A NORTHERN ENERGY STRATEGY

THE FINAL REPORT OF THE NORTHERN ENERGY TASKFORCE

October 2017

IPPR North
Institute for Public Policy Research

NORTHERN ENERGY TASKFORCE

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IPPR's purpose is to conduct and promote research into, and the education of the public in, the economic, social and political sciences, science and technology, the voluntary sector and social enterprise, public services, and industry and commerce.

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The progressive policy think tank

Contents

Recommendations key:

- For national government, Ofgem and national stakeholders
- For Energy for the North and regional stakeholders
- For Combined Authorities, Local Enterprise Partnerships and local stakeholders

ACKNOWLEDGEMENTS

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Acknowledgements

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FOREWORD

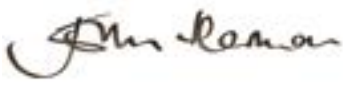
For at least the last hundred years, the north of England was the powerhouse of the country. Even as King Coal's reign came to an end, the North retained a significant slice of the nation's generating capacity, mainly through wind and nuclear power; but of even greater significance is the North's legacy of skills in engineering, distribution and manufacturing, a strong research base, and unique geographical assets.

The Northern Energy Taskforce came together with the belief that the energy sector should continue to be a fundamental strength of the economy of the North; not only continuing to power the nation in its low carbon future, but in innovation and demand management. Above all, in a region where fuel poverty is all too evident, the North can develop an energy system which meets the needs of all consumers, resolving the so-called "trilemma" of low carbon supply, security and price. A year and three reports later, that belief has hardened into conviction. With the right leadership and direction, we believe that our vision to create an energy economy worth £15 billion and create 100,000 jobs by 2050 is within our grasp. Furthermore, we believe that unleashing the northern energy economy is essential to achieving the nation's climate change commitments and has the potential to deliver affordable energy for businesses and households alike.

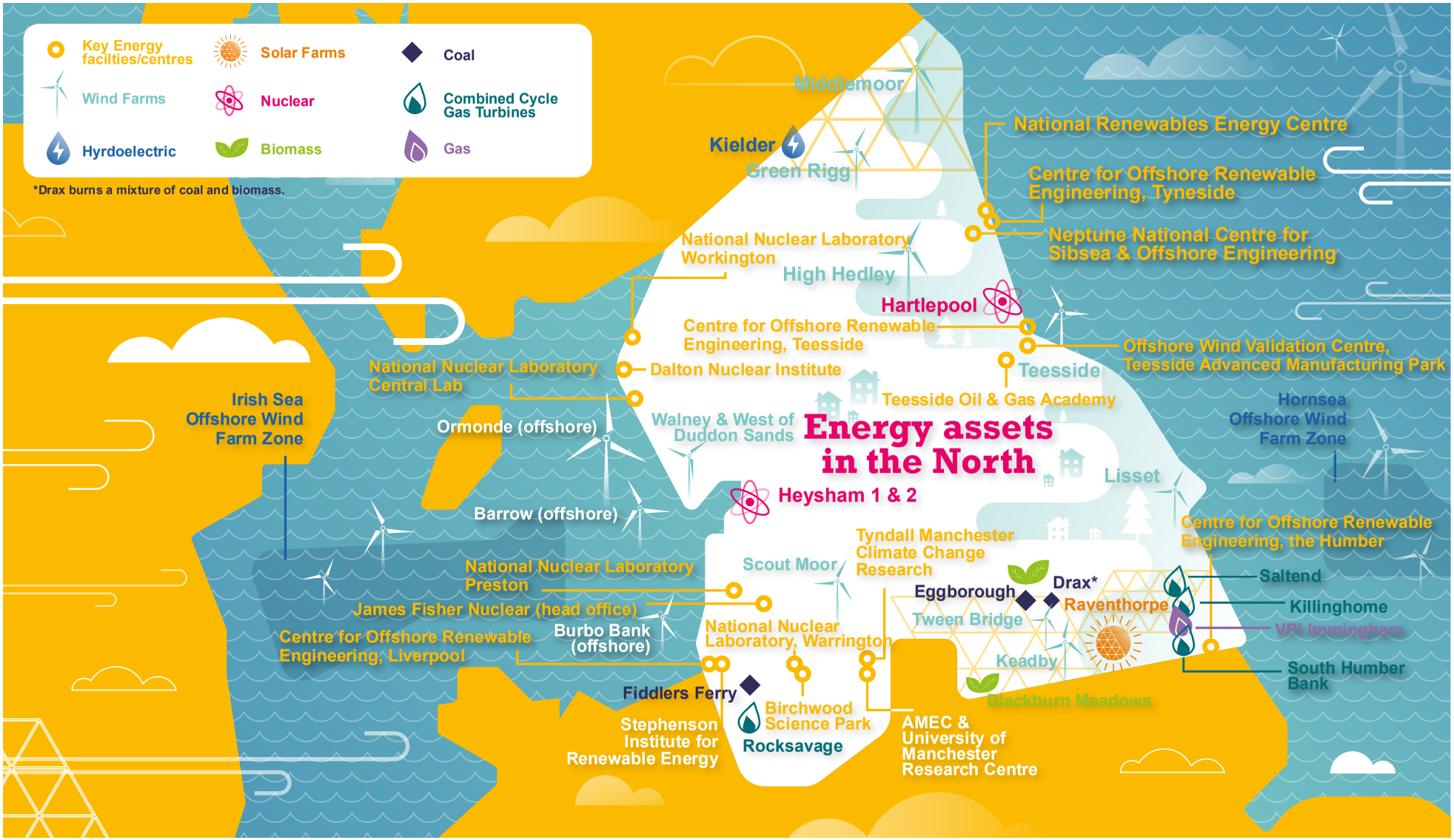
This strategy provides a routemap to get there. The success of the energy sector in the North is by no means guaranteed. While the North has a number of distinctive geographical and geological assets and is home to a range of pioneering innovations, these require investment and support. Our historical strengths – not least our skills-base – must undergo a major transition. Patterns of energy production and use are changing fast and our energy systems need to change quickly too.

