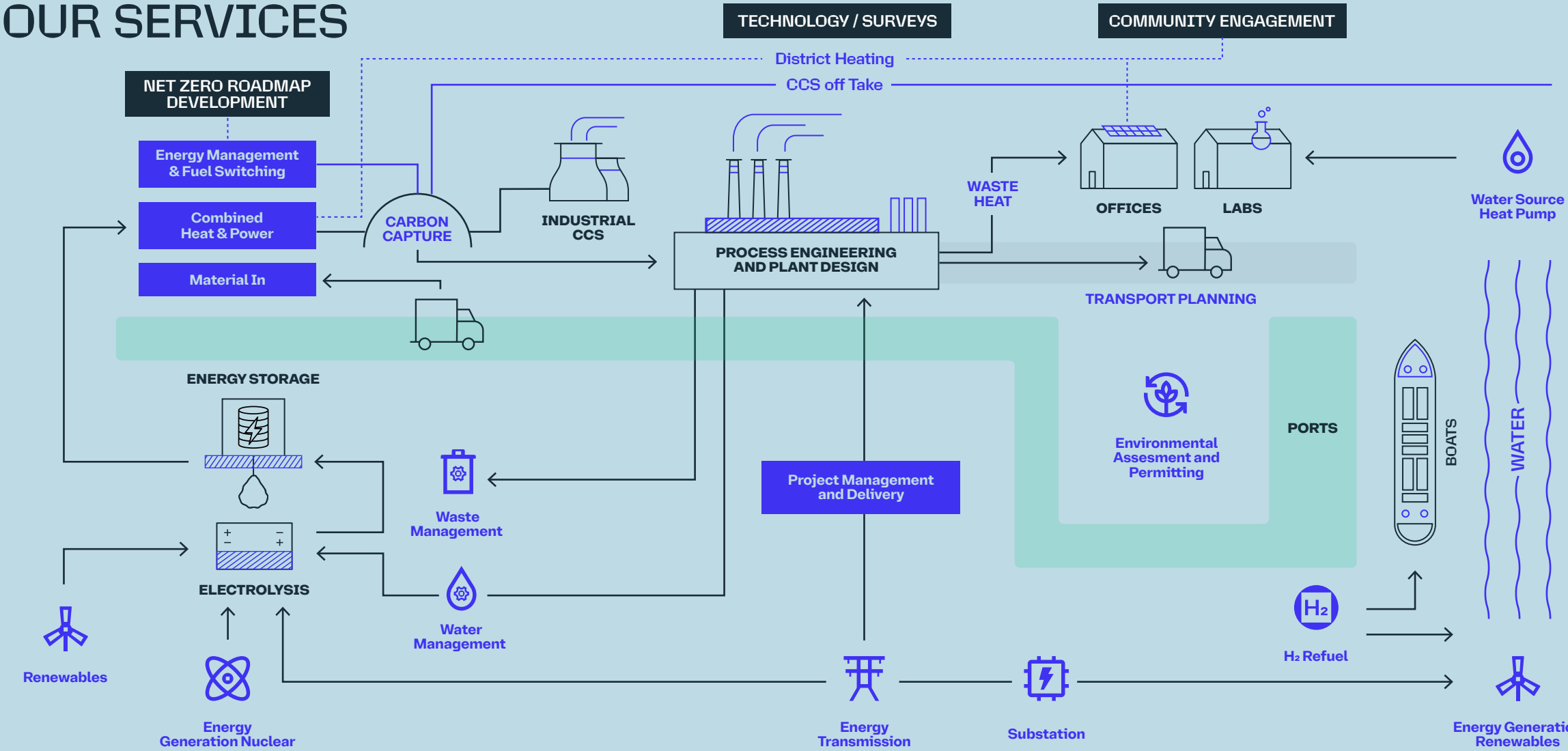


FIGURE 1 INDUSTRIAL DECARBONISATION LIFECYCLE

Engineering Net Zero

OUR SERVICES

ENERGY MANAGEMENT

Energy generation, transmission and storage are key to all areas of industrial processing and decarbonisation. Our whole system thinking provides end to end capability across the lifecycle of energy system assets, ensuring our clients' aspirations and commitments to Net Zero are achieved. We understand how to assess clients' energy needs and design a clean energy system through integrating equipment and infrastructure to maximise energy efficiency, reduce embodied carbon and create flexibility space for plant longevity. Our teams bring a wealth of knowledge on the design, integration and modelling of different energy supplies and systems including renewables, nuclear and green fuels.

