

North East
Local Enterprise Partnership



North East *Energy for Growth*



The North East Local Enterprise Partnership thanks those individuals and organisations which have contributed to shaping the Energy for Growth strategy.

Advance Northumberland	Newcastle University
Advanced Electrical Machines	North East Automotive Alliance
Avid Technology	North East Chamber of Commerce
Connected Energy	North East Combined Authority
Department for Business Energy and Industrial Strategy	North East Procurement Organisation
Department for International Trade	North of Tyne Combined Authority
Durham County Council	North Tyneside Council
Durham Energy Institute	Northern Gas Networks
Durham University	Northern Powergrid
Element Energy	Northumberland County Council
Energy Systems Catapult	Northumbrian Water
Environment Agency	Offshore Energy & Subsea Technology hub
Federation of Small Businesses	Offshore Renewable Energy Catapult
Gateshead College	Port of Blyth
Gateshead Council	Port of Sunderland
GHD	Port of Tyne
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Executive summary

Following wide stakeholder engagement, the North East Local Enterprise Partnership (North East LEP) has led development of this energy strategy, '*Energy for Growth*', as part of the Department for Business, Energy and Industrial Strategy (BEIS) local energy programme. The North East LEP will assist in developing this strategy into a pipeline of strategic projects via the *Energy for Growth* programme. Its overarching vision is to:

'Drive growth in the North East while delivering on national energy objectives'

This *Energy for Growth* strategy sits against a national policy landscape set out by the UK's Industrial Strategy and Clean Growth Strategy in particular. These documents outline ambitious commitments to decarbonise the UK's economy, while stimulating growth, improving productivity, and meeting national and international climate commitments.

Within the foundations of productivity set out in the Industrial Strategy, the North East has a unique range of assets, capabilities and structures which give it a crucial role in delivering national policy, and make energy a key theme for the regional economy. These are outlined below:

An overview of the North East's energy context

Ideas: The North East is home to a suite of energy demonstration and innovation assets which offer a powerful test-bed for business and research. These assets are innovating, testing, demonstrating, and validating energy technologies, challenges and processes. They feed into the cutting edge of energy science and research. As the UK transitions to clean growth, responds to new consumer demands, and emerging energy challenges, these assets can play a crucial role in de-risking and commercialising new technologies.

People: The North East's energy sector is supported by an extensive research and education base. This keeps the region at the forefront of the energy agenda, with leading-edge knowledge constantly being created and shared. The North East is also contributing to defining and providing the pipeline of skills required for the energy sector in the future, and for the transition to clean growth.

Infrastructure: The North East benefits from excellent national and international transport connectivity, through an international airport, excellent national rail and road links. Together with availability of land, for example through key development sites such as enterprise zones, this supports businesses in the energy sector to be highly competitive. The region is home to a globally significant offshore energy and subsea technology cluster, which is supported by a comprehensive infrastructure offer around the three major ports in the region. Local gas and electricity distribution network operators provide regular information on network capacity and investment plans, to help inform new developments for the future energy system.

Business environment: The energy sector is central to the North East's economy, with an innovative community of businesses creating wealth, skills, and jobs across various aspects of the sector. Building on existing strengths and capabilities, the energy sector presents a huge ongoing opportunity for the region. Particular opportunities to drive economic growth and deliver more and better jobs include continuing growth and diversification of an already globally important offshore energy and subsea cluster, and developing technologies at the intersection of energy systems, alternative propulsion and automotive.

Place: The North East LEP covers seven Local Authority areas: County Durham, Gateshead, Newcastle, North Tyneside, Northumberland, South Tyneside and Sunderland. Each is home to specific energy assets and opportunities, while contributing to the regional context and pipeline (see Appendix 1). The North East is also an important contributor to the energy agenda across wider geographies. This includes across the Northern Powerhouse, the Borderlands project, the North East, Yorkshire and Humber (NEYH) energy hub, and through national sector deals and challenges. The wider North has a well-established energy heritage, with the region's role in the sector embedded in local culture. The North was historically a powerhouse for the country, with a long history of centralised power generation. It is now playing a



world-leading role in agendas such as offshore energy, renewables, and development of hydrogen technologies.

An assessment of this context, analysis of sub-national energy data, and results of extensive cross-sector stakeholder engagement, highlight a number of strategic energy themes for the North East. Delivering a coordinated strategic approach around these themes could contribute significantly to national goals, while driving additional regional growth and benefit.

The strategic energy themes identified for the North East are outlined below. A gap analysis of these themes against national policy, and the results of an initial prioritisation exercise with partners, can be found in Appendix 2 and 3 respectively.

North East strategic energy themes

<i>Offshore energy and subsea technology</i>	The North East's offshore energy and subsea technology cluster is nationally and globally important. The region stands to benefit from both new and existing global market opportunities in offshore wind and oil and gas. Supporting employment, competitiveness and productivity in this sector is a strategic energy opportunity for the North East.
<i>Infrastructure intelligence</i>	Energy infrastructure is critical in enabling economic and business growth, and supporting communities through the transition to clean growth. As new demands are placed on this infrastructure, a clear and coordinated sharing of intelligence between end-users and network operators is essential. This would create an evidence base for informed decision making and mutual benefit.
<i>Fuel poverty</i>	Fuel poverty is a prominent energy concern for the North East, which is a critical region in achieving national objectives. The North East is therefore well-placed to explore and deliver new policy, investment, technology or partnership approaches to addressing fuel poverty. Addressing fuel poverty also has wider social, environmental and economic benefits for the region.
<i>Domestic Energy</i>	Due to its notable domestic energy trends, and high proportion of energy use in the domestic sector, the North East is an important region in meeting national domestic energy goals. This is both in terms of delivering domestic energy improvements at scale, and in terms of exploring new domestic fuels, particularly for decarbonising heat.
<i>Off-grid domestic energy</i>	The North East has a likely concentration of communities both off the gas network and a significant distance from a network connection. This can lead to use of carbon intensive and expensive energy sources, and exacerbate fuel poverty. Exploring business models, technologies and policy approaches for off-grid domestic energy is an important regional energy theme.
<i>Industrial, commercial and public estate</i>	Industrial and commercial energy is an underlying factor influencing productivity and competitiveness. The North East's considerable energy consumption in the public estate also presents an opportunity to explore collaborative deployment of interventions at scale, perhaps through new business models or with new technologies.
<i>District energy</i>	There is a nationally significant potential pipeline of district energy schemes within the North East. De-risking and commercialising these schemes could increase the likely scale and pace of delivery, and the realisation of wider social, environmental and economic benefits. This is a significant strategic opportunity for the region, and in the national decarbonisation of heat.
<i>Mine energy and geothermal heat</i>	The North East has significant potential for deployment of mine energy and deep geothermal heating schemes. The region can play a national role in commercialising this technology for decarbonisation of heat, by progressing a regional project pipeline. Implementing such schemes could also deliver wider social and economic benefits, potentially in deprived, fuel poor and off grid communities.
<i>Community energy</i>	The North East has a relative lack of community energy projects, which could deliver substantial social, economic and environmental benefits. Sharing of best practice or exploration of how schemes could be aggregated, address skills gaps and access finance, could unlock further implementation.
<i>Large-scale renewables</i>	The North East is an important region for the continuing deployment of large scale renewable energy, for example onshore wind, solar PV. This is both in terms of coordinating potential for single large scale developments, and large scale rollout of domestic micro generation. The region also has an important role in continuing innovation to reduce costs of such technologies.
<i>Energy flexibility</i>	The North East could leverage existing experience and expertise to maximise deployment of energy flexibility schemes. The region can also play a central role in the development of the UK energy flexibility industry. Collaborative exploration of business models, or aggregation of schemes for favourable terms, could help de-risk and deploy an emerging pipeline of schemes.
<i>Low emission transport and advanced propulsion</i>	The North East can combine its energy and automotive capabilities, and play a national role in developing technologies at the intersection of advanced propulsion and energy systems. Deployment of low emission



	transport infrastructure is vital to serve regional communities, and transitioning commercial fleets presents opportunities for collaborative strategy.
Demonstration and innovation	The North East's energy demonstration and innovation assets play a crucial national role in accelerating the transition to clean growth, generating exportable intellectual property, and creating new growth and investment opportunities in the region. Fully mapping and coordinating capabilities could help maximise these opportunities.

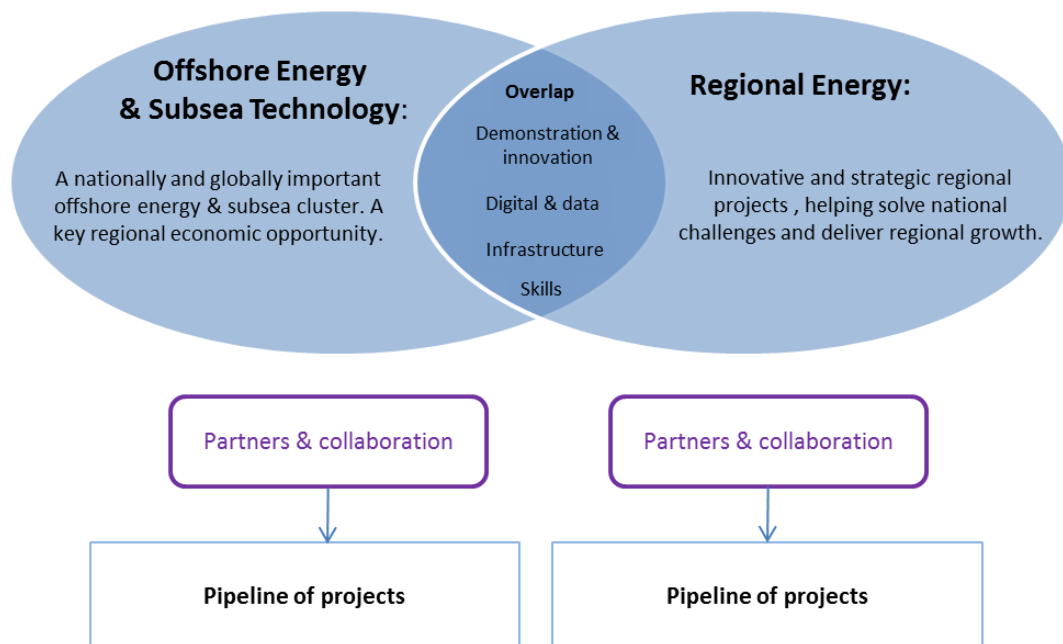
The North East LEP will work with cross-sector partners to facilitate development of the strategic themes into a regional project pipeline through the *Energy for Growth* programme. The programme seeks to coordinate activity at a regional level, where strategic interventions can drive economic growth, job creation and competitiveness, while meeting national goals. Its objectives are to:

- Bring together regional and national energy stakeholders
- Identify and prioritise strategic energy opportunities
- Facilitate delivery support for a strategic energy project pipeline
- Constructively identify challenges and support needs
- Communicate North East energy strengths and activity.

The programme is structured around two discrete workstreams; 'Offshore Energy & Subsea Technology' and 'Regional Energy'. Offshore Energy & Subsea Technology focuses on a key industrial sector, with a specific set of stakeholders and a distinctive economic opportunity. The Regional Energy workstream is focused on identifying and facilitating regional project opportunities across power, heat and transport.

An overview of the North East LEP's energy programme:

Energy for growth



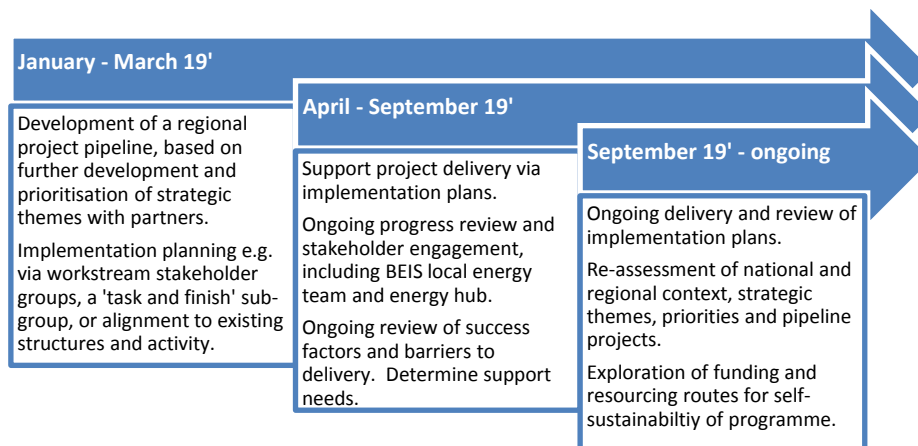
Areas of overlap between these two workstreams, provide scope to explore sector-wide interventions or activities. Most notably this includes energy demonstration and innovation capabilities, and cross-cutting agendas around digital and data, infrastructure, and skills.

The North East LEP facilitates two stakeholder groups which help shape a regional agenda for each workstream, providing advice on opportunities for collaboration, growth and job creation. These groups will be actively engaged to further develop the themes into a project pipeline, defining next steps and a delivery approach. All strategic themes may not be included within the immediate project pipeline, subject to prioritisation of activity.

The North East LEP, working with partners, will also seek to align the energy project pipeline to wider geographies and activity where this may add value. This may include national sector deals and challenges, the Northern Powerhouse, the North East, Yorkshire and Humber (NEYH) energy hub, the Borderlands project, or regional digital, skills, business growth or innovation agendas.

An indicative timeline for development and delivery of an implementation plan around the strategic themes is outlined below.

Outline pipeline development and delivery plan:



The North East LEP, working with national and regional stakeholders, will facilitate activity in-line with this outline pipeline development and delivery plan. Progress against this strategy, plan, and project pipeline will be monitored by the North East LEP Board on at least an annual basis.

Other bodies and structures involved in the resulting project pipeline will help determine the consultation and monitoring requirements of individual projects, to ensure their own reporting requirements are met. The BEIS local energy team and NEYH energy hub will also be regularly updated on progress around the Energy for Growth strategy and project pipeline as appropriate.

The project pipeline, and the wider *Energy for Growth* strategy, will also inform the North East LEP's Local Industrial Strategy. It will help shape the approach to this area of opportunity for the regional economy, including identifying an energy inward investment focus, innovation agenda, and pipeline of projects and capabilities to contribute to Grand Challenges.

Parties with an interest in the strategic themes outlined, or the *Energy for Growth Strategy* more generally, are invited to get in touch to explore opportunities to share work or collaborate, at the contact details below.

Andrew Clark
Programme Lead: Energy

North East Local Enterprise Partnership

+44 0191 338 7452 | +44 07775 003238 | Andrew.Clark@nelep.co.uk

northeastlep.co.uk | @northeastlep

Delivering more and better jobs

Introduction

The North East Local Enterprise Partnership (North East LEP) has led development of this energy strategy, '*Energy for Growth*', as part of the Department for Business, Energy and Industrial Strategy (BEIS) local energy programme

Through the BEIS local energy programme, all Local Enterprise Partnerships (LEPs) have been tasked with developing an energy strategy for their geography. These strategies will identify regional strengths, challenges, and opportunities which align to national policy across power, heat and transport.

The strategies will raise awareness of these regional strengths, challenges and opportunities, to gain buy-in for collaborative implementation, and to help shape a pipeline of strategic projects to be supported through delivery. Wide stakeholder engagement has been undertaken by the North East LEP to shape this strategy in-line with the regional energy context, activity and opportunities.

Underpinning this work, and the *Energy for Growth* strategy, is the North East LEP's Strategic Economic Plan (SEP). The SEP identifies the energy sector as an area of the regional economy with significant existing strengths and distinctive growth opportunities. These opportunities include the North East's global excellence in offshore energy and subsea technologies, as well as a range of regional energy systems assets and opportunities.

This *Energy for Growth* strategy will build upon the commitment within the SEP to drive this area of opportunity, and will provide a basis to focus SEP programmes of delivery on the opportunities and challenges of this area of our economy. It will define strategic energy themes for the region which can contribute towards national policy goals, while improving regional competitiveness, productivity and employment. With these combined aims, the vision of *Energy for Growth* is to:

'Drive growth in the North East while delivering on national energy objectives'

To meet this vision the North East LEP, through its *Energy for Growth* programme, will work with partners to develop activity around the strategic themes identified. This programme will focus on activity which positively impacts regional GVA and creation of more and better jobs. Energy sector activity can do this in a number of ways, shown in figure 1 below.

Figure 1, How energy activity can impact regional GVA and creation of more and better jobs





National policy context

The UK's Industrial Strategy and Clean Growth Strategy outline ambitious commitments to decarbonise the UK's economy, while stimulating growth, improving productivity, and meeting national and international climate commitments. This transition to clean economic growth has significant implications for our energy system, and forms the policy context for this strategy.

Industrial Strategy

The UK's Industrial Strategy¹ aims to boost productivity, stimulate job creation, and increase the earning power of people throughout the UK with investment in skills, industries and infrastructure. To deliver on this it aims to:

- **Strengthen the five foundations of productivity:**
 - *Ideas* – the world's most innovative economy
 - *People* – good jobs and greater earning power for all
 - *Infrastructure* – a major upgrade to the UK's infrastructure
 - *Business environment* – the best place to start and grow a business
 - *Place* – prosperous communities across the UK.
- **Build strategic partnerships through Sector Deals between government and industry**
- **Take on 'Grand Challenges'; society-changing opportunities and future industries:**
 - *AI & data* – putting the UK at the forefront of the AI and data revolution
 - *Ageing society* – using innovation to meet the needs of an ageing society
 - *Clean growth* – the advantages for UK industry from the global shift to clean growth
 - *Future of mobility* – becoming a world leader in shaping the future of mobility

The Industrial Strategy sets out clean growth as one of four 'Grand Challenges' to put the UK at the forefront of the industries of the future. This transition to cleaner economic growth, through low carbon technology and efficient use of resources, is described as one of the greatest industrial opportunities of our time.