The national industrial strategy provides a framework within which these opportunities can be seized but central government can also inhibit progress. Too many opportunities have already gone begging due to policy uncertainty and many other opportunities are best unlocked through more local decision-making. This is why we have put energy devolution at the heart of our plans. A Northern Energy Compact would ultimately provide a framework for investment that can respond more flexibly to regional opportunities; and Local Energy Devolution Deals are designed to unlock a local energy revolution and tackle fuel poverty.

Our strategy contains recommendations for national, regional and local stakeholders, including the formation of Energy for the North. As the taskforce winds up its work, we hope that mayors and local leaders, working with Local Enterprise Partnerships and other energy stakeholders, seize the initiative and form this new body to carry forward this urgent and important work.



Sir John Harman,
Chair of the Northern Energy Taskforce.


Key Energy facilties/centres
Wind Farms
Hyrdoelectric
Solar Farms
Nuclear
Biomass
Coal
Combined Cycle Gas Turbines
Gas
*Drax burns a mixture of coal and biomass.
Energy assets in the North
Middlemoor
Kielder
Green Rigg
National Renewables Energy Centre
Centre for Offshore Renewable Engineering, Tyneside
Neptune National Centre for Sibsea & Offshore Engineering
National Nuclear Laboratory Workington
High Hedley
Hartlepool
Centre for Offshore Renewable Engineering, Teesside
Offshore Wind Validation Centre, Teesside Advanced Manufacturing Park
Teesside
Dalton Nuclear Institute
National Nuclear Laboratory Central Lab
Teesside Oil & Gas Academy
Irish Sea Offshore Wind Farm Zone
Ormonde (offshore)
Walney & West of Duddon Sands
Hornsea Offshore Wind Farm Zone
Lisset
Heysham 1 & 2
Barrow (offshore)
Tyndall Manchester Climate Change Research
Centre for Offshore Renewable Engineering, the Humber
Scout Moor
National Nuclear Laboratory Preston
Eggborough
Drax*
Saltend
Raventhorpe
James Fisher Nuclear (head office)
Tween Bridge
Killinghome
Burbo Bank (offshore)
Centre for Offshore Renewable Engineering, Liverpool
National Nuclear Laboratory, Warrington
VPI Immingham
Keadby
South Humber Bank
Fiddlers Ferry
Blackburn Meadows
Birchwood Science Park
Stephenson Institute for Renewable Energy
Rocksavage
AMEC & University of Manchester Research Centre

SUMMARY

SUMMARY

The Northern Energy Taskforce has spent the past 15 months collaborating with energy sector leaders, and reviewing national and international evidence about the north of England's role in the global energy economy. We have concluded that, despite significant structural challenges, the people of the north of England have much to gain from a redoubling of effort at every level to maximise the local opportunities and regional advantages that we have here to drive 'green growth'. This Northern Energy Strategy represents something of a route map as to how best we move forward.

> Our vision for the north of England is that by 2050 we will be the leading low carbon energy region in the UK, with an energy economy worth £15 billion per annum and 100,000 green jobs providing affordable, clean energy for people and businesses across the North.

In order to achieve this, we propose that Northern leaders work with central government, Ofgem and the Committee on Climate Change to negotiate a long-term **Northern Energy Compact**. Such a compact would be a long-term arrangement to provide the transparency and continuity necessary to facilitate public and private investment in Northern energy assets and opportunities. It would have two key components:

- A **Northern Carbon Budget**, negotiated with the Committee on Climate Change, binding the region to reducing carbon emissions by an agreed amount over five-year periods as part of national carbon reduction targets.
- Negotiated **freedoms and flexibilities within the national regulatory and policy framework**, growing over each five-year period, to maximise opportunities in the energy economy, encourage inward investment, and facilitate more effective progress towards carbon reduction.

The northern energy economy

To become the leading low carbon energy region in the UK, we must build on our existing strengths and put them front and centre of any industrial strategy. The North has strategic advantages in key areas such as hydrogen, tidal and marine energy, as well as in emerging forms of energy storage, but these and other opportunities require a more strategic and consistent approach to energy innovation and supply chain development.

We recommend the formation of a new **Northern Energy Accelerator** to work alongside northern universities, Local Enterprise Partnerships, Innovate UK and national catapult centres, in order to identify, coordinate and drive northern energy sector opportunities from early-stage innovation to commercial and social success.

Northern businesses and universities are leading the way in pioneering new 'smart grid' systems, reducing energy costs for consumers and finding new ways to integrate our electricity, heat and transport needs. But, as Ofgem already recognises, this will require a radical shake-up of existing systems and the creation of new **Distribution System Operators (DSOs)**.

We recommend that Ofgem works closely with existing northern network operators, universities and other key players to pilot new approaches to systems operation and regulation and makes the north of England its **testbed for DSO experimentation and smart grid transition.**

The north of England is also well known for its energy intensive industries: metals, chemicals and cement. It is rarely noted that, while being considered 'dirty' industries, these are vital assets in supporting a low carbon economy: steel for electric vehicles and wind turbines for example; chemicals for batteries and hydrogen for heat. These must be carefully considered as part of local economic strategies and supported by **more flexible and permissive approaches to energy pricing and supply**.

The local energy revolution

Consumer energy needs must sit at the heart of the Northern Energy Strategy. Households and businesses will be the driving force in creating a more efficient and intelligent energy system, and a relatively small number of community energy schemes are already leading the way with local energy generation and efficiency measures. Action must also be taken to eliminate fuel poverty, which is the cause of great social harm and considerable costs to the public purse. To date, however, market mechanisms are working too slowly and top-down policy-making is holding back the local energy revolution that is taking place in other developed nations.