FUEL SWITCHING / HYDROGEN

We are experienced at evaluating the use of hydrogen in industrial applications associated with production and supply. Our hydrogen team can evaluate supply options for your site and the challenges and solutions with implementing hydrogen into your Combined Heat and Power (CHP) or process. For more information please see our Low Carbon Hydrogen brochure.

INDUSTRIAL CARBON CAPTURE AND STORAGE (CCS)

We have many years' experience developing and delivering carbon capture and storage options within industrial and power settings. Our team of process engineers are familiar with pre and post combustion CCS solutions, and the transport and storage options which can be applied to specific sites. For more information, please see our CCS brochure.

ROADMAP GENERATION

Utilising our expertise, our teams work with energy intensive sites to identify low carbon scenarios to decarbonise their processes. We develop a benchmark data set of current emissions and energy use using our understanding of the site operations, and model technical solutions with associated costs, carbon emissions and timelines to identify the most suitable roadmap using our in-house industrial decarbonisation tools. This allows us to generate a bespoke low carbon roadmap for each site to help our Client's meet their net zero targets.

PROCESS ENGINEERING AND PLANT DESIGN

Our team of process engineers are familiar with products and methods for driving energy efficiency into your plant to reduce energy usage, OPEX and ultimately carbon emissions. A key value offering for our clients is the amount of practical construction and operations experience our personnel possess across all disciplines. We understand how to ensure option designs are constructable, maintainable and operable. Our teams understand how to work with operations during brownfield expansions and feed this knowledge into the design of greenfield developments.

PROJECT MANAGEMENT AND DELIVERY

Strong project management is essential for any successful project. AtkinsRéalis's project management methodology uses a variety of dashboards, reporting and digital tools to deliver projects safely and efficiently. We pride ourselves on agile execution with integrated cross-functional teams delivering customised solutions that focus on maximising CAPEX/OPEX, solving pain points and delivering long-lasting sustainable projects.

OUR SERVICES

ENVIRONMENTAL ASSESSMENT

Our team understand the natural environment is paramount in all phases of greenfield or brownfield development. We focus on solutions that meet the needs and expectations of stakeholders as well as comply with best practice and legislation throughout permitting, installation and operation. Our team can support baseline studies, impact assessments, environmental monitoring, waste management, decommissioning and demolition. We can also help ensure that any project implemented results in biodiversity net gain.

COMMUNITY ENGAGEMENT

We understand the criticality of sustainable and socially beneficial projects. Our teams work closely with those who live and work near projects that require development. We support clients in creating and managing community engagement strategies, social impact assessments, development initiatives and community partnerships.

TRANSPORT PLANNING

Transport options for incoming and outgoing material will be assessed to identify options to reduce emissions. We also work with customers to improve the design and monitoring of roads, and to undertake redesign and transport options analysis if changes are required. This can include construction traffic management, temporary parking and diversions.

TECHNOLOGY

Integration of technology is weaved into every project we deliver. We use digitalisation, integrated engineering, plant measuring and monitoring software and Artificial Intelligence solutions to identify and deliver the best solutions. Advanced data analytics and plant data capture including developing digital twins help to manage assets in a timely and cost-effective manner.

PORTS

Our team have acquired significant ports knowledge and expertise working on challenging development projects around the world. They can accelerate linkages to delivery between ports and industrial projects to ensure a Net Zero end to end solution.

WATER MANAGEMENT

Our areas of expertise are wide-ranging from specialising in protecting water sources and ensuring waterborne contaminants stay out of sensitive ecosystems, to meeting compliance with all regulators. We keep our clients' needs in mind and work closely with them to make sure this always happens. Whether we're designing a drinking water plant, figuring out how to treat and return wastewater safely to the ecosystem, or finalising a river management and flood defence strategy, our sustainable solutions are realistic, durable, and adaptable.