The UK's historic role at the forefront the global move to clean growth is reiterated, with recent success in cutting emissions by more than 40% since 1990 while growing the economy by two thirds. The Strategy outlines the UK's world-leading capabilities in areas such as electric vehicles, offshore wind and smart energy systems, and the opportunity for UK businesses to maximise their share of global markets as they are transformed.

Early priorities for action to establish and extend UK leadership in clean growth are defined as:

- ***Develop smart systems for cheap and clean energy across power, heating and transport***
- ***Transform construction techniques to dramatically improve efficiency***
- ***Make energy-intensive industries competitive in the clean economy***
- ***Put the UK at the forefront of the global move to high-efficiency agriculture***
- ***Make the UK the global standard-setter for finance that supports clean growth***

The importance of cross-sector collaboration, in particular between public and private sector actors, the need for innovation, and local leadership in implementing the Industrial Strategy are highlighted throughout.

¹<https://www.gov.uk/government/publications/industrial-strategy-building-a-britain-fit-for-the-future>



Clean Growth Strategy

The Clean Growth Strategy² sets out the approach to decarbonising all sectors of the UK economy, and meeting legal requirements of the Climate Change Act. It states two guiding objectives:

1. **To meet domestic commitments at the lowest possible net cost to UK taxpayers, consumers and businesses; and,**
2. **To maximise the social and economic benefits for the UK from this transition.**

The UK is described as being well placed to take advantage of the economic opportunities which stem from international climate agreements. This is due to existing low carbon industries, a wide research base, expertise in high-value service and financial industries, and a supportive regulatory framework for innovation and development of leading edge technology,

For example, the Paris Agreement will require an estimated \$13.5 trillion of public and private investment in the global energy sector alone between 2015 and 2030. Potential growth of the UK low carbon economy is estimated at 11% per year between 2015 and 2030. This is four times faster than the rest of the economy, and could deliver between £60 billion and £170 billion of export sales of goods and services by 2030.

While outlining the significant opportunity to capture part of this global investment, the Clean Growth Strategy also sets out the challenges associated with achieving domestic commitments, such as the carbon budgets, while expanding the economy.

While significant recent success has been achieved in the power and waste sectors, this will need to be replicated across the economy, particularly in transport, business, industrial and domestic sectors.

Key policies and proposals in the strategy seek to drive down emissions throughout the 2020s. Focus areas are set out in sectors which will need to see the greatest technological breakthrough or large scale deployment if the fifth carbon budget is to be met through domestic action:

- **Improving Business and Industry Energy Efficiency – 25% of UK Emissions.** Enable businesses and industry to improve energy productivity by at least 20% by 2030.
- **Improving Our Homes – 13% of UK Emissions.** Ensure policies encourage people to improve their homes where cost effective and affordable.
- **Accelerating the Shift to Low emission transport – 24% of UK Emissions.** Almost every car and van to be zero emission by 2050, cycling and walking the natural choice for shorter journeys by 2040, continued modernisation of aviation and shipping sectors.
- **Delivering Clean, Smart, Flexible Power – 21% of UK Emissions.** Develop low carbon, cheap and clean sources of electricity. Upgrade our electricity system so it is smarter, flexible and takes advantage of developing technologies such as storage.
- **Enhancing the Benefits and Value of Our Natural Resources – 15% of UK Emissions.** Maximise resource efficiency and productivity, minimise negative impacts from resource use, with an ambition for zero avoidable waste by 2050. Reduce emissions from natural resources and increase tree cover, enhancing our carbon sink.

²<https://www.gov.uk/government/publications/clean-growth-strategy>

- **Leading in the Public Sector – 2% of UK Emissions.** Set longer term emissions reduction targets across the public sector, encourage transparent reporting. Address barriers to energy efficiency and low carbon investment such as access to finance.

Innovation is highlighted as fundamental to achieving clean growth, nurturing new technologies, processes and systems, and driving down costs. To this end the Clean Growth Strategy outlines a £2.5 billion targeted Government investment between 2015 and 2021.

The North East energy context

Within the foundations of productivity set out in the Industrial Strategy, the North East has a unique range of assets, capabilities and structures which give it a crucial role in delivering national policy, and make energy a key sector for the regional economy.

Ideas

Innovation is crucial as the UK seeks to enable clean economic growth, respond to new consumer demands, meet emerging energy challenges, and capitalise on global market opportunities. The North East is home to a suite of energy demonstration and innovation assets which are enabling innovation, and which offer a powerful demonstration test-bed for business and research.

These assets are innovating, testing, demonstrating, and validating energy technologies, challenges and processes. They feed into the cutting edge of energy science and research, and can play a crucial in de-risking and commercialising new technologies.

The North East's energy demonstration and innovation assets include:

Offshore Renewable Energy (ORE) Catapult, National Energy Centre

The £150 million ORE Catapult's National Renewable Energy Centre in Blyth houses world-leading test, validation and demonstration facilities. These specialise in testing wind, wave and tidal energy technology, including the world's largest open-access facilities for testing both wind turbine blades and powertrains, and the only UK centre for testing of offshore cables.

The catapult is also upgrading its research infrastructure by installing one of the world's most advanced grid emulation systems, the 'e-grid'. The 18MVA system allows simultaneous testing of mechanical and electrical systems. AC grid voltage, current, frequency and power balance can be emulated, allowing simulation of abnormal conditions which may be experienced in the field.

The Catapult's clients and partners include multi-national businesses, investors, local authorities, SME's, start-ups and universities.

Tyne Subsea

Tyne Subsea is a purpose built specialist hyperbaric testing, certification and research facility. Unique chambers allow testing of deep water equipment in a range of pressure ratings, orientations and temperatures. This includes capabilities to simulate water depths to 6,000 meters, to test components to -2°C, and to accommodate bigger products in a large chamber with an internal diameter of 2.5 meters.

A local partnership between British Engines and Newcastle University, Tyne Subsea combines a heritage in subsea engineering with access to leading research. It places the North East at the forefront of innovation for offshore energy technology in hazardous environments.

³<https://www.renewableuk.com/news/420533/Offshore-Wind-Industry-Prospectus.htm>



National Centre for Energy Systems Integration (CESI), Newcastle University

CESI is a £20 million multi-institutional, multi-discipline industrial research consortium investigating the future energy challenges for the UK. Led by Newcastle University and partnering with other UK Universities such as Durham. The research undertaken encompasses the whole energy system, including heating, cooling, electricity and transport, taking into account generation, distribution and demand as well as policy, economics and regulation.

Researchers utilise innovative demonstrator facilities to test, validate and improve our understanding of the value of taking a flexible whole systems approach to energy. These include the Newcastle Helix urban development of office space, energy efficient home, and University buildings within the heart of the City.

Researchers also investigate rural energy systems at Cockle Park Farm, Northumberland. The farm houses an anaerobic digester which uses farming waste to produce biogas, fuelling a combined heat and power system. CESI are lead research partners in the InTEGREL facility in Gateshead.

Supergen Energy Networks Hub, Newcastle University

The Supergen Energy Networks Hub brings together academia and industry, with the aim of gaining a deeper understanding of the interactions and inter-dependencies of energy networks. The Hub, led by Newcastle University, integrates a wide range of industrial and academic partners with other energy network stakeholders. Its research is carried out by a consortium of Universities (Newcastle, Manchester, Cardiff, Bath and Leeds), and addresses the challenges of technology, policy, data, markets and energy network risk.

Integrated Transport, Electricity, and Gas Research Laboratory (InTEGREL)

The Integrated Transport Electricity and Gas Research Laboratory (InTEGREL), in Gateshead, is the UK's first full scale integrated energy systems R&D facility. InTEGREL, led by Northern Gas Networks working with Northern Powergrid and Newcastle University, provides a space for industry, academia, SME's and government to explore and test new energy technologies.

Through fully integrating transport, electricity and gas systems, the site gives the North East a leading role in de-risking and commercialising emerging energy systems solutions. When fully complete it will host a battery storage and research lab, domestic appliances and smart system demonstration homes, as well as hydrogen and compressed national gas refuelling stations for vehicles.

Durham Energy Institute (DEI), Durham University

DEI supports and produces cutting-edge energy research, drawing upon the expertise of world leading researchers across Durham University's departments in science, social science and humanities.

The DEI, now recognised as an internationally leading institution, was founded on the recognition that solving energy challenges requires collaboration across the boundaries of conventional disciplines. Approaching research in a new way, across departments, enables the DEI to address challenges and develop a range of unique expertise in areas such as wind, solar and geothermal energy, biofuels, smart energy systems, and carbon capture and storage.

The DEI is helping to shape the thinking of both national policy makers and industry. DEI geothermal energy research has been discussed in parliamentary debates, and strategic partnerships between with energy sector organisations such as Ørsted are linking new research directly with industry needs.

More widely, the DEI is bringing international collaborators to the North East from countries such as India, Malaysia, and Mexico to develop new approaches on topics such as organic energy research. The institute emphasises a 'Science and Society' approach to energy, tackling societal aspects of energy alongside developing new energy technologies.



Smart Grid Lab, Newcastle Helix

The UK's largest smart grid project, the Smart Grid Lab integrates a £2 million energy storage test bed with a full scale smart grid on the Newcastle Helix site. This allows simulation of distribution networks under future scenarios in a real-time network simulator, to understand how smart grids will help meet future energy challenges.

The facilities are the result of a partnership between Newcastle University and industrial partners Northern Powergrid and Siemens, demonstrating the region's pedigree in engaging industry with state of the art laboratory facilities.

Innovation SuperNetwork

The Innovation SuperNetwork's is the first of its kind in the UK, a network of over 50 partners and 5,000 businesses working to generate new ideas, market opportunities, and knowledge. It exists to increase connectivity and collaboration between the region's business community, to enhance innovation and share best practice.

The SuperNetwork's activities include running regional conferences, facilitating innovation challenges across its network, and leveraging relationships to enable businesses to access money for growth.

Supported by partner organisations, and delivering projects funded by European Regional Development Fund, the SuperNetwork has strategic alignment to the North East LEP. Activities and challenges are often related to the regional areas of opportunity outlined in the SEP, such as energy, helping connect organisations across sectors to create new energy innovations, market opportunities, and grow energy businesses.

People

The North East's energy sector is supported by an extensive skills, research and education base, with strong links into local, national and global industry. This keeps the region at the forefront of the energy agenda, with leading-edge knowledge constantly being created and shared.

The North East is also contributing to defining and providing the pipeline of skills required for the energy sector, and for the transition to clean growth. The North East's skills, research and education base include:

Newcastle University

Energy is one of the largest areas of teaching and research for Newcastle University, and it has one of the largest marine technology groups in the world. Newcastle University leads the National Centre for Energy Systems Integration and the National Centre for Subsea and Offshore Engineering.

Its Blyth Marine Station hosts the Emerson Cavitation Tunnel and facilities for studying coatings, fouling and hydrodynamics. Its teaching includes degree apprenticeships in power engineering, a large suite of undergraduate engineering degrees, and masters courses including Offshore Engineering and Renewable Energy.

Newcastle University is a global principal partner with engineering and technology giant Siemens, and has strong relationships with industry and many companies located in the region including Tyne Subsea, BEL Valves, Reece Group, and Soil Machine Dynamics (SMD).

Northumbria University

Ranked in the top 300 for engineering and technology in the Times Higher Education's World University subject rankings 2018, Northumbria University offers courses in Electrical Power Engineering (MSc), Renewable and Sustainable Energy Technologies (MSc), and has an expanding degree apprenticeship programme. It has established links with major energy companies in the region, and has delivered a bespoke master's course for a global oil company.



Durham University

Durham University through its Energy Institute is one of the key national research centres for renewable energy. There is an emphasis on science and society that provides Durham with a unique socio-technical approach to energy research and teaching. Durham offers a series of related masters courses along with a Centre for Doctoral Training in Energy, offering significant interaction with both local and international companies.

Newcastle College

Based on the North bank of the Tyne, the Newcastle College Energy Academy provides a centre of innovation, training and development for the energy sector. The academy delivers qualifications from level two through to degree level in energy technologies, manufacturing and maintenance, as well as apprenticeships.

Courses include a level two and three in Welding and Fabrication, level three in Renewable and Subsea Engineering, and Foundation degrees (FdEng) in Renewable Energy Technology and Subsea Engineering. The Energy Academy has successfully developed a Maintenance and Operation Engineering Technician apprenticeship for the wind energy and subsea sectors.

Gateshead college, Zero Carbon Futures

Zero Carbon Futures, a subsidiary of Gateshead College, was set up in 2011 as an independent consultancy specialising in low carbon vehicle technologies. The company develops electric vehicle infrastructure, and has managed a range of projects to increase electric vehicle uptake. Its ultimate aim is to research and develop new and emerging technologies, as low carbon vehicles move into the mainstream and become a major part of our transport system.

Infrastructure

Infrastructure is vital in enabling businesses to be productive and competitive in the North East, and therefore to creating more and better jobs. Transport connectivity and availability of land are crucial in supporting energy sector businesses to thrive, and in encouraging them to locate in the North East.

In particular, the North East is home to a globally significant offshore energy and subsea technology cluster. Many organisations in this cluster are located around, or rely on, the comprehensive infrastructure offer around the region's three major ports.

Energy security, sustainability, accessibility and affordability are also an important part of the regional infrastructure offer. The capacity of regional energy distribution networks, and long term development plans, are a key consideration for businesses considering locating in the North East. Key aspects of the North East's infrastructure capabilities, supporting the energy sector, are:

Energy Gateway, offshore energy and subsea technology

The North East is a well connected 'Energy Gateway', with a long-established capability and easy access to global offshore energy and subsea technology markets. The region also provides excellent access to key North Sea oil and gas fields, and offshore wind development sites such as Dogger Bank, Firth of Forth and Hornsea.

Key assets and supporting infrastructure in this Energy Gateway include three major ports, Port of Blyth, Port of Tyne and Port of Sunderland. These ports provide 7km of quay next to deep water, as well as easy access to 400ha of development land and 30 development sites, many with enterprise zone status.

An international airport, exceptional national rail and road networks, and the largest rapid transit system outside London (the Tyne and Wear metro) also make the North East an excellent and well connected place to do business in these sectors. This compelling offer helps enable this cluster to grow and respond to national policy and aims, including the emerging offshore wind sector deal.



Enterprise Zones

Enterprise Zones are designated sites across England which provide tax breaks and Government support in strategic areas that will help grow regional economies. The North East has range of enterprise zone sites.

These include key sites alongside the river Tyne, river Wear, and at Port of Blyth, which support offshore energy and subsea businesses. Sites have direct access to port and quayside facilities, laydown and loading space, and manufacturing and fabrication space. Sites include Port of Tyne, Neptune Yard, Swan Hunters, East Sleekburn, Bates and Wimbourne Quay, Commissioners Quay and Dun Cow Quay.

The A19 Corridor, Sunderland, enterprise zone was also the UK's first designated area for Ultra Low Carbon Vehicles. In close proximity to the UK home of Nissan and a global automotive supply chain, these sites have a focus on low carbon vehicles and advanced manufacturing.

Transport Connectivity

Newcastle International Airport offers frequent, daily flights to locations including London, Amsterdam, Paris and Dubai. The airport carries almost five million passengers per year to a number of European and global hubs, as well as airfreight services to and from international markets.

Excellent North East rail links to the UK high speed rail network include half-hourly services from Newcastle Central Station to London Kings Cross and Edinburgh. London and Birmingham can be reached by rail in less than three hours, and Edinburgh in 90 minutes.

The Tyne and Wear metro system is the largest rapid transport system in the UK outside of London, with over 60 stations across Tyne and Wear. It connects the workforce to major business hubs and Newcastle International Airport.

By road, the A1(M) connects the North East to the entire UK motorway network. The A19 and A69 trunk roads provide connections to the South and West of the UK.

Electricity Infrastructure

The electricity distribution network operator in the North East is Northern Powergrid, which has an operational territory from Northumberland to the Humber, and from the Pennines to the East Coast.

Northern Powergrid distributes electricity to around 3.9 million homes and businesses, through a network of more than 63,000 substations, 60,000 miles of overhead powerlines, and underground cables spanning 9,650 square miles.

Northern Powergrid publishes an annual 'Long Term Development Statement' (LTDS) in the public domain, which compiles network information. The LTDS is intended to assist existing and future users of the network to assess opportunities for projects which make new or additional use of the electricity distribution system. It provides plans and information on distribution system development, and to enable initial assessments of system capability.

Northern Powergrid also provides online interactive demand and generation availability maps. These provide an indication of the networks capability to connect large-scale developments to major substations.

Gas infrastructure

The gas distributor in the North East is Northern Gas Networks, which serves an area of 25,000km² and around 2,700,000 customers, operating 37,000km of pipeline. Northern Gas Networks' operational territory covers an area from Northern Cumbria and Northumberland, and much of Yorkshire, and it manages the development, operation and maintenance of the distribution network.

Northern Gas Networks publishes an annual 'Long Term Development Statement'. This provides a forecast of system usage, and likely developments, and can be used by new and existing users to identify and evaluate system and network opportunities. The statement contains information on actual volumes, supply and demand forecasts, system reinforcement projects, and investment plans.