In order to kickstart a local energy revolution, we recommend that government and combined authorities work closely together to strike **local energy devolution deals**. At the heart of each deal there will be a commitment from government to **devolve the receipts from the Carbon Floor Price (CFP)**

and Emissions Trading Scheme (ETS) for that area, in return for specific commitments on the part of the combined authority to stimulate more decentralised approaches to energy generation and efficiency. Such commitments could include: a big focus on improving the energy efficiency of local housing stock, schemes for the extensive roll-out of solar panels, transitional support for energy intensive businesses and schemes to promote community energy initiatives.

As part of Local Energy Devolution Deals we recommend that:

- Individually and collectively, local authorities across the North adopt a **Northern Low carbon Homes Commitment**, ensuring that all new build properties meet the original low carbon homes standards dropped by central government
- at least one northern city-region should work with Ofgem to pilot the **UK's first municipally-owned energy services company (MO-ESCo)**.

In order to address the significant underperformance of energy efficiency initiatives such as the Green Deal, we recommend that the responsibility for the introduction of **energy efficiency measures should be switched from energy supply companies to energy distributors (DNOs)** as part of the switch to a smarter grid. They would, in turn, work closely with local players as part of local energy devolution deals.

In addition, in all 11 Local Enterprise Partnership areas across the North, irrespective of whether there is a Local Energy Devolution Deal, there should be **local energy strategies in every area**. These should include:

- a portfolio of investable energy projects to drive the local energy economy (supported by the Northern Energy Accelerator)
- initiatives to enhance local sustainability and drive down energy costs for households and businesses
- clear guidelines for the integration of planning, transport, air quality, energy supply and demand and smart grid development.

Expanding low carbon generation

The north of England has always played a leading role in the nation's energy generation on account of its geographical and geological assets. While recognising that traditional fuels such as coal and natural gas are likely to play a continued role within the northern energy system in the coming decades, the focus of our effort must now be placed on the North's renewable heat and power sources.

As regards the transition from natural gas, we recommend that government reinvigorates its interest in **carbon capture, storage and utilisation (CCS)** and establishes some form of CCS catapult initiative as part of its industrial strategy. This should be one of a number of preconditions for shale gas extraction.

We also recommend that the government's proposed £4.3 million **Hydrogen-for-Heat demonstrator project** is allocated to a consortium of northern companies who have already invested significant private funds in these technologies, and that the pilot should be extended to exploring the manufacture and transmission of hydrogen to homes and businesses.

As regards renewable energy, nearly half of England's renewable power is already generated in the North, and this proportion is growing. Our strategy identifies **urgent actions required across the range of renewable technologies**, including onshore and offshore wind, marine and tidal energy, solar PV, renewable heat, and bio-fuels.

The North is also home to some of the world's leading research and development hubs for the nuclear sector, and there are ongoing plans for future nuclear generation at Moorside. However, perhaps the biggest opportunity in this domain is for the North to export hazard remediation technologies into the burgeoning **European market for nuclear decommissioning**.

However, the primary way in which any of these technologies can be supported by public policy is for there to be transparency, continuity, and **certainty regarding the energy policy framework to facilitate private investment**. We believe this can be best achieved through the Northern Energy Compact and carbon budget described above.

Much of the institutional framework necessary to drive forward this Northern Energy Strategy is in place already, and national and local players both in the public and private sector have bold and innovative ideas for change. What is missing in the UK – unlike many other developed nations – is the regional capacity necessary to connect, coordinate and facilitate the North's burgeoning energy sector. To this extent, we propose the formation of **Energy for the North**: a strategic body with responsibility for driving forward this Northern Energy Strategy and negotiating the Northern Energy Compact.

THE NORTHERN ENERGY TASKFORCE

The Northern Energy Taskforce was convened in summer 2016 to oversee an ambitious programme of work in order to develop an energy strategy for the Northern Powerhouse. The taskforce was chaired by Sir John Harman, who was supported by a number of high-profile figures with expertise across infrastructure, engineering, finance, academia and local government.

The Northern Energy Taskforce:

Sir John Harman
Phil Jones, Northern Powergrid
David Gill, Northern Gas Networks
Paul Hamer, WYG
Richard Evans, KPMG
Carl Ennis, Siemens
Ingrid Holmes, E3G
Phil Taylor, Newcastle University
Paul Booth, Tees Valley Unlimited
Nina Skorupska, Renewable Energy Association
Julianne Antrobus, Atkins
Matthew Bilson, University of Sheffield
Graham Meeks, Green Investment Bank
Chris Jones, GHD/Durham Energy Institute
Anthony Hatton, Peel Group

The Northern Energy Taskforce workshops

In collecting evidence for our strategy we conducted six workshops across the North. These covered:

- Energy supply and its impact on energy intensive industries (Middlesbrough)
- Research and development in the energy sector (Newcastle)
- Developing a northern energy supply chain (Hull)
- Finance: How to finance an energy strategy for the North (Leeds)
- Energy devolution and the powers needed to implement a northern energy strategy (Manchester)
- The future of the grid in the North (Workington)

We also held roundtable discussions with strategic lead officers from Local Enterprise Partnerships and combined authorities and with BEIS officials.

The taskforce had three main objectives.

1. To develop a strategy for the northern energy system to 2050, addressing the key needs and challenges facing energy consumers and businesses in the North.
2. To create an economic vision for the northern energy sector in 2050 and a practical roadmap for how to get there, addressing the opportunities in the energy sector for businesses, higher education institutions and the public sector.
3. To set out a plan for 'energy devolution' that will consider whether and how various powers and responsibilities for energy issues should be devolved to different pan-northern, sub-regional and local levels.