OUR EXPERIENCE AND CAPABILITIES

Delivered by our dedicated, in-house, low carbon technology specialists, our project and technical staff support our clients throughout the project lifecycle in the development, engineering, design, construction and commissioning of industrial facilities.

CONFIDENTIAL PHARMACEUTICAL MANUFACTURING CLIENT NET ZERO ROUTEMAP

This project delivered a zero-carbon route map for a pharmaceutical manufacturing client's process plant. The plant was their largest carbon emitter in the UK, with an existing 12.9 MWe gas-fired CHP unit producing the bulk of these emissions. The Client declared a company-wide target to make its sites zero carbon emissions by 2025.

AtkinsRéalis reviewed a range of potential options to enable the site to meet Net Zero, reviewing both the technical and financial suitability of each. The technical assessment was based on predicted site demand data, while the economic assessment considered available government support and relevant taxes to ensure the most suitable solution was identified.

During technical assessment, a range of options were considered. These included maintaining the existing CHP whilst installing a carbon capture plant or deploying hydrogen on site; to heat pumps and hot water networks for space heating.

AtkinsRéalis have continued to support the client with additional study work to help progress the deployment of the selected decarbonisation technology. As a result of this, the project is on track to achieve the decarbonisation targets initially set by the Client.

This case study demonstrates our expertise in decarbonisation and concept optioneering by developing a Net Zero route map of recommended project deployments and timelines depending on the client's preferred solution to demonstrate the options available and associated costs.

SYNGENTA INDUSTRIAL DECARBONISATION

The aim of this project was to achieve company-wide carbon emission reduction targets and reduced operating costs at the Syngenta Huddersfield manufacturing site.

The site uses a CHP energy centre to meet the steam and power requirements.

AtkinsRéalis carried out an optioneering study by producing a tool to create a baseline for the current site costs and carbon emissions for the energy centre. The tool was used to consider a total of twenty modifications against seven future operating scenarios where demand for steam and/ or power from the energy centre would change.

AtkinsRéalis produced a project roadmap based on the recommendations to guide the client on when strategic decisions must be made to achieve their emission reduction targets.

This case study demonstrates our expertise in decarbonisation and concept optioneering through the development of a tool to support data-driven strategic decisions. We provided the client with the information required to understand how different decarbonisation strategies would align with changes in demand for steam and power from their energy centre, and enabled them to improve efficiency and flexibility, and reduce carbon emissions.

CHESHIRE ENERGY HUB

This project helped identify low carbon options for the North West region of England.

AtkinsRéalis provided low carbon technology technical counsel and engineering knowledge to support the Client and provided project feasibility review/ assessment on the proposed concepts for the region. AtkinsRéalis helped develop outline business cases for Invest Net Zero Cheshire, a consortium including Cheshire and Warrington local enterprise partnerships and the Cheshire Energy Hub.

Our team provided support for two key areas: heat decarbonisation and low carbon fuel supply/refuelling.

The following concepts were considered as part of the project:

- Local heat networks.
- Industrial manufacturing site heat decarbonisation.
- Waste heat utilisation for greenhouses.
- Green hydrogen production.
- Food waste anaerobic digestion to biogas.
- Waste fleet decarbonisation.
- Hydrogen refuelling hub.
- Sustainable multi-vector refuelling hub including liquified natural gas.
- Compressed natural gas and electric vehicles.

These concepts were developed, and their technical feasibility was assessed for discussion with the client and key stakeholders.

This case study demonstrates our understanding and expertise across a broad range of low carbon technologies, applications, and industries.

Throughout, the AtkinsRéalis team supported the client by attending the required meetings with stakeholders to ensure challenges for each concept were understood on practical and commercial aspects, which were considered in the final recommendations and business case data.

INDUSTRIAL CCS ROADMAP FOR SCOTLAND

The aim of the study was to produce an industrial CCS roadmap for Scotland. The starting point of the study was to map current and future industrial emitters in Scotland.