Business environment

The energy sector is central to the North East's economy, with an innovative community of businesses creating wealth, skills, and jobs across various aspects of the sector. Building on existing strengths and capabilities, the energy sector presents huge ongoing opportunities.

New solutions that provide clean, secure and accessible energy will drive economic growth and deliver more and better jobs. North East organisations are delivering on this opportunity, and national energy objectives, through innovation, investment and skills development. Key aspects of the North East energy business environment include:

Offshore energy and subsea technology

The North East is home to a globally important offshore energy and subsea technology supply chain cluster, with organisations servicing various aspects of these global markets. The region boasts world-class expertise in subsea engineering, robotics, planning and development, as well as design and fabrication of components such as pipelines, umbilicals and wind turbine foundations.

Local businesses such as Soil Machine Dynamics (SMD), Tekmar, and BEL Valves have world-class reputations, and deliver goods and services across the globe. Companies from other parts of the UK and overseas, such as Baker Hughes and Fabricom, have also chosen to invest in the region. This cluster is of strategic importance in the global offshore energy and subsea sectors, winning work internationally and maximising the export potential of UK expertise. For example:

- Remotely operated vehicles (ROV's) from Wallsend-based SMD, with capabilities for both sea salvage and oil and gas operations, are delivering projects from Scotland to Shanghai
- Newton Aycliffe-based Tekmar, a global market leader in offshore cable protection, has supplied systems and services across Europe, and for projects in the USA and Asia Pacific region
- Stocksfield-based Royal IHC Limited, the UK arm of Dutch parent company Royal IHC, designed its 80-metre J-lay system in the North East. Capable of installing pipelines with the equivalent mass of 2,000 cars, the system is ready to tackle challenging projects across the world following testing at Port of Blyth.

Supply chain, promotional, and business development support is available from NOF energy, Energi Coast and Subsea North East, helping members win work in the offshore renewables and subsea sectors.

Automotive, alternate propulsion and energy technology

A range of businesses operating and innovating in the automotive, alternative propulsion and energy technology sectors are based in the North East. Many of these businesses are developing complementary products and services, particularly at the intersection between energy and automotive technology.

These products and services can help address national energy challenges, and the North East is home to a critical mass of businesses, both large and small, to develop and export this expertise. For example:

- The North East Automotive Alliance (NEAA) industry-led cluster group supports the economic sustainable growth and competitiveness of the automotive sector in the North East. The largest automotive cluster group in the UK, with other 300 participants, the NEAA explores topics including advanced propulsion and energy
- The North East is home to automotive OEM's including Komatsu, Caterpillar and Cummins, responsible for producing over 502,000 passenger cars and commercial vehicles, 6,400 non-highway vehicles and over 325,000 engines. The Nissan manufacturing plant in Sunderland is also home to the Nissan LEAF
- AVID Technology, based in Cramlington, designs and manufactures cutting-edge electrified powertrain components and systems for heavy-duty and high performance hybrid and full electric vehicles
- Sunderland-based Hyperdrive Innovation utilises market leading lithium-ion battery technology to deliver solutions to challenging applications for electric vehicles and battery storage systems
- Advanced Electrical Machines, based in Blaydon, develops advanced motor technology, the High-Density Switched Reluctance Machine (HDSRM), for hybrid, range extended and electrical commercial vehicles
- Based on the Newcastle Helix site, Connected Energy is accelerating new approaches to grid-load management with its British designed battery storage systems and energy optimisation expertise.



International connectivity

Various North East organisations and institutions have international partnerships across the energy sector. These partnerships keep the region at the forefront of developments in markets, research and technology, and forge links between global industries and the public and academic sectors. This makes the North East a great place to do business or research in energy. Examples include:

- Since 2015 Newcastle University has held global Principal Partner status with Siemens. This partnership includes joint research programmes (including CESI), development of new qualifications, and provision of industry placements
- The Energy Group of Durham University is part of a partnership with Ørsted, the world's largest offshore wind farm company, and Siemens Gamesa, wind turbine fabricator. A joint programme addresses current and future challenges in reducing the cost of electricity from offshore wind. Ørsted also has a long-standing partnership with Durham University, including supporting a Chair in Renewable Energy position at Durham Energy Institute, PhD research collaborations, and MSc scholarships since 2011
- The ORE Catapult and TusPark Newcastle (part of Chinese 'TusPark's' international network of science parks and incubator projects) signed a research and development collaboration agreement in 2017, aimed at introducing UK SMEs to the Chinese market. In 2018 this was followed by a partnership between ORE Catapult and TUS-Wind to establish a £2 million joint research centre for innovative technologies, and to support development of an offshore wind farm of at least 300MW with a minimum 10% UK content.

Business energy support

A number of schemes and initiatives in the North East provide specific support to businesses on their energy use, focussed on reducing costs. These include:

- The Business Energy Efficiency Project (BEEP) provides County Durham SMEs with free energy audits and other direct support, to make financial savings through energy efficiency. Grant funding is also available to financially support the installation of energy efficient equipment. BEEP is a partnership with Durham County Council, Business Durham, The North East Chamber of Commerce, The Federation of Small Business, the North East LEP, and Northern Powergrid.
- The Newcastle City Council Business Energy Efficiency Scheme provides a service to assist business to reduce energy and water costs, and improve sustainability. This includes energy monitoring and analysis, energy awareness, funding identification and support with carbon and energy legislation.

Wider business support

The North East offers a mature business support ecosystem, which energy sector businesses can capitalise on for assistance to grow and scale-up. This includes:

- The North East Growth Hub which provides access to business support and finance to businesses in all parts of the North East economy. Growth Hub Online also provides access to over 220 sources of business advice and support from across the region and from UK programmes
- Dedicated scaleup support is provided through Scaleup North East, assisting businesses that have the potential to grow rapidly to reach their full potential. Support is flexible and tailored to the needs of the business. Scaleup partners, who have a track record in scaling businesses themselves, work with businesses to define objectives and mentor leaders to take the right action at the right time.
- Supply Chain North East helps businesses identify opportunities they might not otherwise know exist to help them grow. Market experts work with businesses to identify new customers, new markets and supply chains that they may never have previously considered. The programme provides access to the specialist support and resources required to unlock doors, adopt new technology and adhere to new quality standards and requirements.
- Invest North East England (INEE), the North East Combined Authority's strategic inward investment body, acts as a single point of contact for inward investment, and works closely with the North East LEP and local authorities. INEE has access to an extensive partnership network of support agencies, sector specialists, universities, colleges, knowledge networks and business organisations throughout the region.



Place

The North East LEP covers seven Local Authority areas; County Durham, Gateshead, Newcastle, North Tyneside, Northumberland, South Tyneside and Sunderland. Each is home to specific energy assets and opportunities, while contributing to the regional context and pipeline (see Appendix 1). There are two Combined Authorities within this region, the North of Tyne mayoral Combined Authority which spans Newcastle, Northumberland and North Tyneside, and the North East Combined Authority which brings together Durham, Gateshead, Sunderland and South Tyneside.

The North East is an important contributor to the energy agenda across wider geographies. This includes across the Northern Powerhouse, the Borderlands project, the NEYH energy hub, and through national sector deals and challenges. The wider North has a well-established energy heritage, with the region's role in the sector embedded in local culture.

The North was historically a powerhouse for the country, with a long history of centralised power generation. It is now playing a world-leading role in agendas such as offshore energy, renewables, and development of hydrogen technologies. An overview of the North East, and the wider energy agenda of the North, includes:

Public sector

The North East has a higher proportion of employment in the public sector than other areas. Over and above the services of local authorities, this includes strong education and health services, and a concentration of shared service and back office functions for government and other agencies.

All seven Local Authorities within the North East are developing Local Plans. These will set out local planning policies, and identify how land will be used. In particular Local Plans will set out what development will take place, for example where new housing should be built, and where new office and industrial space is needed to support economic and population growth.

The ambitions of the North East LEP's SEP are supported by partners across the region. With a reputation for effective delivery and innovative solutions, the North East LEP was invited to be one of the first six Local Enterprise Partnership areas to work with government on wave two of Local Industrial Strategies.

2017 saw the agreement of a devolution deal for the North of Tyne area, and in November 2018, the new Mayoral Combined Authority was created, bringing new policy, powers and resources into the region.

Economy

The North East's economy is fast growing and generates over £40 billion each year. It was traditionally dominated by mining and manufacturing. Manufacturing remains an important part of the regional economy, which is growing with clusters in automotive and medicines.

The wider regional economy has grown, developed and diversified over the last 40 years. Energy has been identified by the North East LEP as one of four areas of distinct economic opportunity for the region, alongside digitalisation, advanced manufacturing, and health and life sciences. The North East also has strengths in a number of enabling services sectors including financial professional and business services, education, transport and logistics and construction.

Population and geography

The North East is home to almost 2 million people, three cities, with a well connected urban hinterland. Newcastle has vibrant science, education, culture, digital and service sectors. Historic Durham has a leading university, science and tourism sites. Sunderland is renowned for its manufacturing capability, home of Nissan's world-leading car manufacturing base and the focus of one of the Europe's leading automotive clusters.

Towns, rural and coastal communities provide employment in a number of sectors. Across these territories, creative initiatives embedding new business growth are underway. For example incubators alongside rural tourism hubs like The Sill in Northumberland, growth in iconic cultural locations like Beamish and Auckland Castle and initiatives to foster digital innovation in farming and water delivery, demonstrate opportunities to drive employment across every part of the economy.



Energy across the North

The North has a long-established heritage in the energy sector, historically acting as a powerhouse for the country through centralised generating capacity, and more recently through wind and nuclear power. This heritage has led to the energy sector becoming embedded in the fabric of local culture, with a strong legacy of engineering and manufacturing skills, and a concentration of energy research and innovation.

Building on this legacy, the North is now playing a world-leading role in emerging energy challenges, with expertise in nuclear energy, large scale renewables, energy storage, transport, and a proven record in the global oil and gas and offshore wind sectors.

The North is also acting as the UK centre of excellence for development of hydrogen technology. Through the H21 project Northern Gas Networks, in collaboration with partners, is leading globally significant plans to use hydrogen as a heating fuel, helping decarbonise millions of Northern homes.

Northern Gas networks, and Cadent the gas distribution network operator for the North West and West Midlands, are also a key partners in other pioneering Hydrogen projects such as HyDeploy. This leading project has been granted approval from the UK Health & Safety Executive, and will run live large-scale trials delivering a blended hydrogen and natural gas to homes and businesses at a large scale.

In terms of offshore energy, the East coast is critical for the UK to capitalise on global opportunities in offshore wind. Across the North East, Teesside and the Humber, the Northern Powerhouse is playing a central role nationally. The region already has the majority of the UK's offshore wind farms along its coast, and services them from operations and maintenance, to fabrication of blades and foundations.

Global developers are building huge amounts of new capacity off the East coast in the coming years, such as Ørsted's Hornsea 1 and 2, and Equinor, SSE and Innogy's Dogger Bank developments. The North is extremely well placed to secure a significant share of the UK content in these farms, following recent investments in the region such as the Siemens Gamesa blade factory in Hull.

The North East, Yorkshire and Humber (NEYH) Energy Hub, part of the BIES local energy programme has been established to take a co-ordinated approach across the development and delivery of LEP energy strategies. This hub will identify and prioritise pan-Northern energy priorities, providing delivery support.

Across the Northern Powerhouse further partnerships are being created which could support or align to energy priorities. For example, the creation of Transport for the North, and a new Northern Powerhouse structure, where the 11 LEP Chairs will work together to support growth across the North.

Work to develop a Borderlands Deal will include Northumberland in a new cross-border structure with four other areas in northern England and Scotland. The ambition is to create an exemplar in rural growth.

Strategic energy themes

The North East has a distinctive energy context across the foundations of productivity, with a vast amount of cross-sector activity presenting unique strengths and capabilities. In addition to this energy context, energy trends across heat, power and transport indicate areas where the region has a particular opportunity or challenge.

Wide stakeholder engagement has been undertaken across the public, private and academic sectors to shape this context, and regional energy trends, into thematic areas for delivery. This has taken place through specific one on one discussion with stakeholders, and via North East LEP working groups and other regional fora.

Following initial engagement with partners to determine existing activity and priorities, a specific energy strategy workshop was also convened by the North East LEP to enable discussion of emerging strategic themes. This was attended by organisations including BEIS, public authorities, distribution network operators, private businesses, universities and centers of innovation.

Following discussion and feedback from partners at this workshop, themes have been subsequently refined with a view towards prioritisation and practical delivery. Themes listed



below highlight where a coordinated approach among partners, or a strategic project, would further contribute to national goals while driving additional regional growth, productivity, competitiveness.

For example, this may be where cross-sector collaboration could unlock previously undelivered potential, address a market failure, achieve economies of scale, attract inward investment, create more and better jobs, enable an opportunity to be grasped at scale, or deliver wider social and environmental benefits.

Strategic themes

Offshore energy and subsea technology

The North East is home to a globally important offshore energy and subsea technology supply chain cluster. The sector presents a distinct area of opportunity for the regional economy, as a leading location in England for the offshore wind and oil and gas sectors.

North East businesses have a well-established track record servicing both UK and global markets. The region is home to world-class expertise in subsea engineering, robotics, planning and development, as well as design and fabrication of components such as pipelines, umbilicals and wind turbine foundations.

Local businesses across the supply chain are delivering goods and services around the globe, and international companies have chosen to locate and invest in the North East. The subsea sector itself includes around 50 supply chain companies, supporting 15,000 jobs and generating combined turnover in excess of £1.5 billion.

The North East LEP and Tees Valley Combined Authority (TVCA) areas together, are a leading location in England for oil and gas foreign direct investment (FDI). Relative to population, this is the best performing region in England at attracting coal, oil and natural gas FDI, securing 7% of all projects in the UK from 2013-2017. This area is equally a leading location for offshore wind investment, securing 5.4% of all FDI projects in the wind sector in the UK from 2003-2017.

The North East has been identified as a key cluster for delivery of the offshore wind sector deal, which reinforces the industry's ambition to deliver at least 30GW of capacity by 2030. This follows government announcements confirming new Contracts for Difference (CfD) auctions, to support an additional 2GW of offshore wind capacity per year in the 2020s.

The North East has excellent proximity to key UK offshore wind development sites such as Dogger Bank, Firth of Forth and Hornsea. With its supply chain cluster and infrastructure offer, the region is extremely well placed to service these important developments, attract inward investment, and contribute more widely to a transformational offshore wind sector deal for the UK.

As well as the potential scale of UK offshore wind capacity, the Offshore Wind Industry Council (OWIC) has highlighted the global export potential for the offshore wind industry. With exports at approximately £0.5 billion in 2017, there is the potential to reach £2.6 billion by 2030, with UK expertise, components and services being exported to a growing global market³.

³<https://www.renewableuk.com/news/420533/Offshore-Wind-Industry-Prospectus.htm>



The North East is a center for offshore innovation, with a crucial role in creating exportable intellectual property for the UK. Regional demonstration and innovation assets include Tyne Subsea and ORE Catapult's National Renewable Energy Centre, alongside a range of innovative supply chain businesses. North East universities are also in the top 20 for research publications in both offshore wind (Durham 3rd, Northumbria 19th) and oil and gas (Newcastle 7th, Durham 11th).

The North East's offshore energy and subsea technology cluster is nationally and globally important. The region stands to benefit from both new and existing global market opportunities in offshore wind and oil and gas. Supporting employment, competitiveness and productivity in this sector is a strategic energy opportunity for the North East.

Infrastructure intelligence

The National Grid Future Energy Scenarios (FES) 2018⁴ highlights the changing nature of the UK's energy system as a result of technological innovation, changes in the profile of energy generation, and new end-user demands and behaviours. FES 2018 sets out four key messages and trends:

- ***The growth of decentralised and low carbon energy.*** The energy system and market will need to adapt to a changing generation mix, balancing security of supply, affordability and efficiency.
- ***The growth of electric vehicles and supporting infrastructure.*** Smart charging and vehicle to grid solutions can help decarbonise electricity. Balancing supply and demand will become increasingly complex, and data and information flows will be increasingly critical.
- ***Accelerating the mix of low carbon heat.*** Accelerating the decarbonisation of heat during the 2020s is essential to meet national carbon reduction targets. A mix of solutions and better thermal efficiency of buildings is needed. Development of hydrogen and the rollout of heat pumps need to be driven by clear policy.
- ***Gas will play a key role in providing reliable, flexible energy supplies, and can decarbonise the whole energy sector.*** Development of hydrogen and carbon capture utilisation and storage needs innovation and demonstration projects to overcome challenges

These trends are all relevant to the North East, and the changing nature of the energy system is affecting the region. Energy is a crucial enabler of business growth and productivity, therefore understanding and planning for these changes to the energy system is vital to support economic development. For example to ensure that adequate energy capacity, affordability, and security is available on key development sites such as enterprise zones.

Similarly, supporting communities to respond to the changing energy system is critical in enabling them to be economically active and prosperous. For example allowing new and existing homes to access electric vehicle charging infrastructure, affordable and secure energy either through grid connection or microgeneration, and to be flexible with their energy consumption to reduce costs.

Local organisations are already engaged in understanding the challenges and opportunities that are arising as a result of the changing energy system. This is both to support communities and businesses through the changes, and to develop emerging commercial opportunities.