The taskforce has carried out its work through an intensive programme of research led by IPPR North. Alongside desk-based study, it has carried out six workshops across the north of England as well as holding seminars with government officials, Local Enterprise Partnerships and combined authorities and over 50 separate meetings with industry stakeholders.

The taskforce has published two major reports to date:

- *Who will power the powerhouse?* (Baxter and Cox 2017) took stock of the current landscape of the northern energy sector, assessing the key challenges it faces and opportunities it could grasp.
- *Leading, adopting or drifting? Where next for the Northern energy sector?* (Baxter and Cox 2017) demonstrated how the North could become an energy sector leader and act as a pathfinder for unlocking the energy trilemma for the UK: ensuring security of supply, managing the cost of and access to energy, while decarbonising the energy system.

It has also published working papers on transport, geological assets and the implications of Brexit for he energy sector in the North.

This strategy represents the final report of the Northern Energy Taskforce.

CHAPTER 1.
OUR VISION FOR NORTHERN ENERGY

INTRODUCTION

In our previous reports, the Northern Energy Taskforce has identified the vital role that the North has played in powering up the nation, the present challenges it faces, and the huge opportunities that currently exist for the North to once again regain its role as a national – even global – energy leader.

The North has the geological, geographic and historical assets to power and heat the nation. It is leading the way in the transition to a renewable power supply, with nearly half of all UK renewable power generated in the north of England, and significant scope to scale-up offshore wind and develop tidal schemes. It is also home to an extensive nuclear capability, and biomass energy generation represents another short- to mid-term option for cleaner generation. As regards heat, the North has the attributes and natural advantages to lead in the take-up of new approaches, infrastructure and resources that will underpin a sustainable, low carbon pattern of heat supply for the nation.

The North is leading the way to a sustainable future with its burgeoning low carbon goods and services sector, in which levels of employment are well above national averages with pockets of innovation in critical areas such as energy storage and demand management. Many of these specialisms are linked to wider economic capabilities in which the North has world-leading strengths, such as in advanced manufacturing and data processing, placing the northern energy sector front and centre in a place-based industrial strategy.

Yet we have been realistic about the challenges.

- Traditional power generation is already in decline, with coal-fired power stations due to be phased out by 2025 and many combined cycle gas turbines reaching the end of their working lives.
- Energy demand is disproportionately high in the North due to the presence of several energy-intensive commercial and industrial sectors.
- Our region's ability to exploit the potential sites for power generation is potentially vulnerable given its reliance on a national energy policy and direction of travel, which has and may continue to obscure or miss regional opportunities and key strengths.

Despite these challenges, we believe that – with the appropriate support and strategic oversight – the north of England could address three national priorities.

1. It could unlock the so-called the 'energy trilemma' for the UK: ensuring security of supply, and managing the cost of and access to energy, while decarbonising the energy system.

2. It could open up significant economic benefits for the North and the nation more widely, and narrow the regional productivity gap in doing so.

3. It could successfully demonstrate a new whole-systems approach to the UK energy sector and pioneer its implementation at a regional level.

Realising these priorities will enhance national energy security and generate strong and resilient economic growth, while meeting the nation's legally binding emissions reductions targets needed to mitigate – the effects of a changing climate.

Energy consumers – both households and businesses – have been crucial contributors to our work and sit at the heart of our strategy. We are rapidly moving into an era when a low carbon energy system is running without the need for subsidy. Our strategy can deliver clean, low carbon power, heat and transport options as well as realising new job opportunities and wider economic benefits to everyone living and working in the North.

The members of our taskforce have demonstrated that the opportunities to become a global energy leader will depend upon great collaboration.

- Businesses, Local Enterprise Partnerships, local and combined authorities and academic institutions must take a leading role in charting the way forward. In recent years, central government has taken decisions which have disrupted Northern energy opportunities and disincentivised investment in green technologies. This means it is all the more important for key stakeholders in the North to set their own vision and priorities for action in order to rebuild business and investor confidence.

- Central government, regulators and other national bodies must come alongside these efforts to enable opportunities to be seized, ensure a level-playing field for northern businesses and unlock investment and change.

- Ultimately, citizens and communities will drive the transformation with their own choices, expressed through their consumer behaviour and their local activism. This will be underpinned by a collective vision, expressed through the democratic system, for the kind of economy and environment they want for their own children and grandchildren.

OUR 2050 VISION FOR THE NORTHERN ENERGY SYSTEM

Our vision for the north of England is that by 2050 we will be the leading low carbon energy region in the UK, with an energy economy worth £15 billion and 100,000 green jobs providing competitive, affordable and clean energy for people and businesses across the North.

Our vision has a strong focus on the economy. With an increasing interest in the role of industrial strategy in improving productivity and sharing prosperity more widely across our nation, our Northern Energy Strategy represents a crucial component in rebalancing the economy.

To this end, it begins with northern strengths in energy innovation, systems integration and energy infrastructure.

Our 2050 vision for innovation, integration and infrastructure can be set out as follows.

- The north of England will be the leading low carbon energy region in the UK, with an energy economy worth £15.3 billion (more than double its current size), and the home to 100,000 green jobs[1].
- The north of England will be recognised as a global hub for research and innovation in the energy sector, from early stage innovation in its universities through to commercialisation and scale-up in cutting-edge industrial sites.
- The north of England will be recognised as being at the vanguard of energy systems integration and demand management, having pioneered some of the world's first smart grid technologies; large-scale, low carbon heating and transport systems; and supported widespread consumer behaviour changes.
- The north of England will be an energy skills hub with a wide range of job opportunities, from research and development to engineering to digital and customer services.

More details about how we will drive our energy economy are set out in chapter 2 of this strategy.

Consumers, households, businesses and communities must sit at the heart of the energy transformation we need to see. We need an energy market which generates competitively priced, affordable and clean energy, particularly for those on the lowest incomes and at risk of fuel poverty. This will require nothing short of a local energy revolution.