Each emitter was allocated a score based on CO_2 capacity, access to potential transport and storage sites and CO_2 capture technology. The highest scoring projects formed the starting point of the roadmap.

Particular consideration was given to potential barriers to CCS development based on lessons learnt from the CCUS Commercialisation Programme.

This study highlights AtkinsRéalis' broad understanding of the applications of CCS across various sectors, aligning both technology with industry process and experience crafting a development programme to achieve longer term objectives.

The findings were used to present an industrial CCS roadmap for Scotland to the client. This has helped deliver a long-term CCUS strategy in Scotland through Project Acorn.

NET ZERO LEISTON

The aim of this project is to reach Net Zero carbon emissions in the Suffolk coastal town of Leiston.

The project is led by Leiston Town Council and the Leiston Together Board with financial and project management support from EDF. It is a 'whole system' approach to Net Zero master planning for a medium sized rural community.

AtkinsRéalis led the overall consultancy input to create a Net Zero route map, considering domestic and non-domestic buildings, infrastructure, transportation, agriculture, and community measures to reach Net Zero for the district of Leiston.

AtkinsRéalis provided services including boundary definition, calculation of baseline carbon emissions, identification and techno-economic assessment of carbon reduction and sequestration measures.

This case study demonstrates our expertise in decarbonisation, techno-economic modelling and route map development. AtkinsRéalis provided technical leadership in delivering Net Zero while also playing an integral role on stakeholder engagement, PR, and communications.

SEMBCORP INDUSTRIAL DECARBONISATION FEASIBILITY STUDY

AtkinsRéalis produced a feasibility study for new build and retrofit decarbonisation across three sites in the UK, including decarbonisation of utility supply and processes.

Using our low carbon technology expertise and in house decarbonisation tools, AtkinsRéalis are investigating the economic viability of decarbonisation options over the asset lifetime. This considers changes to current regulatory regimes, potential grant funding and expected changes to energy policy that will incentivise decarbonisation.

The assessment also considers the potential for greenhouse gas emissions reduction including nitrous oxide and methane. The scope covers fuel switching, renewable energy generation enabling and CCS technologies.

NESTLE NET ZERO CARBON STRATEGY UK

AtkinsRéalis were selected as Nestle's engineering partner to provide decarbonisation services across their UK sites. This included developing an energy strategy, performing carbon assessments, mechanical and electrical engineering and carbon accounting.

Focusing initial work on Nestle's larger sites, AtkinsRéalis identified a range of options to decarbonise the sites including replacement of steam heating with hot water systems and heat pumps where feasible, anaerobic digestion to produce fuel gas and removal of existing gas fire CHP assets.

The solutions identified demonstrated the potential for significant carbon savings with sensible payback timeframes. This will help Nestle's wider decarbonisation strategy, with the models proposed for the larger sites providing a template for other sites to decarbonise across their manufacturing portfolio.

INDUSTRY OF THE FUTURE PROGRAMME

AtkinsRéalis delivered the Industry of Future Programme (IFP) Scoping Study for the UK Government, Department for Energy Security and Net Zero (DESNZ). Throughout this programme, AtkinsRéalis generated more than 45 net zero roadmaps for 15 industrial sites across the UK.

The programme focussed on dispersed sites, which are industries located outside of the major UK industrial clusters and the sites were split across seven sectors – paper, chemicals, minerals, food & drink, waste water, pharmaceuticals and transportation.

Each roadmap was developed using our industrial decarbonisation tools, to identify the most feasible roadmap for each site regarding both the technical and economic viability.

This provided a fast, effective and consistent approach to roadmap generation and each industrial partner received a roadmap report summarising findings. By comparing different decarbonisation technologies, AtkinsRéalis were able to identify the major blockers to reaching decarbonisation and how this would affect the solutions proposed.

The outputs included a final publishable report for DESNZ that detailed key findings for each site. DESNZ also received the Roadmap Reports, together with an Overview Report which outlined the findings from the industrial partners, increasing government and market understanding, and influencing government decision making around what could be done to help different industries meet the targets.