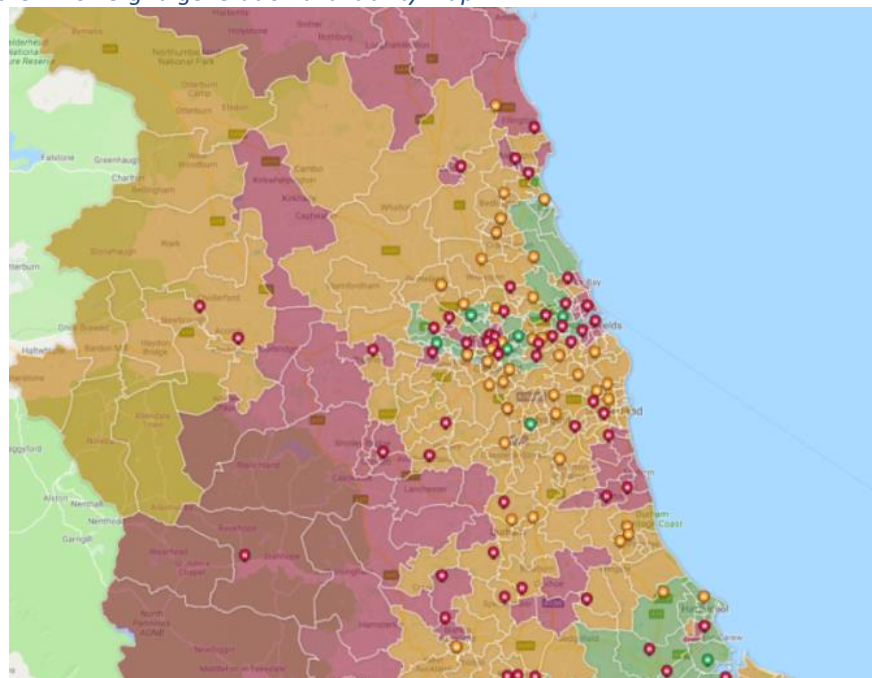
⁴<http://fes.nationalgrid.com/>



Energy distribution network operators, Northern Powergrid and Northern Gas Networks, share information with end users, to help guide investment decisions. This includes information on system trends, capacity, and investment plans.

In terms of the electricity distribution network, an initial assessment of capacity for generation can be made using the Northern Powergrid availability map⁵. This indicates that available capability to connect developments to major substations may be subject to some constraints. While this data only provides an indication of capabilities, it supports the need to share regional intelligence.

Figure 2, Northern Powergrid generation availability map



In response to energy system trends, end-users such as public authorities and private businesses are exploring and deploying various technologies. This includes decentralised energy generation, electric vehicles and charging infrastructure, battery storage systems, and low carbon heating. These technologies place new demands on, and can be constrained by, network capacity.

A shared understanding of the needs and plans of end users, alongside network capacity and constraints, is essential for the regional organisations to adapt to the changing energy system. Sharing this infrastructure intelligence in a tailored and detailed way, would allow network operators and end users to plan and invest effectively. Ensuring economic growth and communities are supported.

The North East is also home to a range of academic institutions and industry partnerships which are leading national research, innovation and demonstration agendas for energy systems. This makes the region an ideal place to explore new ways of sharing detailed and tailored infrastructure intelligence.

Energy infrastructure is critical in enabling economic growth, and supporting communities through the transition to clean growth. As new demands are placed on this infrastructure, a clear and coordinated sharing of intelligence between both end-users and network operators is essential. This will create an evidence base for effective decision making and mutual benefit.

⁵<https://www.northernpowergrid.com/generation-availability-map>



Fuel poverty

Fuel poverty is a prominent energy challenge for the North East. Within the North East LEP area all local authorities have estimated rates of fuel poverty above the national average, with over 117,000 total households estimated to be in fuel poverty⁶. The region also has a higher proportion of households in social housing than the overall average for England⁷.

Figure 3, Fuel poverty and social housing statistics

2016	Est' % of households fuel poor	Est' no. fuel poor households	Est' % social housing
County Durham	14.00%	31,906	19.84%
Gateshead	12.80%	11,663	5.49%
Newcastle upon Tyne	14.40%	17,268	7.86%
North Tyneside	11.20%	10,469	5.94%
Northumberland	12.80%	18,162	11.49%
South Tyneside	13.20%	9,050	6.86%
Sunderland	15.30%	18,670	26.98%
North East Total	13.54%	117,188	13.77%
England	11.09%	2550565	10.48%

Fuel poverty has wide social and economic consequences. Fuel poor households living in cold homes are often subject to exacerbation of illness, including respiratory illness such as asthma and influenza. This places subsequent costs and strain on health services.

Fuel poor households are also often forced to make difficult decisions about paying for heating, or going into debt, and can therefore be less economically active or mobile. This can have subsequent impacts in terms of wellbeing and vulnerability.

Within the North East (including Tees Valley), over 90% of fuel poor households are in a property with an Energy Performance Certificate (EPC) rated in band D or worse. Of households that are EPC band C or better, only 2.9% are fuel poor.

Figure 4, EPC, fuel poor households and ECO AW data (National Energy Action, analysis of English House Condition Survey, 2016)

	North East (Incl' Tees)	England
% of fuel poor households in EPC band C or better	7.4%	6.0%
% of fuel poor households in EPC band D	63.9%	53.4%
% of total households eligible for ECO AW	12.9%	11.1%
% of ECO AW eligible households which are fuel poor	30.5%	29.7%
% of total households in EPC band D or better	33.9%	28.5%

In the context of the Clean Growth Strategy's goal for all fuel poor homes to reach band C or better by 2030, and with high rates of fuel poverty overall, the North East a critical region to invest in measures, and to test new technologies or policy approaches which address fuel poverty.

The North East also has a higher proportion of properties in EPC band D than England overall, many of these homes may present cost-effective opportunities to move a proportion of homes to band C or better. The North East is also a key region for of solutions focused on addressing fuel poverty in social housing, due to its higher than average concentration of social homes.

Additionally the North East has a higher proportion of households eligible for energy company obligation affordable warmth (ECO AW), and a higher percentage of those households in fuel

⁶ <https://www.gov.uk/government/statistics/sub-regional-fuel-poverty-data-2018>

⁷ <https://www.gov.uk/government/statistical-data-sets/live-tables-on-dwelling-stock-including-vacants>

poverty, than the average in England. This makes the North East an important region for meeting multiple policy objectives via this funding.

Fuel poverty is a prominent energy concern for the North East, which is a critical region in achieving national objectives. Addressing fuel poverty has wider social, environmental and economic benefits for the region. The North East is also well-placed to explore and deliver new policy, investment, technology or partnership approaches to addressing fuel poverty.

Domestic energy

As a region, the North East has a higher proportion of energy consumption in the domestic sector than the UK overall⁸. Domestic gas in particular is a significantly higher, and the second highest single source of energy consumption in the North East, at 28% of total energy compared to 21% for the UK⁸.

Figure 5⁸

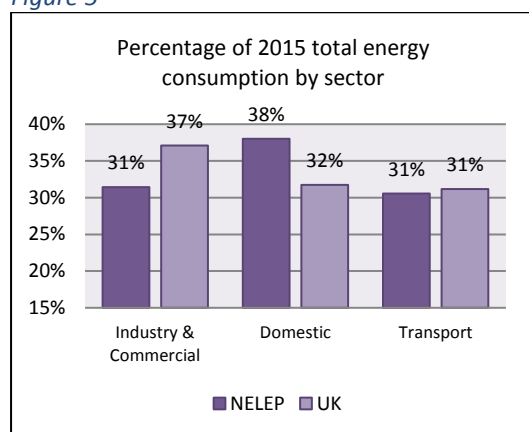
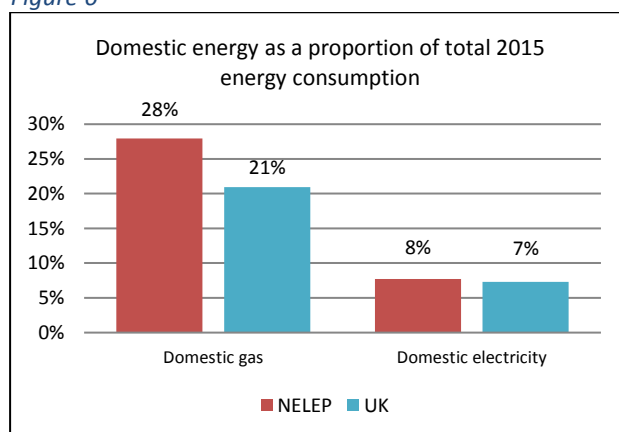


Figure 6⁸



Average domestic gas consumption per meter is above the average for England and Great Britain in all North East Local Authority areas except South Tyneside⁹. This may be indicative of lower than average thermal efficiency of housing stock, a prevalence of inefficient gas domestic heating systems, or a greater need to heat the home for other reasons. While this trend has obvious implications for fuel poor households, it also reflects the wider regional domestic energy context.

The North East is broadly in-line with Great Britain and England overall in terms of total energy consumption from domestic electricity. However average electricity consumption per domestic meter is below the average for England and Great Britain in all North East Local Authority areas¹⁰.

While this could be due to various factors, the inability of fuel poor homes to afford electricity may be a contributor to this overall context. As heating is decarbonised, and a transition away from gas is made to alternative technologies such as electric heat pumps, North East homes may see a greater impact on energy bills and fuel poverty due to these trends.

⁸ <https://www.gov.uk/government/statistical-data-sets/total-final-energy-consumption-at-regional-and-local-authority-level>

⁹ <https://www.gov.uk/government/collections/sub-national-gas-consumption-data>

¹⁰ <https://www.gov.uk/government/collections/sub-national-electricity-consumption-data>



Figure 7⁹

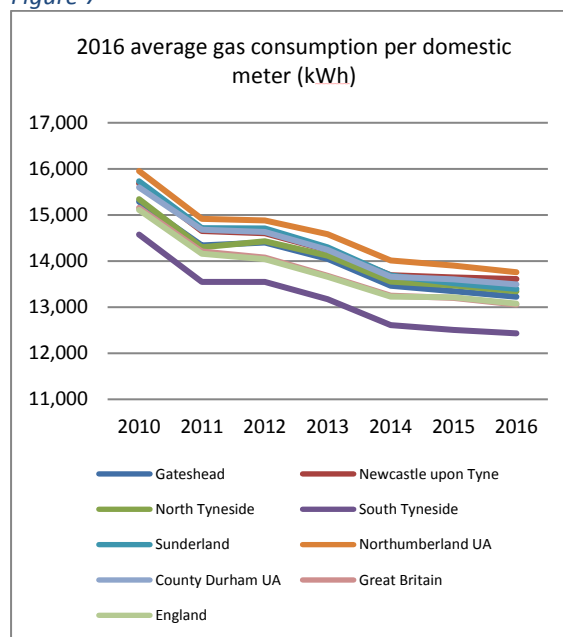
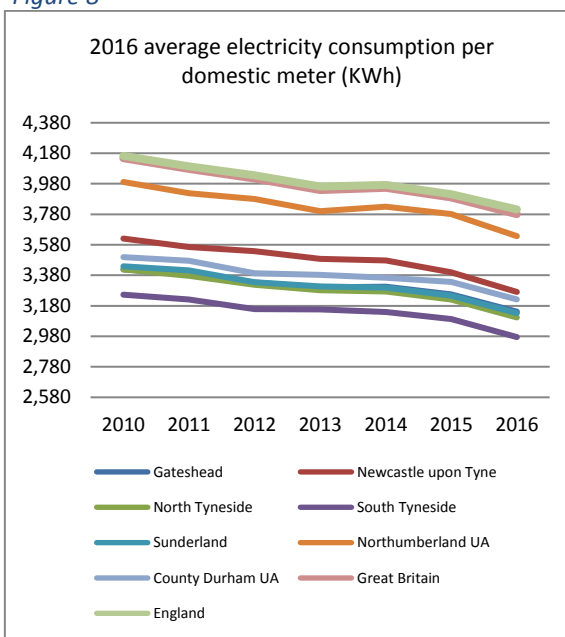


Figure 8¹⁰



Analysis of regional EPC ratings in figure 4 reveals that nearly two thirds of total households in the North East (including Tees Valley) are rated in EPC band D or worse at 66.1%. This is better than for England overall, where 71.5% of households are rated in EPC band D or worse.

However, addressing this at scale remains a significant challenge in the context of national targets; for all private rented homes to be EPC band C or better by 2030, and social rented homes to reach a similar standard. Large-scale domestic retrofit programmes have been traditionally difficult to implement, and The North East has a higher proportion of social rented homes than the overall average for England (figure 3).

Due to its notable domestic energy trends, and high proportion of energy use in the domestic sector, the North East is an important region in meeting national domestic energy goals. This is both in terms of delivering domestic energy improvements at scale, and in terms of exploring new domestic fuels, particularly for decarbonising heat.

Off-grid domestic energy

The percentage of households within the North East estimated to be not connected to the gas network is lower than Great Britain overall. However, the region has significant rural communities particularly across Durham and Northumberland, and a legacy of off-grid mining communities.

Within specific Local Authority areas there are notably high estimates of households not connected to the gas network, for example 18% in Northumberland and 11% in Newcastle¹¹.

¹¹ <https://www.gov.uk/government/statistics/loa-estimates-of-households-not-connected-to-the-gas-network>



Figure 9, Off-grid property statistics¹¹

2016	Est' households not connected to the gas network	Est' % households not connected to gas network
County Durham	11,275	5%
Gateshead	4,481	5%
Sunderland	4,948	4%
North Tyneside	3,855	4%
South Tyneside	1,154	2%
Northumberland	25,330	18%
Newcastle	13,198	11%
North East LEP	64,240	7%
Great Britain	3,744,445	14%

Although based on older estimated data, the North East LEP also has a higher proportion of off gas grid properties greater than 2km from the network than the UK average. These properties are all in Durham and Northumberland. Almost one third (30%) of off grid properties are also greater than 50 meters from a network connection, compared to 14% for the UK overall¹².

Figure 10¹²

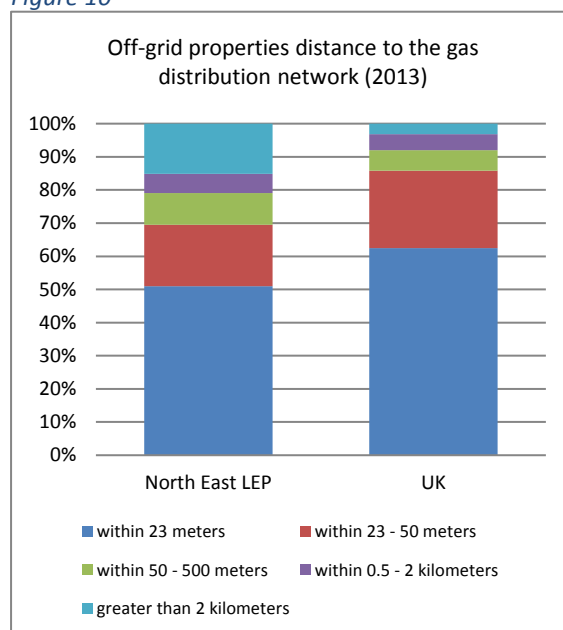
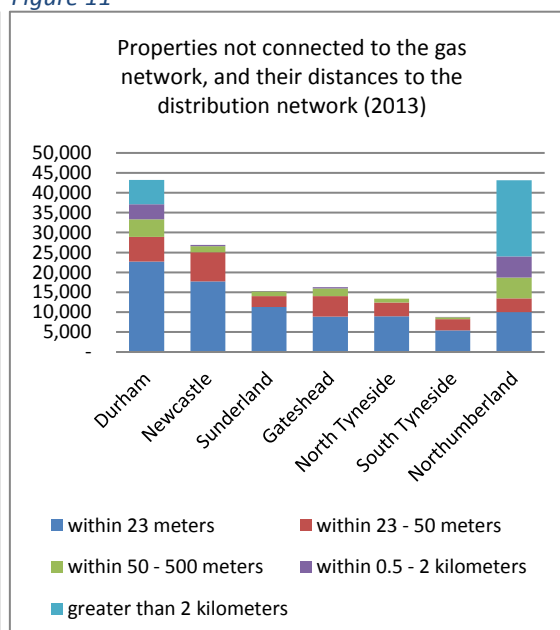


Figure 11¹²



There may therefore be a concentration of communities, particularly within rural geographies and legacy mining communities, which are both off gas grid and a long distance from a network connection.

These communities may also contain fuel poor households, given the high rates of fuel poverty within the same Local Authority areas. Properties may also have low EPC ratings and be of 'hard to treat' construction type for energy efficiency, such as solid wall.

¹²<https://www.gov.uk/government/statistics/lsa-estimates-of-distances-between-non-gas-households-and-nearest-grid-connection>

Regardless of the proportion of households in these communities which are fuel poor, the lack of gas network connection may leave only expensive and carbon intensive alternatives for domestic energy, such as oil heating. Additional costs of such energy sources may also reduce the economic activity of these households, with long distances from a network connection increasing the costs and technical difficulty of achieving a grid connection.