Our 2050 vision for local energy comprises four key dimensions.

- Domestic energy demand in the North will have fallen faster than the national average due to a transformation in energy efficiency measures and the use of smart appliances.
- Energy costs and poor housing stock will no longer be a source of fuel poverty, with public agencies in the North reaping the benefits of improved health and social outcomes.
- Decentralised energy generation will account for one half of all energy supply in the North.[2]
- The north of England will be at the vanguard of low carbon transport systems, with significant reductions in private vehicle use and 80 per cent of all public and private transportation generating ultra-low emissions.

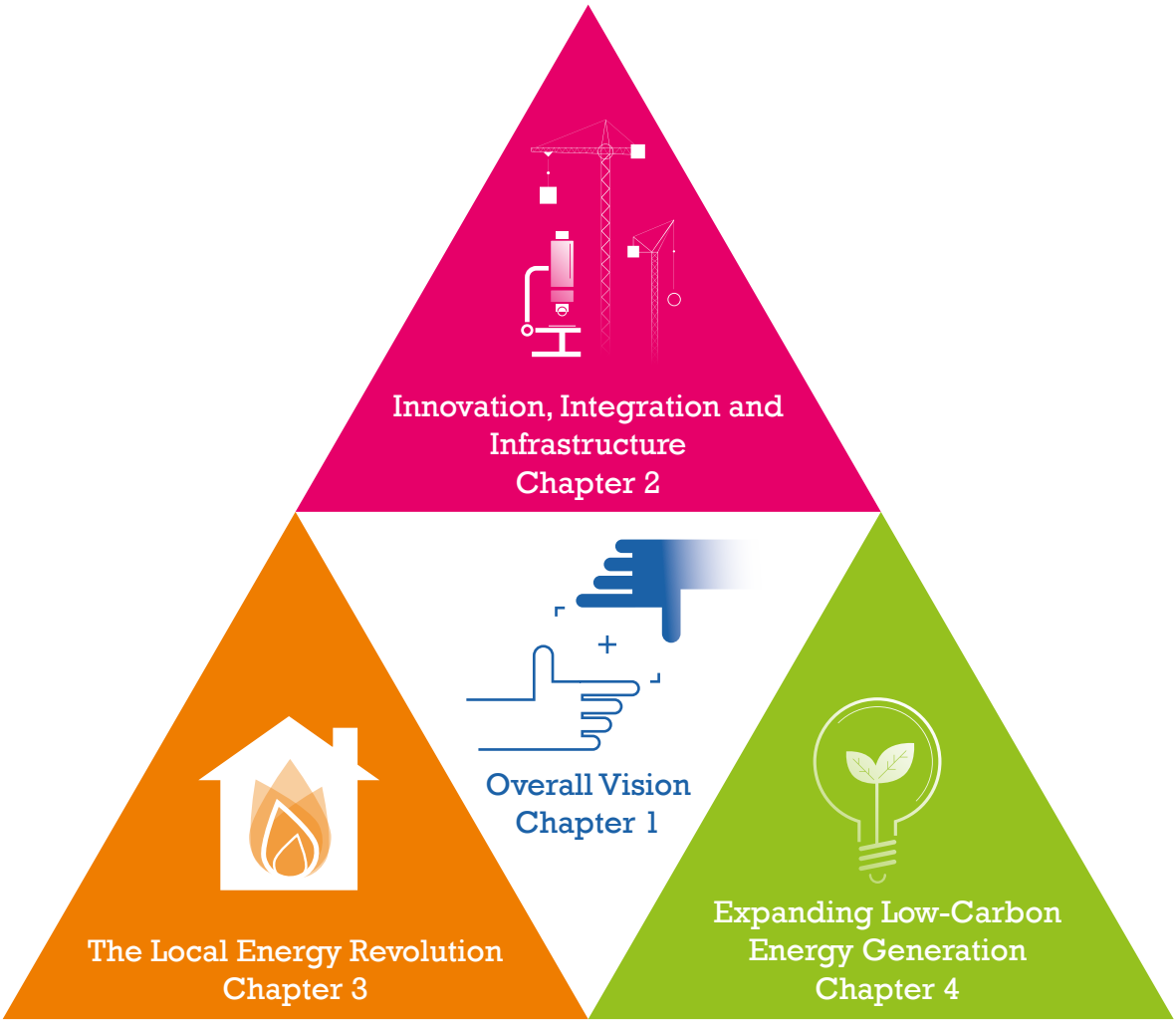
More details about how we will stimulate a local energy revolution are set out in chapter 3 of this strategy.

If the north of England is going to play its part in meeting its international obligations to lower carbon emissions, how it generates its energy is critical. Many developed nations are moving rapidly to energy systems with a much higher level of decentralised and renewable generation, and the north of England has the potential to lead the charge in the UK context.

1 These estimates are taken from econometric modelling developed by SQW and Cambridge Econometrics as part of the Northern Powerhouse Independent Economic Review (SQW 2016).
2 Based on FES Two Degrees scenario; National Grid, 2017
3 Adapted from SES, using National Grid FES Two Degrees scenario; National Grid, 2017

Our vision for low carbon energy generation in the North can be summarised as follows.

- The North will have achieved almost complete decarbonisation of its energy system, with 100 per cent of all energy consumed delivered from low carbon intensity sources.[3]
- The north of England will be leading the nation in making the transition from traditional fuels to renewable energy sources, not least in decarbonising our heating systems through pioneering large-scale innovations in non-fossil fuel gas technologies alongside carbon capture and storage or utilisation.
- The north of England will have regained its role as the nation's powerhouse, maximising energy security through a smart, flexible grid system and large-scale nuclear, tidal and offshore wind generation, while minimising our dependency on imported energy from overseas.
- Non-domestic buildings and our manufacturing and industrial sectors will have significantly enhanced their competitiveness through improved energy efficiency and a reduced reliance on carbon intensive feedstocks.