This programme will aid the sites to seek funding, using the report as a good foundational basis for investment to reach the 2050 targets and mobilising them on their Net Zero journey.

OUR LOW CARBON TRACK RECORD

Over 100 years ago we made our mark while the energy sector was undergoing a major transformation.

Today, as a new energy paradigm emerges, our clients recognise us for our sustainable project execution and tangible contributions to improving people's lives around the world.

Our teams are based in the UK, Europe, Middle East, Canada and the United States.

Across the globe AtkinsRéalisRéalis has 36,000 engineering and project management staff with over 3,000 working on low carbon energy projects. Our experts deliver offshore wind, hydroelectric, carbon capture, hydrogen and power distribution projects.

LEADING INDUSTRY BY EXAMPLE

TRANSMISSION & DISTRIBUTION

We work with National Grid, Office of Gas and Electricity Markets (OfGEM), and Energy System Operators (ESOs) to support the transformation of the grid to support increased decentralisation of supply from renewables. We provide services in network planning and development, power system modelling, High Voltage and Low Voltage substation Front End Engineering Design and detailed design and support to utility regulation.

Boniface.Chileshe@atkinsrealis.com

CARBON CAPTURE

We delivered SaskPower's groundbreaking Integrated Carbon Capture and Utilisation initiative in Saskatchewan, Canada. We have completed feasibility, concept and FEED studies for carbon capture projects for Drax, Energy Technologies Institute, SSE, National Grid, the Department for Business Energy and Industrial Strategy (BEIS) and the International Energy Agency. AtkinsRéalisRéalis is the owner's engineer for the pioneering Whitetail Clean Energy project on Teesside in the UK.

Julie.Gilmour@atkinsrealis.com

LOW CARBON HYDROGEN

We work closely with our clients to support them through all stages of their projects. We have provided concept design and optioneering for TAQA, EDF and the Energy Technology Institute as well as being appointed owner's engineer for SSE. Our services cover hydrogen production from electricity, heat or reforming fossil fuels with carbon capture and storage as well as hydrogen storage and distribution networks.

Rachael.Eatwell@atkinsrealis.com

ENERGY STORAGE

Our energy storage team specializes in the subsurface storage of hydrocarbons and clean energy products such as hydrogen and compressed air. As owner's engineer for Nord West Kavernengesellschaft (NWKG), we provided technical and project management services across NWKG's operational assets. We are a long-term delivery partner to SSE Gas Storage and have advised the Energy Technologies Institute on salt cavern behavior when operated in a hydrogen storage system.