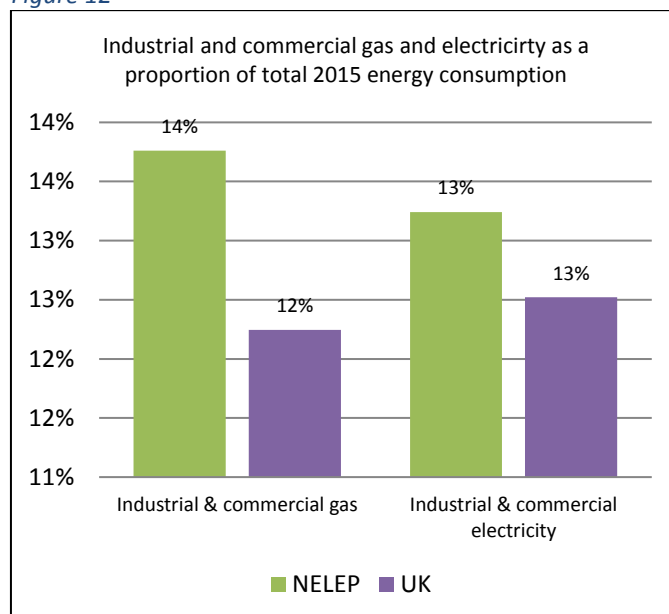
The North East has a likely concentration of communities both off the gas network and a significant distance from a network connection. This can lead to use of carbon intensive and expensive energy sources, and exacerbate fuel poverty. Exploring business models, technologies and policy approaches for off-grid domestic energy is an important regional energy theme.

Industrial, commercial and public estate

The North East has a lower proportion of energy consumption in the industrial & commercial sector than the UK overall (including gas, electricity, petroleum products, manufactured fuels and coal), see figure 5.

However the North East has a higher proportion of energy consumption from industrial and commercial gas and electricity than the UK overall⁸. Industrial and commercial electricity usage makes up 64% of total electricity consumption, and gas makes up 31%⁸.

Figure 12⁸



Northumberland and Gateshead have a consistently higher average non-domestic gas consumption per meter than for Great Britain overall. Other areas have remained within a similar range as the national average, except South Tyneside which is notably below⁹.

Average non-domestic electricity consumption per meter varies significantly in volume among Local Authority areas. Sunderland has consistently the highest, with Newcastle, Gateshead and North Tyneside also being consistently above the average for Great Britain. Overall consumption trends have broadly followed national consumption trends¹⁰.



Figure 13⁹

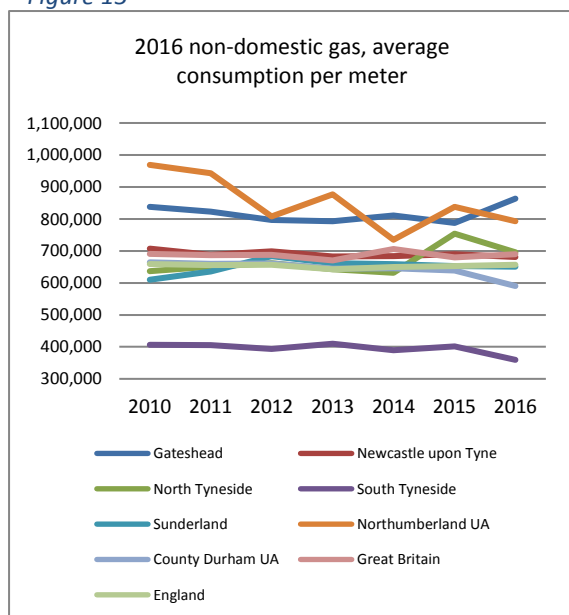
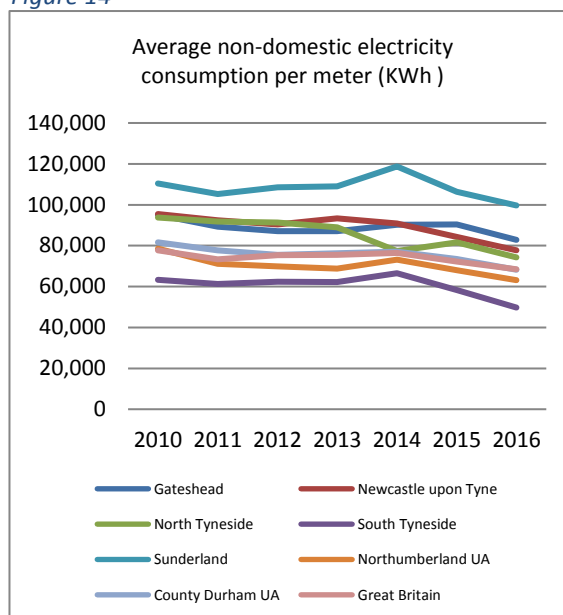


Figure 14¹⁰



Industrial and commercial electricity and gas consumption is very likely to reflect the nature of facilities and economic activity in this sector. For example the Nissan manufacturing plant in Sunderland is almost certainly a factor in the consistently high electricity consumption per meter.

Total non-domestic electricity and gas consumption in the North East, and in each Local Authority area, has broadly followed national trends between 2010 and 2016. However following an increase in in 2015, gas consumption declined in 2016 diverging from the national trend.

Figure 15⁹

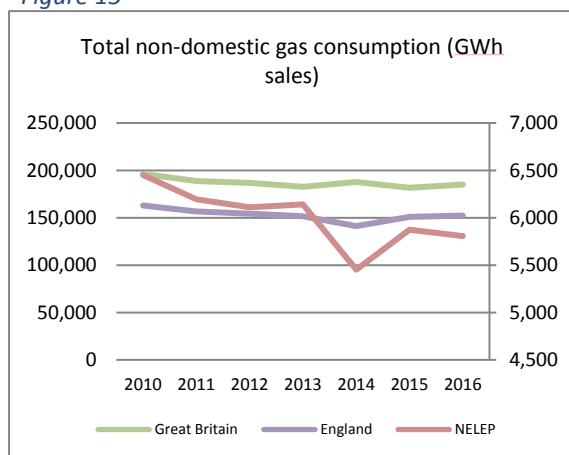
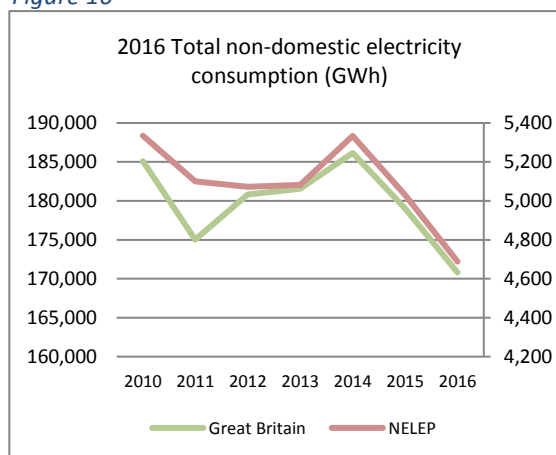


Figure 16¹⁰



A competitively priced and secure energy supply and being able to maximise energy productivity are important factors in business competitiveness. Subsequently, industrial and commercial energy trends are an important issue for business growth, job creation, and wider economic growth within the region.



The North East is also home to a considerable public estate, which includes Local Authority offices, depots, schools, academies, leisure sites and community centers. Energy consumption data on this estate has been made available by the North East Procurement Organisation (NEPO), following agreement by the Local Authorities. Analysis of this shows that in 2016/17 the total public estate for which data is available made up 10% of non-domestic gas consumption in the North East, and 7% of non-domestic electricity consumption. Almost two thirds of energy consumption in the public estate is from gas.

In certain Local Authority areas the public estate comprises between approximately 10% and 30% of total non-domestic gas consumption, and up to around 10% of electricity consumption. Since 2014, most authorities follow a gradual trend of reduction in electricity consumption, however gas consumption has been much more variable possibly due to seasonality. It is important to note that this data does not cover all public estate energy consumption within the region.

Energy is an important cost base for local authorities, which are also developing and implementing plans for a range of energy projects and pilots across their managed estates. These include energy flexibility, generation and efficiency schemes. This could present opportunities for Local Authorities to collaborate on such schemes, and to use the public estate as an anchor and critical mass for wider collaboration and delivery

Industrial and commercial energy is an important factor underlying productivity and competitiveness for the region. The North East's considerable energy consumption in the public estate also presents an opportunity to explore collaborative deployment of interventions at scale, perhaps through new business models or with new technologies.

District energy

Studies undertaken by the Association of Decentralised Energy (ADE) estimate that the North East is home to around 9% of UK heat networks. However, adjusted for economic activity (heat capacity per £mGVA), the North East is second only to the North West and London¹³.

The North East has a number of existing district heating schemes including; the Freeman Hospital, North Tyneside General Hospital, The Royal Victoria Infirmary, Sunderland Royal Hospital, Riverside Dene high-rise Newcastle, The Rise new build housing scheme Newcastle, Newcastle University, the Gateshead Energy Centre, Gateshead HEIGHTs high rise, and the Newcastle Helix Energy Centre (which is currently in development).

Deployment of heat networks is recognised by the regions public authorities as a key opportunity to address social, economic and environmental challenges. District energy schemes can provide domestic, public and commercial customers with competitively priced, low carbon and secure energy. As such, local authorities and partners are actively managing existing schemes, as well as exploring deployment of further schemes in line with national and local policy objectives.

Across the North East a significant number of new heat network feasibility studies have been undertaken. The results show huge potential for new schemes to be deployed, as well as for extension of existing schemes. This feasibility work has largely been led by local authorities, with many studies capitalising on BEIS funding via the Heat Network Delivery Unit (HNDU).

¹³ https://www.theade.co.uk/assets/docs/resources/Heat%20Networks%20in%20the%20UK_v5%20web%20single%20pages.pdf



The studies have included heat mapping and technological and economic feasibility assessment, allowing consideration of how district energy schemes could service specific areas of heat and power demand. Analysis of the most appropriate technology options, and how potential schemes fit into broader urban development plans, is also considered.

This aggregated pipeline of schemes, across both the North East LEP and Tees Valley Combined Authority areas, comprises 23 potential schemes with a total estimated value of over £280 million. Schemes vary in terms of progress, between pre-feasibility and planned network extensions. There are also a variety of potential technology options, locations, timescales and end-customers.

The aggregated scale of the pipeline demonstrates the significance of the North East to the national clean growth agenda, particularly on decarbonisation of heat, and its inward investment appeal for district energy supply chain partners. Most schemes are at the high-level feasibility stage, with a view to potentially undertaking detailed project development and commercialisation subject to approval. However, projects at feasibility stage are not yet committed to progress.

Figure 17, Potential district energy pipeline, North East LEP and TVCA areas

	Name	Technology	Current stage	Estimated value	Estimated timescale
North Tyneside	Killingworth Town Centre	Gas CHP	High-level feasibility	£1,400,000	TBD
	A19 South Scheme	Gas CHP	High-level feasibility	£1,300,000	TBD
	Killingworth and Murton Gap	Gas CHP + heat pump	High-level feasibility	TBD	TBD
Gateshead	Town Centre – phase 1	Gas CHP expansion	Planned expansion	£6,600,000	2019
	Town Centre – phase 2	Gas CHP expansion	Planned expansion	£1,200,000	2020-2021
	Gateshead Quays	Gas CHP expansion	Planned expansion	£2,500,000	2022-2023
	Baltic Business Quarter	Gas CHP expansion	Subject to developers	TBD	2019-2024
	Exemplar Neighbourhood	Gas CHP expansion	Subject to housing market	£4,000,000	TBD
South Tyneside	Viking Energy Network Jarrow	Gas CHP + heat pump	Funding application	£9,640,000	2019-2020
Durham	Durham town centre	Gas CHP + heat pump	High-level feasibility	£11,150,000	2019
	Durham University	Gas CHP	High-level feasibility	£22,110,000	2019
Newcastle	Civic quarter	Gas CHP	High-level feasibility	£6,090,000	TBD
	Newcastle Helix	Gas CHP expansion	High-level feasibility	TBD	TBD
	Forth Banks	Gas CHP	High-level feasibility	TBD	TBD
Sunderland	City Centre	Gas CHP	High-level feasibility	£18,000,000	TBD
	St Peters	TBC	Pre-feasibility	£6,000,000	TBD
	Stadium Village	TBC	Pre-feasibility	£4,000,000	TBD
	Transport Corridor	TBC	Pre-feasibility	£43,000,000	TBD
	Washington	TBC	Pre-feasibility	£10,000,000	TBD
Tees Valley Combined Authority	Middlesbrough District Energy Network	Gas CHP or AD	High-level feasibility	£40,000,000	From 2021
Stockton	Seal Sands	Network expansion	High-level feasibility	£50,000,000	TBD
	Billingham	Network expansion	Funding application	£20,000,000	2019
	Stockton	Network expansion	High-level feasibility	£25,000,000	TBD
TOTAL				£281,990,000	



Based on this feasibility work, the regions local authorities are now considering possible next steps for greater deployment of heat networks, alongside existing district energy and local development plans. Authorities have come together to share these plans and discuss this potential, within the context of a nationally significant pipeline of potential schemes across the North East.

There is a nationally significant potential pipeline of district energy schemes within the North East. De-risking and commercialising these schemes could increase the likely scale and pace of delivery, and the realisation of wider social, environmental and economic benefits. This is a significant strategic opportunity for the region, and in the national decarbonisation of heat.

Mine energy and geothermal heat

The North East has a particularly rich geothermal potential, with both deep and shallow resources. This includes radiothermal granites in the North Pennines, and flooded mineshafts in abandoned coalfields particularly in Durham and Northumberland.

Figure 18, Sedimentary basins & radiothermal granites¹⁴

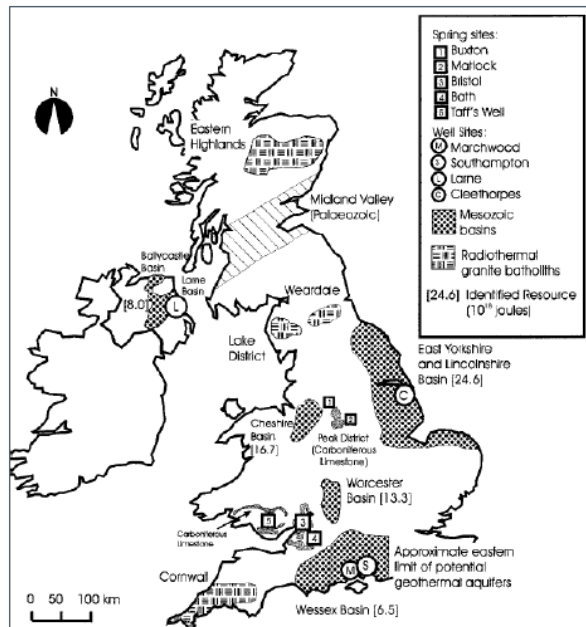
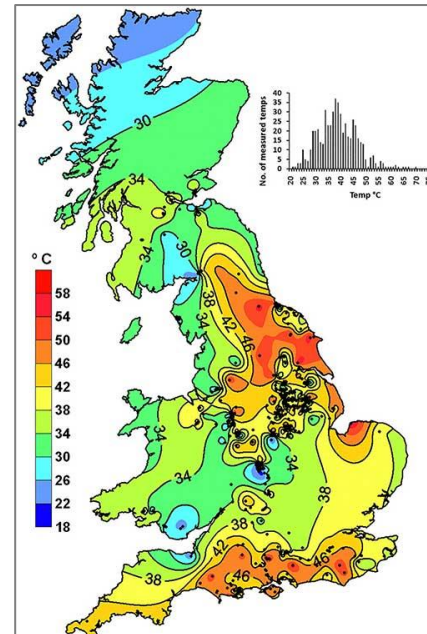


Figure 19, Temperatures at 1km below ground¹⁵



These resources offer an opportunity to decarbonise heat within the region, while providing wider social and economic benefits. The concentration of opportunities in the region also makes it an ideal location to prove and commercialise the technology nationally.

Use of geothermal energy sourced from abandoned coal mines presents a particular opportunity for creation of wider social benefits in post-industrial former mining communities. In coalfield areas, 43% of coalfield neighbourhoods are within the worst 30% in the UK with respect to deprivation¹⁶. There are 50 jobs available per 100 residents of working age, and poor health is widespread¹⁶.

¹⁴ <https://www.gov.uk/government/publications/deep-geothermal-review-study>

¹⁵ <https://eurogeologists.eu/european-geologist-journal-43-collins-the-development-and-deployment-of-deep-geothermal-single-well-dgsw-technology-in-the-united-kingdom/>

¹⁶ <https://www.coalfields-regen.org.uk/our-research>



Using the UK's abandoned mining heritage as a low carbon, and potentially low cost, energy source could help attract development, investment and employment onto what in many cases are brownfield sites. This would support wider social and economic regeneration of potentially depressed communities, and could also help tackle problems such as fuel poverty and off grid energy provision in a domestic setting.

Examples of such benefits can be seen internationally, for example at Heerlen in the Netherlands heat from abandoned mines has supported social regeneration within depressed ex-mining communities, and attracted inward investment¹⁷.

Mine energy heat schemes have also already been deployed in the North East, with two existing projects; at Lanchester Wines and Dawdon Colliery. Wider geothermal schemes have also been explored to various stages, including the Eastgate Borehole. This research well was the first deep geothermal exploration to be drilled in the UK for over 20 years when it was drilled in 2004. More recently the Science Central Borehole was drilled in Newcastle in 2011¹⁸.

A range of potential deep geothermal and mine energy heat schemes exist at various stages within the region. North East institutions, local authorities and other partners have begun collaboration to define and scope these schemes and identify policy, regulatory, market and commercial barriers. This work is informing a potential implementation plan and pipeline of delivery, with an early focus is on demonstration, awareness raising, and commercialisation of the technology.