MAKING THE LEAP

If the north of England is going to make the transition suggested by our grand vision, then it needs the levers and the institutions to drive forward change. To date, too many decisions about our economic future and about our energy system are taken in Westminster and Whitehall. Our city-regions are already beginning to show what they can do when they are given the space to nurture their local economies. On a bigger scale, Transport for the North is making impressive progress in facilitating pan-northern collaboration around key transport priorities. And the devolved nations are making good progress developing their own bespoke energy and low carbon strategies.

For this reason, we believe we need some new, devolved arrangements to give the North of England the ability to maximise its opportunity. These will involve the following.

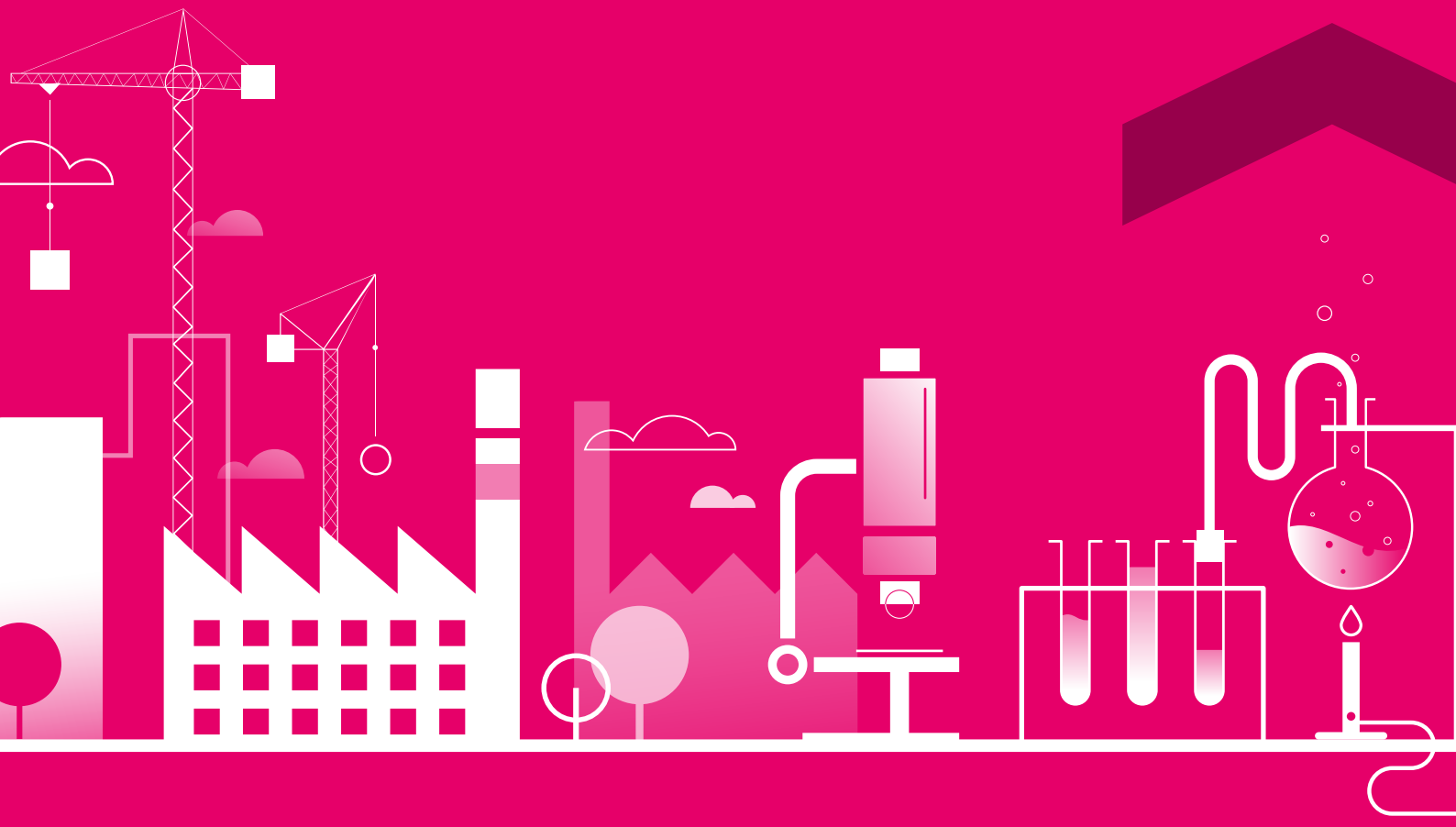
- Local Energy Devolution Deals: to give mayors and their combined authorities greater control over energy efficiency funding, building standards and system operations, in order to tackle fuel poverty and drive decentralised energy schemes. (Details of these deals are set out in chapter 3).
- A Northern Energy Compact: giving northern stakeholders the ability to adapt policy incentives and regulatory functions to encourage investment in renewable generation and clean technologies in exchange for direct responsibility for a Northern Carbon Budget. (This is set out in chapter 5).

In order to develop and deliver our Northern Energy Strategy and to provide accountability for any Northern Energy Compact, we are proposing the formation of a new body called **Energy for the North** (EfN). We are also proposing the formation of a **Northern Energy Accelerator** with particular responsibilities for coordinating local energy innovation and the various clusters and catapults across the North, and supporting investment and supply chain development.

EfN may ultimately become a statutory body, much like Transport for the North, with responsibility for agreeing the Northern Energy Devolution Deal and meeting its Northern Carbon Budget obligations. It will also develop a Northern Energy Generation Framework and have formal oversight for the Northern Energy Accelerator.

More details of these two new bodies are also set out in chapter 5.

CHAPTER 2.
INNOVATION, INTEGRATION AND INFRASTRUCTURE



2050 VISION

Our 2050 vision for the northern energy economy combines four elements.