Christopher.Mcmichael@atkinsrealis.com

NUCLEAR

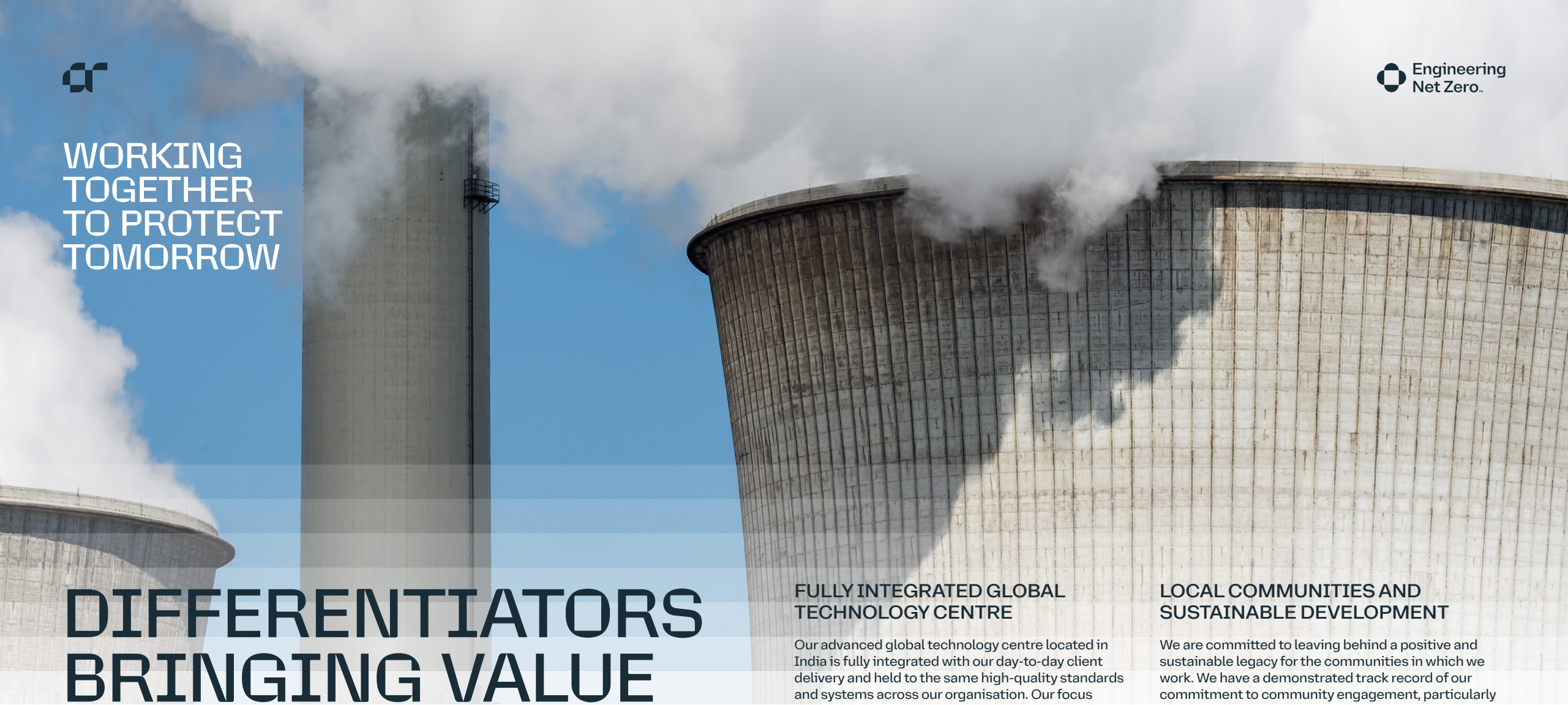
We work alongside our clients to provide unparalleled support throughout the entirety of the nuclear lifecycle. We are working on projects to realise the benefits of nuclear generation in a low carbon energy system, including for hydrogen generation and direct air carbon capture. We are also heavily involved in the future of nuclear power developing small modular reactors (SMRs) and fusion projects.

Jason.Dreisbach@atkinsrealis.com

WIND & RENEWABLES

We carry out design, geotechnical, environmental, asset integrity and life extension work on offshore and onshore wind turbines for developers in the UK and globally. We provide transmission and distribution services for offshore wind connectivity to the grid and we integrate renewable energy with hydrogen generation projects.

Rupert.Green@atkinsrealis.com



Engineering Net Zero™

WORKING TOGETHER TO PROTECT TOMORROW

DIFFERENTIATORS BRINGING VALUE TO OUR CLIENTS

FULLY INTEGRATED GLOBAL TECHNOLOGY CENTRE

Our advanced global technology centre located in India is fully integrated with our day-to-day client delivery and held to the same high-quality standards and systems across our organisation. Our focus on investing in the best tools and data processing capabilities and a team that has delivered hundreds of projects all over the world provides our clients the opportunity to achieve lower costs, and longer working hours – seamlessly.

LOCAL COMMUNITIES AND SUSTAINABLE DEVELOPMENT

We are committed to leaving behind a positive and sustainable legacy for the communities in which we work. We have a demonstrated track record of our commitment to community engagement, particularly in industrial work locations, delivering:

- Skills training and mentoring programs
- Involvement in our local community's organizations
- Traditional knowledge and community studies
- Assistance in education and health services
- Permitting and approvals

NET ZERO CARBON. NET ZERO EXCUSES.

Engineering Net Zero™

engineeringnetzero.com

atkinsrealis.com

Julie Gilmour
Industrial Decarbonisation Lead

Julie.Gilmour@atkinsrealis.com

AtkinsRéalis