As well as using mine energy as a heat source, heat can also be stored in flooded mine workings as an innovative form of surplus energy storage which can also help balance seasonal demands. Skills and supply chains present in the North East's oil and gas sector would be well placed to support development of both mine energy and geothermal energy schemes. This could offer diversification and export opportunities for North East businesses, as well as attracting inward investment.

The North East has significant potential for deployment of mine energy and deep geothermal heating schemes. The region can play a national role in commercialising this technology for decarbonisation of heat. Implementing such schemes could also deliver wider social and economic benefits, potentially in deprived, fuel poor and off grid communities.

Community energy

Community energy projects are typically initiatives led by local communities, with an emphasis on community ownership, leadership or control, where the community benefits. They are typically focused on reducing energy use, better managing energy, and generating or purchasing energy.

Community energy projects are often initiated in rural communities, and can help maintain energy security, reduce consumer energy bills, and enable a transition to clean growth. They can also deliver wider social, economic and environmental benefits, such as building cohesive communities, developing skills and creating local income streams.

The North East has historically had a low concentration of community energy projects, with a low number of schemes in implementation compared to other regions. The Community Energy Strategy (2014)¹⁹ showed that many projects in the North East were either abandoned or progress was unknown.

¹⁷ <http://www.mijnwater.com/?lang=en>

¹⁸ <http://www.britgeothermal.org/home.html>

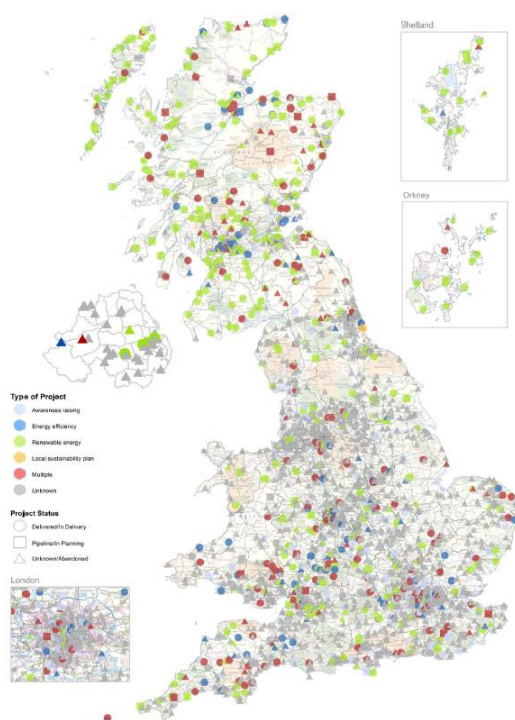
¹⁹ <https://www.gov.uk/government/publications/community-energy-strategy>



A review of the Community Energy England project map also shows that the North East has a relatively low number of projects in place. This is particularly compared to other regions across the Midlands and the South.

Figure 20, Community Energy Strategy project map¹⁹

Figure 21, Community Energy England project map²⁰



Despite the benefits of community energy projects, this is seemingly a gap for the North East. However, given the region's sizeable rural population as well as urban communities, high rates of fuel poverty, and off-grid communities a long distance from a network connection, there may be considerable benefits in wider deployment of community energy schemes.

Community energy business models may also assist in commercialising some of the unique energy opportunities in the North East, such as mine energy heating in coalfield communities. They could also be suited to building on the track record of regional deployment of other renewables such as solar PV or onshore wind, and to addressing wider domestic energy trends.

Feedback from local authorities, and other regional partners with previous involvement in community energy projects, has been that lack of project scale, skills gaps and access to finance are common barriers to implementation. This could also indicate that a number of feasible community energy projects may be lying dormant due to such barriers.

The North East has a relative lack of community energy projects, which could deliver substantial social, economic and environmental benefits. Sharing of best practice or exploration of how schemes could be aggregated, address skills gaps and access finance, could unlock further implementation.

²⁰ <https://hub.communityenergyengland.org/projects/>



Large-scale renewables

The North East has a track record of delivering renewable energy capacity, capitalising on available natural resources, supportive planning regimes, and local supply chain capacity and skills. A number of Local Authority areas within the region are in the top 50 for renewable energy, across 406 UK authorities.

Figure 22, North East Local Authority areas UK rankings for renewable energy²¹

2016	Photovoltaic (no. of sites)	Onshore Wind (Gen MWh)	Hydro (Gen MWh)	Anaerobic Digestion (Gen MWh)	Landfill Gas (Gen MWh)	Plant Biomass (Gen MWh)
County Durham	5th	21 st (6th in England)	21 st (7th in England)	19th	38th	15th
Gateshead					14th	
North Tyneside	50th					
Northumberland	6th	10 (2nd in England)	10th (1st in England)		50th	
Sunderland	4th					

Most notably, Northumberland generates the most renewable electricity from hydro, and second most from onshore wind, of any English Local Authority area. County Durham is also in the top six English Local Authority areas for onshore wind generation. The North East generates a significantly greater proportion of renewable electricity from onshore wind than the UK average.

County Durham, Northumberland and Sunderland are all in the top six UK Local Authority areas for solar PV sites. The region also produces a greater proportion of renewable electricity from landfill gas and anaerobic digestion than the UK average, including through advanced anaerobic digestion processes pioneered by Northumbrian Water at its Howden site. Overall Northumberland generates almost 40% the amount of its total electricity use from renewable sources.

Although the percentage of electricity generation from solar PV is lower than the UK average, it makes up 22% of installed renewable capacity in the North East. As well as a number of large scale individual solar farms, the region also has good penetration of domestic solar PV, including roll-out on some Local Authority and social housing stock.

Figure 23²¹

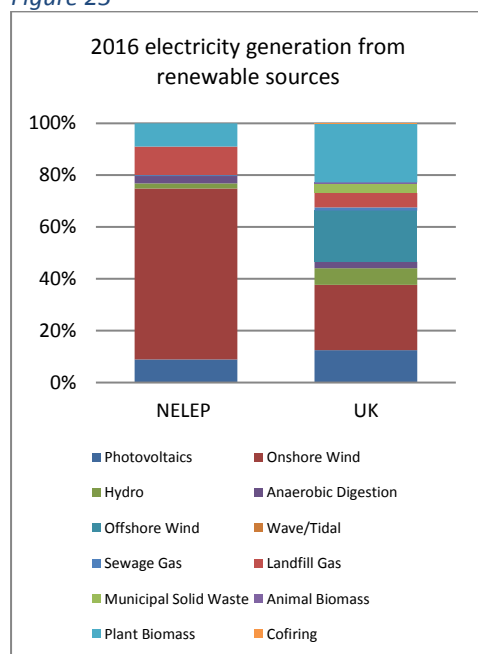
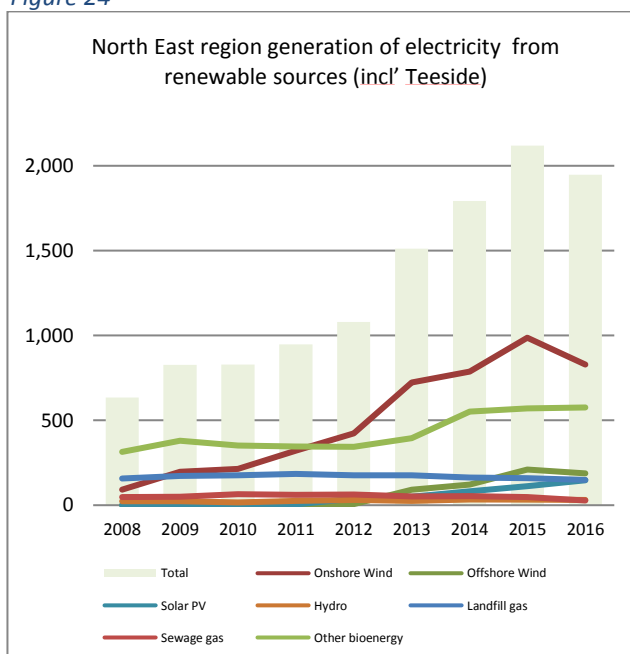


Figure 24²²



²²<https://www.gov.uk/government/statistics/regional-renewable-statistics>

The amount of electricity generated from renewable sources in the North East (including Teeside) has grown by 206% since 2008. However this declined in 2016, largely due to a reduction in generation from onshore wind assets.

While this rate of growth is slower than the UK overall (281%), the North East has grown its onshore wind capacity significantly faster, 804% between 2008 and 2016 compared to 262% for the UK. The North East has also outpaced the UK in terms of increasing renewable electricity generation from hydro since 2008 (27% compared to 5%).

Figure 25, Growth or decline in GWh generation by renewable source, North East vs UK²²

2016	Onshore Wind	Offshore Wind	Solar PV	Hydro	Landfill gas	Sewage gas	Other bioenergy	GWh total
North East	804%	2775%	290%	27%	-5%	-42%	83%	206%
UK	262%	116%	670%	5%	0.1%	73%	464%	281%
	since 2008	since 2012	since 2012	since 2008	since 2008	since 2008	since 2008	since 2008

Within the context of government goals to transition to clean growth and deliver clean power for the UK, the North East is an important region for deployment of renewable energy at scale. The region has a particular track record around deployment of well-established technologies which have seen costs reduce drastically in recent years, onshore wind and solar PV in particular.

Further potential to deploy these technologies exists within in region, given the right commercial and policy environment, or where technical feasibility overlaps with a demand for energy. Together with local energy demonstration and innovation assets, this also makes the region an ideal place to continue to innovate to further reduce costs of deployment for such technologies, in-line with national objectives.

In addition a number of companies are also exploring and developing specific large-scale low carbon energy innovations in the North East. These include the Catfoss-owned 'Graphite Resources' energy from waste facility in Gateshead, which is developing is processes to convert waste into compost like output (CLO), refuse derived fuel (RDF) and solid recovered fuel (SRF).

The North East is an important region for the continuing deployment of large scale renewable energy, for example onshore wind and solar PV. This is both in terms of single large scale developments, and large scale rollout of domestic micro generation. The region also has an important role in continuing innovation to reduce costs of such technologies.

Energy flexibility

In response to the changing nature of the energy system, various new business models and technologies are emerging to provide the grid with greater flexibility, and also create new revenue streams. The majority of these are focused on the electricity grid, including demand-side response (DSR) schemes which incentivise users to change the profile of their consumption, and energy storage technologies which allow surplus energy to be stored and sold when its needed.



Organisations in the North East are already exploring these emerging solutions, for example several utility-scale energy storage and demand side response schemes are in place, including:

- A 25MW lithium-ion battery close to the Cobalt Business Park, North Tyneside, developed by Element Power and since acquired by Enel
- A 35MW battery at Port of Tyne, developed by Renewable Energy Systems, and since acquired by Foresight Group
- A 3MW battery which is part of the Gateshead Energy Centre, developed by Gateshead Borough Council

Organisations within the region are also undertaking a growing number of feasibility studies, and experiencing inward investment enquiries and approaches from businesses with a service offer around energy flexibility. These include demand-side response schemes and related smart systems technology, and battery storage schemes.

As indicated by National Grid FES 2018, the balancing of supply and demand of energy is likely to become increasingly critical over coming years. The All Party Parliamentary Group (APPG) on Energy Storage set out in its 'Batteries, Exports, and Energy Security' report²³, the clear requirement for energy storage technologies in the UK.

It specifically outlines the important role storage technologies play in increasing household and business energy self-reliance, maximising efficiency and managing variable generation from renewables, and managing the electrification of passenger vehicles.

The APPG also reported that the battery storage sector could grow from 60MW in 2016, to up to 12GW by the end of 2021, in the right UK regulatory framework²⁰. This could allow the UK industry to develop, and allow UK companies and institutions to export products and services globally.

The North East is home to several national centres of excellence, and unique demonstration facilities for energy systems which could play a central and leading role in this UK industry. This includes CESI, INTEGREL, the ORE Catapult e-grid and the Smart Grid Lab at Newcastle Helix. Further to this, a variety of local businesses are developing products and services related to energy flexibility and storage, including Equiwatt, Hyperdrive, and Connected Energy.

As well as providing national benefits for energy system flexibility and reliability, there are also local benefits from schemes for communities or organisations. These include creation of revenue streams, increasing energy productivity and self-reliance, better management of energy costs, maximising output from renewables, and enhancing energy security. More widely these benefits can support the inward investment case on key economic development sites such as enterprise zones, or support the economic prosperity of communities.

The North East could leverage existing experience and expertise to maximise deployment of energy flexibility schemes. The region can also play a central role in the development of the UK energy flexibility industry. Collaborative exploration of business models, or aggregation of schemes for favourable terms, could help de-risk and deploy an emerging pipeline of schemes.

Low emission transport and advanced propulsion

The single largest source of energy consumption in the North East is road transport, at 29% of total energy consumption⁸. The North East has followed the broad national trend of declining energy use in road transport following 2007. However while the UK began a consistent upward trend in 2013, the North East began to decrease again in 2014²⁴.

²³ http://www.r-e-a.net/upload/energy_storage_appg_report_-_dec_2017_-_large_-_final.pdf

²⁴ <https://www.gov.uk/government/statistical-data-sets/road-transport-energy-consumption-at-regional-and-local-authority-level>



Figure 26²⁴

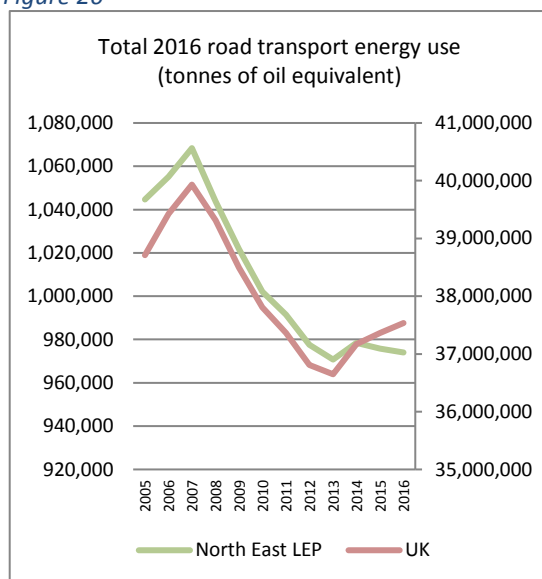
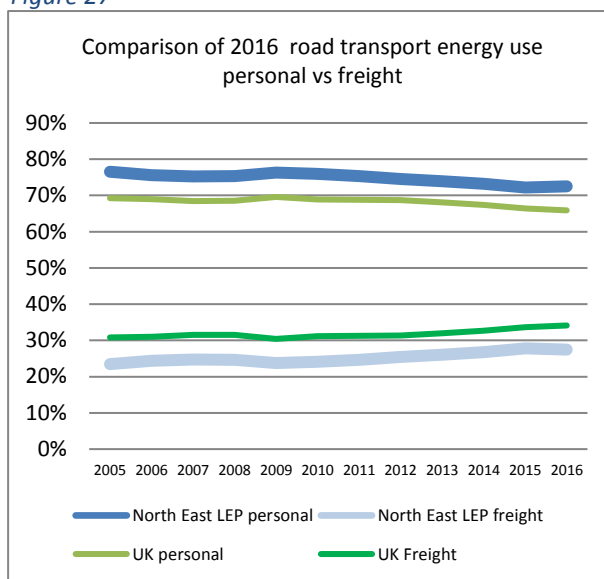


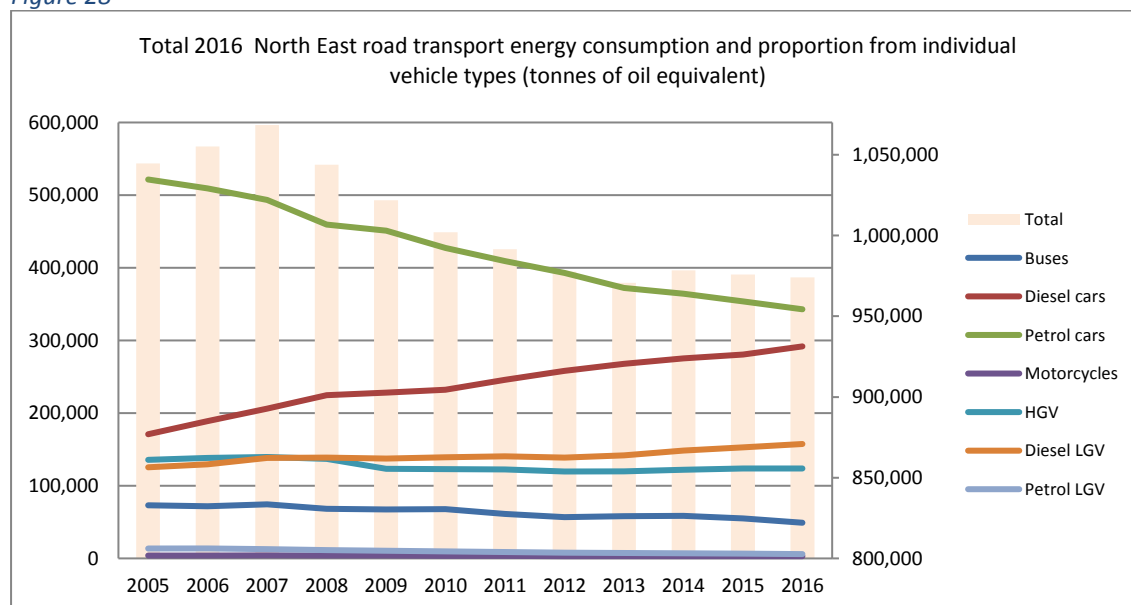
Figure 27²⁴



This appears partly to be due to the UK's increasing freight energy consumption from 2013. The North East's freight consumption decreased between 2014 and 2016, against a national trend of increase. The region has had a consistently lower percentage of freight road transport energy use than the UK overall.