- The north of England will be the leading low carbon energy region in the UK with an energy economy worth £15.3 billion, more than double its current size, and the home to 100,000 green jobs[4]
- The north of England will be a global hub for research and innovation in the energy sector from early stage innovation in its universities through to commercialisation and scale-up in cutting-edge industrial sites.
- The north of England will be at the vanguard of energy systems integration and demand management, having pioneered some of the world's first smart grid technologies; large-scale, low carbon heating and transport systems; and supported widespread consumer behaviour changes.
- The north of England will be an energy skill hub with a wide range of job opportunities, from research and development to engineering to digital and customer services.

Context

Government is right to pursue a more active, modern industrial strategy. In its green paper it identified energy as one of its ten pillars – both in terms of the infrastructure needed to underpin wider economic success but also as a growth sector in its own right. If this is to be the case, then the north of England has a crucial role to play.

In last year's Northern Independent Economic Review (NIER), energy was identified as one of four 'prime capabilities' in the North, where some aspects of the energy sector were identified as world-class and there was a widespread distribution of energy assets and capabilities across the whole of the North giving scale as well as depth to northern energy opportunities.

With its world-class universities, manufacturers and historic skills base, the North could, with the right strategy, develop its potential as a breeding-ground and leading destination for energy innovation. This in turn creates opportunities for economic linkages with other prime capabilities in digital and advantaged manufacturing which, could lead to deep northern energy supply chains.

At the more local level, many northern Local Enterprise Partnerships have identified the energy sector – and particular local clusters and capabilities – as being crucial to their future success.

4 These estimates are taken from econometric modelling developed by SQW and Cambridge Econometrics as part of the Northern Powerhouse Independent Economic Review (SQW 2016).

However, in recent times the track record of northern businesses and wider stakeholders to capitalise on such strengths has been mixed. There is a widely held view that opportunities to gain first-mover advantages in offshore wind were squandered by indecisive policy-making and, more recently, the opportunity to become a world-leader in carbon capture and storage or utilisation technologies is perceived to be slipping away. The journey from early-stage innovation to full commercialisation and scale-up requires careful navigation with support from public and private players and at different spatial scales.

The security and affordability of supply is also crucial for the wider economy. All businesses and households depend on a robust energy infrastructure to supply their changing needs. This is particularly true in certain parts of the North where energy intensive industries represent major employers and key economic 'hubs'. Whether it is local network resilience and flood risk, or the cost of importing energy from overseas, energy users in the North are right to be concerned that our energy infrastructure and supply is secure.

In this context, the changing nature of electricity generation and usage presents notable challenges to the existing grid system. In both electricity and heat markets, new technologies and business models are needed. While these changes are needed nationally, efforts to adapt to these changes will happen at a local and regional level and are likely to offer significant first-mover advantages. With its Centre for Energy Systems Integration (CESI), and a number of pioneering stakeholders in this field, this again presents a particular opportunity for the North to lead the way.

Our approach

At present, the UK has a centralised system of decision-making in the energy sector which lacks the granularity and local engagement to make the most of regional opportunities. This has meant the country has been slow to support some new technologies and slow to maximise significant regional benefits.

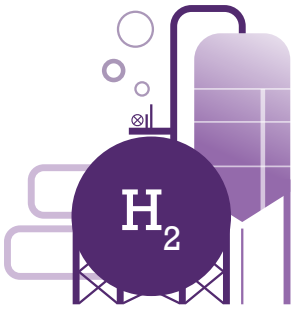
The devolved nations – Scotland, Northern Ireland and Wales – have demonstrated successes through shaping their own more ambitious and cleaner energy policies. For example, Wales and Scotland have used planning policies and devolved Renewable Obligations Certificate (ROC) subsidies, the former financing mechanism for renewable generation, to make it easier for companies to build onshore wind farms. While onshore wind is by no means an innovative energy technology, now well established, the lessons drawn from these administrations could be applied to newer, less tested technologies.

If the north of England is to maximise the economic opportunities that exist in the energy sector and ensure long-term security of supply, then it needs a stronger commitment to collaboration across LEP areas and greater autonomy to drive forward its distinctive economic priorities.

KEY PRIORITIES

Priority 1: Energy innovation and supply chain development

The north of England has a strategic advantage in a number of technologies which could be key in a future energy system. These are outlined in the box below.

Technology	Opportunities
Hydrogen 	Currently, Tees Valley produces the majority of the UK's hydrogen. Additionally, firms elsewhere in the region, such as ITM Power Ltd. in Sheffield, are manufacturing hydrogen through electrolysis powered by renewable electricity. Northern Gas Networks, working with partners, have developed a plan to convert the gas grid in Leeds to run on hydrogen so as to decarbonise the city-region's heat supply. This would involve a pan-northern supply chain, which could ultimately support this infrastructure transition nationally (Northern Gas Networks, 2016). There are also opportunities in the North West, such as the Liverpool-Manchester Hydrogen Clusters project (Cadent Gas 2017). This could give the region a particular first-mover advantage in a fuel and its accompanying technologies, which may be of national and international significance.
Tidal and marine 	Tidal lagoon energy, where a large manmade lagoon is constructed to capture water at high tide and releasing it later through turbines to generate electricity, is currently absent from the UK's energy mix, but could supply as much as 16GW of capacity if UK wide proposals are taken forward. One of the potential sites is located in West Cumbria (Tidal Lagoon Power 2017), in the Solway Firth near Workington, while there are also opportunities in the Liverpool Bay area (Hendry 2016). The project would bring online 2GW of capacity, representing a significant supply of low carbon energy and creating local supply chain opportunities. There have also been expressions of interest in tidal barrages and bridges, although these are less developed. For example, the Solway Energy Gateway project hopes to construct a cycle and pedestrian bridge linking Scotland and Cumbria in the Solway Firth (Solway Energy Gateway 2017). Unlike a barrage, a tidal bridge does not impound water. Those behind the scheme argue that this avoids the negative environmental impacts associated with barrages, and means that the technology does not impact on local wildlife (Solway Energy Gateway 2017).