Of the declining energy use in road transport in the North East, petrol cars have consistently been the largest source. Though, their total energy consumption has been in consistent decline. Diesel cars are the second largest source, with total energy consumption gradually increasing. Diesel light goods vehicles (LGVs) are the next highest source, which is slowly increasing. Heavy goods vehicles (HGVs) follow, and have remained broadly level in terms of total energy consumption since 2009.

Figure 28²⁴





Of the top four vehicle types for total energy consumption, the majority of energy consumption occurs on A roads, followed by minor roads. These consumption trends for each vehicle type broadly mirror that of the UK overall.

Figure 29²⁴

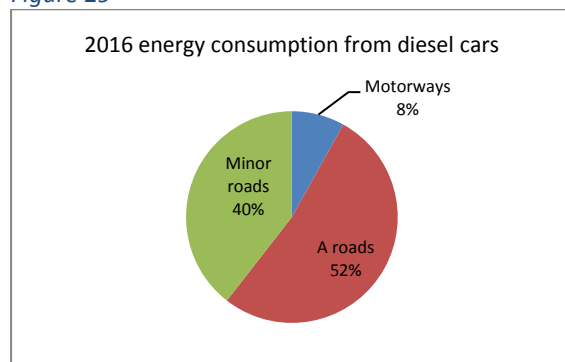


Figure 30²⁴

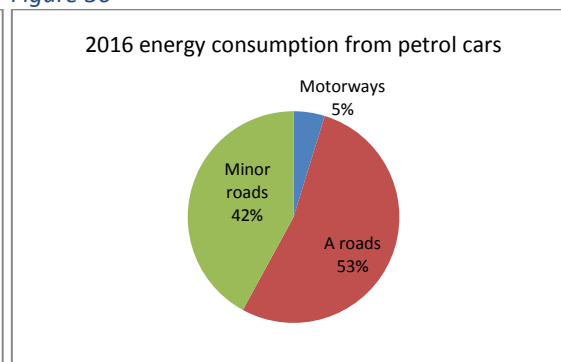


Figure 31²⁴

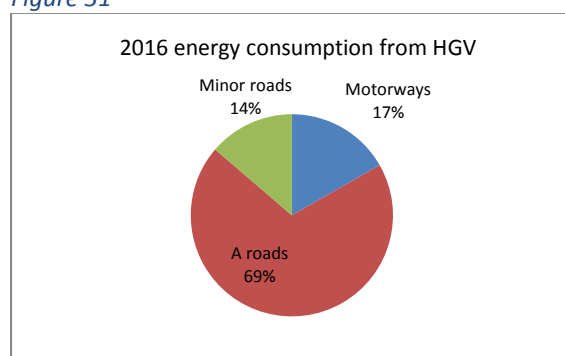
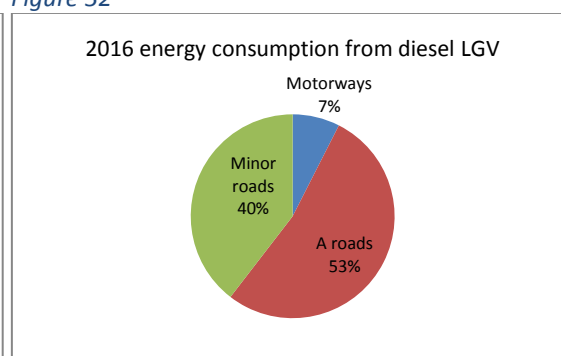


Figure 32²⁴



In accelerating the shift to low emission road transport, electric vehicles and supporting charging infrastructure is a focus for national policy, as set out in the Road to Zero strategy. It is also acknowledged that other technologies will be important to provide a range of solutions which meet different needs. This includes hydrogen, compressed natural gas, biogas, and biodiesel.

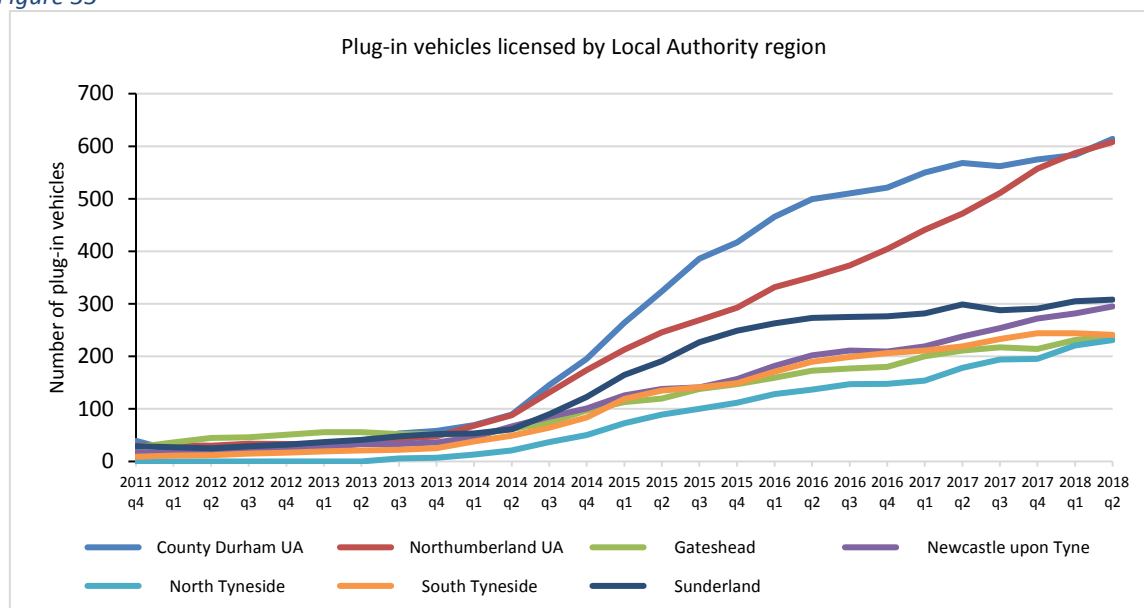
Delivering on this national policy, and implementing these technologies, will not only reduce carbon emissions but will also result in important health and social benefits. Increasing use of low emission vehicle technology will improve air quality, reducing emissions of Nitrogen oxides (NOx), particulate matter (PM), and other emission which are harmful to human health.

Given the profile of the North East's road transport energy consumption, supporting a switch from petrol and diesel cars to low emission alternatives is crucial in the transition to clean growth. In the context of national policy, the provision of electric vehicle charging infrastructure and encouraging use of electric cars is an important factor in this. This is particularly true in serving rural communities, and infrastructure around A-roads.

The North East has had a very successful 'Go Ultra Low programme', which has made progress in delivering a high quality electric vehicle charging network for the region. Plans are also being developed by regional public authorities to further develop this network, including introducing rapid cluster charging points and EV filling stations by the end of 2019. This supports continued growth in the number of plug-in vehicles licensed in each Local Authority area.



Figure 33²⁵



As well as supporting the transition of private cars to low emission alternatives, addressing energy consumption from LGVs and HGVs is an important aspect of regional road transport energy. Regional organisations are already developing plans for low emission commercial fleets.

For example, local authorities and utility providers are developing low emission fleet strategies, with many focused on electric vehicles and infrastructure. Other technologies are also being investigated, such as gas, for vehicles which may need a longer range or have a less predictable routes and duty cycles.

This could present opportunities for collaborative development of low emission fleet strategies and infrastructure plans. Accessing economies of scale for procurement, or other benefits through standardisation of specification, may also be possible.

The North East is home to wider low emission transport expertise, and is engaged in this agenda nationally. The internationally significant automotive cluster, the NEAA, brings together regional organisations on workstreams including advanced propulsion. The Gateshead College subsidiary consultancy Zero Carbon Futures has also developed an international reputation for development of low carbon vehicle strategies.

The North East is extremely well placed to explore the connections between low emission transport, advanced propulsion and energy systems, combining this automotive expertise with nationally important assets related to energy flexibility. As outlined in the National Grid FES 2018, electric vehicles have the potential to contribute towards increasing energy system flexibility, for example through vehicle to grid technology.

The North East can combine its energy and automotive capabilities, and play a national role in developing technologies at the intersection of advanced propulsion and energy systems. Deployment of low emission transport infrastructure is vital to serve regional communities, and transitioning commercial fleets presents opportunities for collaborative strategy.

²⁵ <https://www.gov.uk/government/collections/vehicles-statistics#vehicle-licensing-statistics>



Demonstration and innovation

The range of energy demonstration and innovation assets in the North East, described on pages 8 to 10, form a significant hub for academic research, and a powerful test-bed for businesses. These assets play a crucial role in addressing national and international challenges across all energy vectors, de-risking, commercialising and reducing costs of new and existing technologies.

There are significant challenges ahead if the UK is to meet its future carbon budgets, and achieve the transition to clean growth. North East capabilities can play an important national role in accelerating the route to market for solutions which address these challenges, including:

- proving the case for technologies at scale, such as hydrogen and larger wind turbines
- decarbonising heat and transport
- implementing a low carbon waste system
- integration of energy vectors and smart grid technologies
- development of energy storage solutions
- low emission transport and vehicle to grid solutions
- reducing the costs of renewable energy technologies.

Facilities in the North East present the unique ability to innovate, demonstrate, and test a highly comprehensive range of energy technologies at all scales, including offshore and onshore technologies. Common themes among the capability of these assets include grid connectivity, flexibility and integration, energy storage, and skills needs.

These assets are also a platform through which to connect private, public and academic partners around key challenges, with various existing industrial and academic partnerships. As partners utilise demonstration and innovation facilities to better define energy challenges, they also create opportunities to engage businesses from other sectors for mutual benefit.

By bringing different sources of expertise together, for example from the digital or advanced manufacturing sectors, this can assist in developing new technologies and solutions to emerging energy challenges. These cross-sector links can help generate new business growth, export, GVA and employment opportunities.

In addition to these specific assets, the region's unique 'Place' characteristics make it a perfect test-bed for real-world innovation, demonstration and deployment of energy solutions. The North East offers a wide range of geographies from rural communities through to a core city, three rivers and a wealth of coastline, and key development sites identified for housing and business growth.

The strategic energy themes identified also demonstrate the region is an important location in addressing specific national policy goals, such as those around fuel poverty, domestic energy, and decarbonisation of heat. Together with the range of local geographies, this offers a wide variety of scenarios for new applications of energy technologies, or testing of new policy approaches and business models which address national challenges.

The North East's energy demonstration and innovation assets play a crucial national role in accelerating the transition to clean growth, generating exportable intellectual property, and creating new growth and investment opportunities in the region. Fully mapping and coordinating capabilities could help maximise these opportunities.



Summary of strategic themes

<i>Offshore energy and subsea technology</i>	The North East's offshore energy and subsea technology cluster is nationally and globally important. The region stands to benefit from both new and existing global market opportunities in offshore wind and oil and gas. Supporting employment, competitiveness and productivity in this sector is a strategic energy opportunity for the North East.
<i>Infrastructure intelligence</i>	Energy infrastructure is critical in enabling economic growth, and supporting communities through the transition to clean growth. As new demands are placed on this infrastructure, a clear and coordinated sharing of intelligence between both end-users and network operators is essential. This will create an evidence base for informed decision making and mutual benefit.
<i>Fuel poverty</i>	Fuel poverty is a prominent energy concern for the North East, which is a critical region in achieving national objectives. Addressing fuel poverty has wider social, environmental and economic benefits for the region. The North East is also well-placed to explore and deliver new policy, investment, technology or partnership approaches to addressing fuel poverty.
<i>Domestic Energy</i>	Due to its notable domestic energy trends, and high proportion of energy use in the domestic sector, the North East is an important region in meeting national domestic energy goals. This is both in terms of delivering domestic energy improvements at scale, and in terms of exploring new domestic fuels, particularly for decarbonising heat.
<i>Off-grid domestic energy</i>	The North East has a likely concentration of communities both off the gas network and a significant distance from a network connection. This can lead to use of carbon intensive and expensive energy sources, and exacerbate fuel poverty. Exploring business models, technologies and policy approaches for off-grid domestic energy is an important regional energy theme.
<i>Industrial, commercial and public estate</i>	Industrial and commercial energy is an important factor underlying productivity and competitiveness for the region. The North East's considerable energy consumption in the public estate also presents an opportunity to explore collaborative deployment of interventions at scale, perhaps through new business models or with new technologies.
<i>District energy</i>	There is a nationally significant potential pipeline of district energy schemes within the North East. De-risking and commercialising these schemes could increase the likely scale and pace of delivery, and the realisation of wider social, environmental and economic benefits. This is a significant strategic opportunity for the region, and in the national decarbonisation of heat.
<i>Mine energy and geothermal heat</i>	The North East has significant potential for deployment of mine energy and deep geothermal heating schemes. The region can play a national role in commercialising this technology for decarbonisation of heat. Implementing such schemes could also deliver wider social and economic benefits, potentially in deprived, fuel poor and off grid communities.
<i>Community energy</i>	The North East has a relative lack of community energy projects, which could deliver substantial social, economic and environmental benefits. Sharing of best practice or exploration of how schemes could be aggregated, address skills gaps and access finance, could unlock further implementation.
<i>Large-scale renewables</i>	The North East is an important region for the continuing deployment of large scale renewable energy, for example onshore wind and solar PV. This is both in terms of single large scale developments, and large scale rollout of domestic micro generation. The region also has an important role in continuing innovation to reduce costs of such technologies.
<i>Energy flexibility</i>	The North East could leverage existing experience and expertise to maximise deployment of energy flexibility schemes. The region can also play a central role in the development of the UK energy flexibility industry. Collaborative exploration of business models, or aggregation of schemes for favourable terms, could help de-risk and deploy an emerging pipeline of schemes.
<i>Low emission transport and advanced propulsion</i>	The North East can combine its energy and automotive capabilities, and play a national role in developing technologies at the intersection of advanced propulsion and energy systems. Deployment of low emission transport infrastructure is vital to serve regional communities, and transitioning commercial fleets presents opportunities for collaborative strategy.
<i>Demonstration and innovation</i>	The North East's energy demonstration and innovation assets play a crucial national role in accelerating the transition to clean growth, generating exportable intellectual property, and creating new growth and investment opportunities in the region. Fully mapping and coordinating capabilities could help maximise these opportunities.



Policy gap analysis

The outlined strategic energy themes for the North East highlight areas where energy can help drive and enable regional growth. Strategic energy projects can improve the energy productivity of organisations, attract investment, create and maintain jobs, and underpin communities with energy affordability and security so that they can prosper and contribute to the regional economy.

These strategic themes also map closely to national policy objectives, demonstrating clearly the important role that the North East can play in contributing to the transition to clean growth across various policy goals. An overview of how regional strategic themes map to national policy can be found in Appendix 2, showing clear overlap between regional themes and policy objectives.

Particularly prominent regional themes in this respect include the domestic energy, demonstration and innovation, and delivering clean and flexible energy and transport system. Two areas of government policy show no overlap with regional themes; carbon, capture, use and storage, and the phasing out of unabated coal.

The North East does not have traditional centralised power generation assets, such as coal or gas fired power stations. However, neighbouring LEP areas within the NEYH Energy Hub do have assets related to these two topics, for example the concentration of energy-intensive industry and centralised generation on Teeside. The North East LEP will work closely through the hub with partners in these areas, aligning local assets to any activity on these topics.

Delivery

Energy for Growth Programme

The North East LEP works with cross-sector partners on regional energy priorities and projects through the *Energy for Growth* programme. The programme seeks to coordinate activity at a regional level, where strategic interventions can drive economic growth, job creation and competitiveness, while meeting national goals. As such its overarching vision is to:

‘Drive growth in the North East while delivering on national energy objectives’

In working to meet this vision, the objectives of the *Energy for Growth* programme are to:

- Bring together regional and national energy stakeholders
- Identify and prioritise strategic energy opportunities
- Facilitate delivery support for a strategic energy project pipeline
- Constructively identify challenges and support needs
- Communicate North East energy strengths and activity.

Working with partners on its objectives, the *Energy for Growth* programme seeks to identify, prioritise and facilitate delivery of activity which can positively impact regional GVA and creation of more and better jobs. Activity in the energy sector can do this in a number of ways.

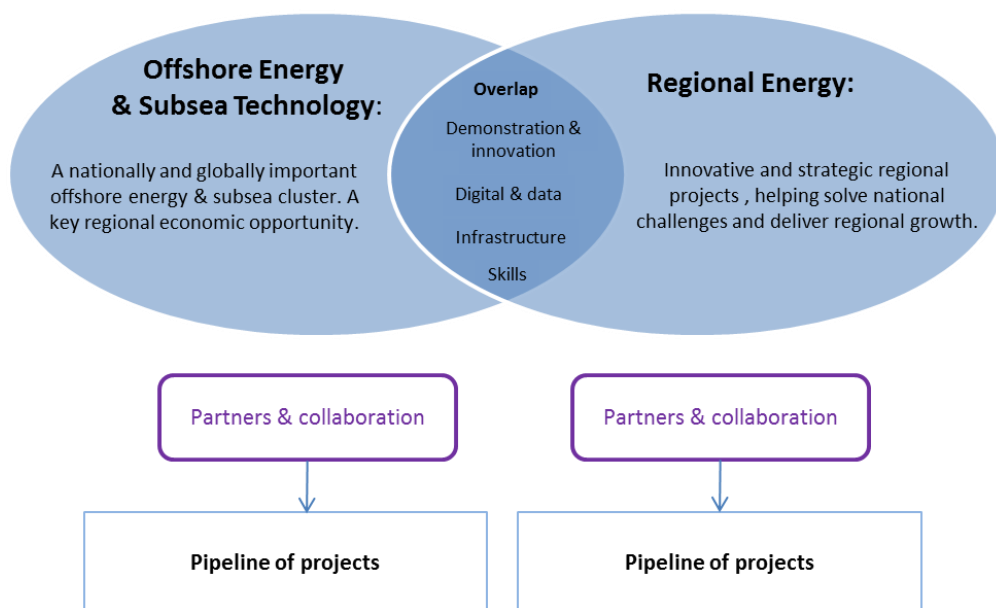
Figure 34 (as in figure 1), How energy activity can impact regional GVA and creation of more and better jobs



The programme is structured around two workstreams; 'Offshore Energy & Subsea Technology' and 'Regional Energy'. The offshore energy & subsea technology workstream focuses on a key industrial sector of economic opportunity, and with a specific set of stakeholders. The regional energy workstream is focused on opportunities across regional power, heat and transport.

Figure 34, An overview of the Energy for Growth programme:

Energy for growth





With partners in the region, opportunities arising in each workstream will be prioritised and shaped into collaborative and strategic interventions. These interventions can be supported as a regional energy project pipeline, where appropriate leveraging capacity to deliver through North East LEP's wider programmes (e.g. skills, business growth, investment, innovation) and other regional partners and assets.

There are areas of overlap between the two main workstreams, with scope to explore sector-wide interventions or activities. Most notably this includes energy demonstration and innovation capabilities, and cross-cutting agendas around digital and data, infrastructure, and skills.

The North East LEP collaborates and engages partners through cross-sector stakeholder groups in each workstream. Within the offshore energy and subsea technology workstream, the North East LEP facilitates a steering group made up of universities, supply chain businesses, ports, centres of innovation and other public sector organisations. This group helps shape a regional agenda, and provides advice to the North East LEP on opportunities which support growth and job creation.

A regional energy stakeholder group has also been convened by the North East LEP which includes local authorities and other public bodies, sector cluster groups, distribution network operators, utilities, universities and private sector businesses. This group assisted with an initial prioritisation of regional energy themes (see Appendix 3).

This initial prioritisation indicated that taking a regional approach to each of the strategic themes would be impactful, and add value. The themes were considered to be of varying difficulty for implementation as a regional project, based on previous experiences, expected success factors and challenges, and capacity of regional partners to deliver.

A variety of approaches, and involvement of different partners, would therefore be required to achieve successful implementation around any of the strategic themes identified. Further development is necessary to prioritise and shape these themes into a project pipeline, based on capacity to deliver, existing activity, expected impact, and ease of implementation.

Shaping a project pipeline

Routes to regional implementation against the strategic energy themes will be further developed in collaboration with partners, and through the *Energy for Growth* programme. Regional partners will collaborate around the two workstreams as described, to further prioritise themes and define a delivery approach. All strategic themes may not be included within the immediate project pipeline, subject to delivery capacity and this prioritisation of activity.

Various approaches may be taken, for example stakeholder sub-groups may be convened to lead particular themes, or work may be led or commissioned by specific stakeholders. Certain themes may strongly align to the energy priorities and activity of existing regional structures or individual organisations. The North East LEP may also directly facilitate projects, convene a delivery group, or remain as a stakeholder in work led by another party as appropriate.

Projects could be supported during delivery in various ways such as through the North East LEP's delivery programmes (e.g. skills, innovation, investment, and business growth), and through capacity of other regional partners and assets. This may include identification of funding opportunities, facilitation of partnership working, alignment to existing work programmes, and business case development.

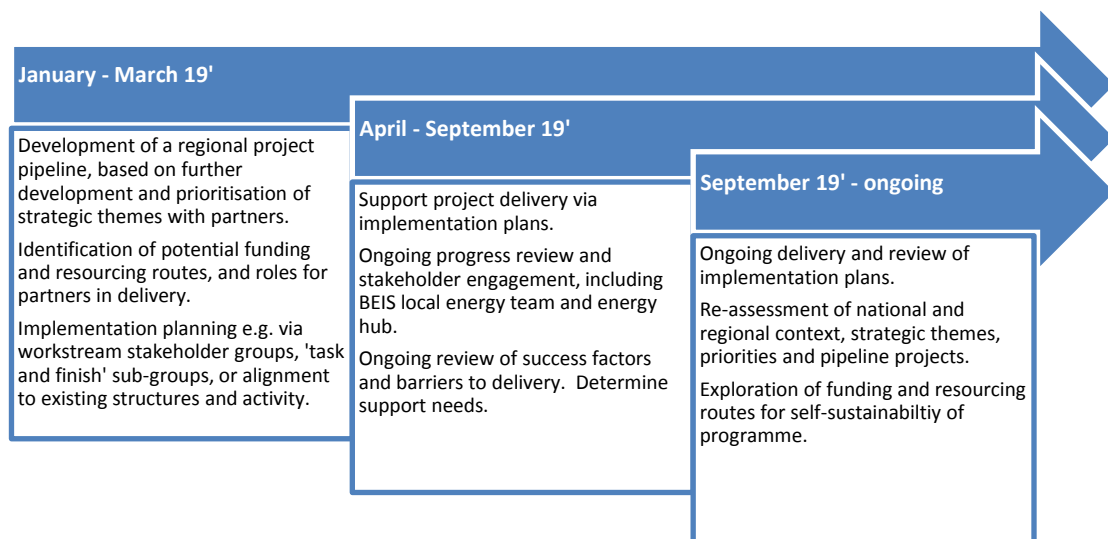
The North East LEP, working with partners, will also seek to align the energy project pipeline to wider geographies and activity where this may add value. This may include national sector deals, the Northern Powerhouse energy agenda, the NEYH energy hub, the Borderlands project, or regional digital, skills or innovation agendas.

A low carbon study, commissioned by all seven North East local authorities, has also been aligned to assist with development of this energy project pipeline from the strategic themes. This study is undertaking modelling and development work, to identify potential emissions reduction projects and trajectories across the region. It has been informed by stakeholder engagement undertaken for the *Energy for Growth* strategy, and its findings are aligned to the thirteen strategic themes.

Through the study, implementation plans are being developed for a number of the potential low carbon projects identified across the region. As appropriate, these plans will be integrated into the energy project pipeline resulting from this strategy, and supported through delivery as described.

An indicative timeline for the development of a project pipeline based on the strategic themes is outlined in figure 35 below.

Figure 35, Outline project pipeline development and delivery plan.



During development of the project pipeline, barriers to delivery and specific implementation challenges will be identified. This will help inform feedback to regional and national policymakers on how delivery against energy policy goals, opportunities and challenges could be better enabled. This may include needs for specific funding, finance, market, regulatory or policy support.

The project pipeline, barriers identified, and the wider *Energy for Growth* strategy, will also inform the North East LEP's Local Industrial Strategy. It will help shape the approach to this area of opportunity for the regional economy, including identifying an energy inward investment focus, innovation agenda, and pipeline of projects and capabilities to contribute to Grand Challenges.

It will also help inform the local approach to relevant aspects of the UK Shared Prosperity Fund (UKSPF), and position local clusters of business through relevant sector deals, such as the role of the Offshore Energy and Subsea Technology Cluster within the Offshore Wind Sector Deal.

Next steps and review

The North East LEP, working with national and regional stakeholders, will facilitate activity in-line with the pipeline development and delivery plan in figure 35. Progress against this strategy, plan, and project pipeline will be reviewed by the North East LEP Board on at least an annual basis.

Other bodies and structures involved in the resulting project pipeline will help determine the consultation and monitoring requirements of individual projects, to ensure their own reporting requirements are met. The BEIS local energy team, NEYH energy hub, and broader Northern partners, will also be regularly updated on progress around the *Energy for Growth* strategy and project pipeline as appropriate.

Parties with an interest in the strategic themes outlined, or the *Energy for Growth Strategy* more generally, are invited to make contact to explore opportunities to share work or collaborate.

Contact

Andrew Clark

Programme Lead: Energy

North East Local Enterprise Partnership

+44 0191 338 7452 | +44 07775 003238 | Andrew.Clark@nelep.co.uk

northeastlep.co.uk | @northeastlep

Delivering more and better jobs

End

Appendix 1, geographical outline of North East energy assets, challenges and opportunities.

North East						
<p><u>Region-wide assets and themes</u></p> <ul style="list-style-type: none"> • Offshore energy & subsea technology supply chain expertise • Proximity to key offshore oil and gas, and offshore wind sites • High rates of fuel poverty • High proportions of energy consumption in the domestic sector, specifically gas • Below average domestic electricity consumption per meter • Shared energy distribution network operators (Northern Powergrid & Northern Gas Networks) • Sizeable energy consumption in the public estate • District energy pipeline projects • High proportions of industrial and commercial gas & electricity use • Deep geothermal & mine energy heat potential • Community energy potential • Large-scale renewables potential • Energy flexibility (including storage) potential • Good deployment of electric vehicle infrastructure, with future development plans • High proportions of road transport energy use, low emission transport potential • Innovation SuperNetwork • North East Automotive Alliance • NOF Energy, Energi Coast, Subsea North East 						
North East Combined Authority				North of Tyne Combined Authority		
County Durham	Gateshead	South Tyneside	Sunderland	Newcastle	North Tyneside	Northumberland
<p><u>Regional energy</u></p> <ul style="list-style-type: none"> • Off-gas properties a large distance from the grid • High proportion of social housing • Above average domestic gas consumption per meter • Business Energy Efficiency Programme (BEEP) • 'Renovation for Energy Efficient Buildings' European project • LOCARBO energy efficiency European project • Significant onshore wind resource • Operational mine energy heating system • Specific high-potential deep geothermal and mine energy heat opportunities • Significant solar PV roll-out • Significant hydro generation • Significant anaerobic digestion generation • Significant landfill gas generation <p><u>Demonstration & Innovation</u></p> <ul style="list-style-type: none"> • Durham Energy Institute <p><u>Research & education</u></p> <ul style="list-style-type: none"> • Durham University 	<p><u>Regional energy</u></p> <ul style="list-style-type: none"> • High non-domestic gas consumption per meter • Above average domestic gas consumption per meter • Pioneering Gateshead Energy Centre • Existing utility-scale battery • Existing district energy schemes • Significant ground source heating schemes • Operational mine energy heating system • Significant landfill gas generation <p><u>Demonstration & Innovation</u></p> <ul style="list-style-type: none"> • InTEGREL • Graphite Resources energy from waste facility <p><u>Research & education</u></p> <ul style="list-style-type: none"> • Gateshead College 	<p><u>Regional energy</u></p> <ul style="list-style-type: none"> • Existing utility-scale battery <p><u>Offshore energy & subsea technology</u></p> <ul style="list-style-type: none"> • Port of Tyne • Enterprise zones supporting offshore energy businesses <p><u>Research & education</u></p> <ul style="list-style-type: none"> • South Tyneside College 	<p><u>Regional energy</u></p> <ul style="list-style-type: none"> • Nissan's UK home & battery plant • 'A19 corridor' and IAMP enterprise zones, focussed on low carbon vehicles & advanced manufacturing • High proportion of social housing • Above average domestic gas consumption per meter • Existing district energy schemes • Significant solar PV roll-out <p><u>Offshore energy & subsea technology</u></p> <ul style="list-style-type: none"> • Port of Sunderland • Enterprise zones supporting offshore energy businesses <p><u>Research & education</u></p> <ul style="list-style-type: none"> • Sunderland University 	<p><u>Regional energy</u></p> <ul style="list-style-type: none"> • High proportion of off-gas properties • Above average domestic gas consumption per meter • Business energy efficiency scheme • Existing district energy schemes <p><u>Offshore energy & subsea technology</u></p> <ul style="list-style-type: none"> • Neptune Yard & riverside development sites • Enterprise zones supporting offshore energy businesses <p><u>Demonstration & Innovation</u></p> <ul style="list-style-type: none"> • CESI • Supergen Energy Networks Hub • Smart Grid Lab • Newcastle Helix • Tyne Subsea <p><u>Research & education</u></p> <ul style="list-style-type: none"> • Newcastle University • Northumbria University • Newcastle College 	<p><u>Regional energy</u></p> <ul style="list-style-type: none"> • Above average domestic gas consumption per meter • Significant solar PV roll-out • Existing utility-scale battery <p><u>Offshore energy & subsea technology</u></p> <ul style="list-style-type: none"> • Port of Tyne • Enterprise zones supporting offshore energy businesses <p><u>Demonstration & Innovation</u></p> <ul style="list-style-type: none"> • Tyne Subsea <p><u>Research & education</u></p> <ul style="list-style-type: none"> • Tyne Metropolitan College 	<p><u>Regional energy</u></p> <ul style="list-style-type: none"> • High proportion of off-gas properties • Domestic properties off the electricity grid • Above average domestic gas consumption per meter • High proportion of social housing • High non-domestic gas consumption per meter • Significant onshore wind resource • Significant solar PV roll-out • Significant hydro generation • Significant landfill gas generation • Lynemouth power station <p><u>Offshore energy & subsea technology</u></p> <ul style="list-style-type: none"> • Port of Blyth • Energy Central • Enterprise zones supporting offshore energy businesses <p><u>Demonstration & Innovation</u></p> <ul style="list-style-type: none"> • Offshore Renewable Energy Catapult <p><u>Research & education</u></p> <ul style="list-style-type: none"> • Port of Blyth training services • Northumberland College



Appendix 2, strategic theme and policy gap analysis.

	Industrial Strategy, Clean Growth Strategy																		
	Specific policy			Business and industrial efficiency					Domestic energy										
	Automotive sector deal	Hydrogen and bioenergy innovation challenge	Offshore wind sector deal	Improve commercial & industrial energy productivity	Carbon Capture, Use and Storage	Low carbon heating in off-grid business	Recycling of industrial heat	Innovate in energy, resource & process efficiency	Domestic energy efficiency (ECO)	Fuel poor homes to EPC band C by 2030	Privately rented homes to EPC band C by 2030	Social housing to similar EPC standards	Energy performance of new homes via building regulations	Smart meter deployment by 2020	Build and extend heat networks underpinned by funding to 2021	Phase out high carbon fuels in heating off-grid properties during 2020s starting with new homes	Improve new boiler standards	Invest in low carbon heating via the RHI	Innovation for energy efficiency and heating for low cost low carbon homes
Offshore energy and subsea technology			✓					✓											
Infrastructure intelligence			✓	✓		✓	✓	✓						✓	✓			✓	
Fuel poverty									✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Domestic energy									✓	✓	✓	✓	✓	✓	✓			✓	✓
Off-grid domestic energy		✓							✓	✓	✓	✓	✓		✓	✓		✓	✓
Industrial, commercial and public estate				✓		✓		✓										✓	
District energy				✓		✓	✓			✓	✓	✓			✓	✓		✓	✓
Minewater and geothermal heat				✓		✓				✓	✓	✓			✓	✓		✓	✓
Community energy									✓						✓	✓		✓	✓
Large-scale renewables		✓	✓	✓		✓									✓	✓		✓	
Energy flexibility				✓				✓		✓	✓	✓		✓	✓				
Low carbon transport and advanced propulsion	✓	✓						✓											
Demonstration and innovation		✓	✓					✓								✓	✓		✓



	Industrial Strategy, Clean Growth Strategy																	
	Accelerating the shift to low carbon transport								Delivering clean, smart, flexible power						Value of natural resources and leading in the public sector			
	Support take-up of ultra low emission vehicles, including electric cars	Develop one of the worlds best ev charging networks	Accelerate uptake of low emission taxis and buses	Public sector lead the transition to zero emission vehicles	Encourage walking and cycling for shorter journeys	Shift freight from road to rail, including low emission rail freight and zero emission last mile	Position the UK at the forefront of research, development and demonstration of Connected and Autonomous vehicle tech	Innovation in low carbon transport tech & fuels: electric batteries, HGV platoons	Reduce power costs: flexible use of energy	Phase-out unabated coal	Improve the route to market for renewables like offshore wind, further pot 2 CFD auctions and a sector deal	Innovation: smart systems and reducing the cost of electricity storage, advanced demand response, grid balancing	Innovation: new nuclear fuels, manufacturing technique, recycling reprocessing, reactor design	Innovation: reduce the cost of renewables, including offshore wind turbine blade technology and foundations	Zero avoidable waste by 2050	New and innovative ways to manage emissions from landfill	Innovation: technology and research for agri-tech and GHG removal, waste and resource efficiency	Energy efficiency in public bodies
Offshore energy and subsea technology											✓		✓	✓				
Infrastructure intelligence	✓	✓	✓			✓	✓	✓	✓		✓	✓						✓
Fuel poverty																		
Domestic energy	✓	✓			✓				✓			✓			✓			
Off-grid domestic energy		✓							✓									
Industrial, commercial and public estate		✓		✓		✓			✓			✓			✓	✓		✓
District energy									✓		✓	✓						
Minewater and geothermal heat																		
Community energy		✓			✓				✓		✓	✓						
Large-scale renewables									✓		✓	✓		✓	✓	✓	✓	
Energy flexibility	✓	✓						✓	✓		✓	✓						✓
Low carbon transport and advanced propulsion	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓						✓
Demonstration and innovation		✓	✓				✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	

Appendix 3, initial regional energy project prioritisation, following energy strategy workshop.