Storage

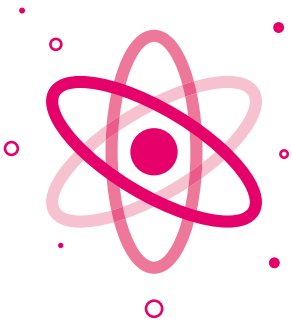
Storage will play an increasing role in the energy system as newer forms of intermittent generation are brought online and new technologies are used to heat the region's homes. The North has a series of opportunities in storage. Nissan – which has been a key manufacturer and user of batteries for electric vehicles – is located in the region, and Centrica have established a major storage project at the former Roosecote power station site at Barrow in Furness (~32MW capacity) (Centrica 2017).

Recent government announcements on battery technology (including the Faraday Challenge and the proposed National Battery Manufacturing Facility) (Innovate UK 2017) are a step in the right direction and might stimulate a significant, globally facing industry in the UK. It may be that the North can build on these assets and take these often time limited opportunities when they occur.

Alongside chemical storage, the region's geology – means that it has an advantage in storage for gas, potentially hydrogen, for compressed air storage and for heat in mine workings. Given that these are based in geological formations, these are very much northern opportunities unable to be replicated elsewhere.

In respect to mine water, abandoned coal workings offer a huge publically owned asset which can be utilised to store significant volumes of heat, typically close to where it is to be used. The opportunity for mine shafts to provide heat is significant, with estimates showing that shallow mine workings could provide upwards of 1,500MW of geothermal across the UK. Even more notable is the storage opportunity. In Sheffield alone, abandoned mine workings could store in excess of 90 GWh of energy beneath the city. With 30% of the UKs mines located in the north of England this is clearly a significant regional opportunity. As 30 per cent of the UK's mine workings are located in the north of England, the region clearly has a significant advantage here. Furthermore, as the UK is the first nation to fully close all its deep mining activities it has an early-mover advantage with the added benefit of exporting its skills and expertise in reutilising these assets.

Nuclear



The north of England has played a key role in the history of the civil nuclear industry, and the sector continues to be a key asset. Existing generation assets in Cumbria and across the North represent 40 per cent of the UK's installed nuclear capacity, and the region is home to a number of research assets. These include the Dalton Nuclear Institute and Centre for Nuclear Energy Technologies (C-NET) at the University of Manchester, the Nuclear Advanced Manufacturing Research Centre at the University of Sheffield, and the UK's National Nuclear Laboratories situated in Cumbria. In addition, the Nuclear decommissioning and waste management capability at Sellafield and the UK's Low Level Waste Repository near Sellafield represent a key strategic asset and opportunity for those firms which seek to enter this global market. A plan for utilising this asset is outlined in chapter 4.

Bringing innovative concepts and technologies to market requires a process that includes fundamental research (and invention), feasibility studies, industrial research, and experimental development, as well as commercialisation and market take-up. This is represented by Innovate UK through nine Technology Readiness Levels (TRL) (Ministry of Defence 2011). These are outlined below.

Market need	TRL 1 - Basic principles observed and reported.
	TRL 2 - Technology concept and/or application formulated.
Ideas feasibility	TRL 3 - Analytical and experimental critical function and/or characteristic proof-of-concept.
	TRL 4 - Technology basic validation in a laboratory environment.
Development	TRL 5 - Technology basic validation in a relevant environment
	TRL 6 - Technology model or prototype demonstration in a relevant environment.
Semi-commercialisation	TRL 7 - Technology prototype demonstration in an operational environment.
	TRL 8 - Actual Technology completed and qualified through test and demonstration.
Full commercialisation	TRL 9 - Actual Technology qualified through successful mission operations.

Support is needed throughout this 'process', but, during the consultations involved in developing this strategy, it has not been possible to identify a clear view as to where there are particular problems. Anecdotally, the picture seems mixed and fragmented.

As regards early-stage innovation, the UK has access to several large research funding sources through the research councils, Innovate UK and Horizon 2020, which allow research and development to take place. Some stakeholders feel this is adequate; others have highlighted the weaknesses of nationally-run schemes and pointed to more effective regionally-specific funds such as Innovus (Innovus 2017).

At mid-stage, the north of England has several demonstrator projects, such as Thornton Science Park which hosts the Intelligent Energy System Demonstrator (IESD) facility, and the Offshore Renewable Energy Catapult at Blyth.

But these institutions focus on demonstration only, and not building links with manufacturers, pricing projects and looking for potential customers.

It seems that the biggest concern regarding the energy innovation journey concerns the commercialisation and scale-up of key technologies. The examples cited above – hydrogen, tidal and battery storage – all represent technologies which are well developed but require a level of sophisticated legal, political and financial support to transform them into world-leading commercial opportunities. Recent government announcements on battery technology are a step in the right direction and might stimulate a coordinated effort to align northern stakeholders in this field, but the North needs an agency and capacity that can support this kind of activity on a consistent basis.

A missed opportunity: Offshore wind

It is a common critique of energy policy in the UK that it has missed opportunities to develop native industries around generation. For example, weak and uncertain support from central government has meant that opportunities to maximise our ideal position to develop offshore wind generation have been missed.

The UK is now in a position where it has created significant numbers of jobs in installation, operations, maintenance and turbine blade manufacture which are important in their own right, i.e. through the Siemens plant at Humber. However, unlike countries such as Denmark, Germany, Spain and France whose governments have supported the technology and its manufacturers, higher value elements of the supply chain – principally the manufacture of the nacelle, in which all the components including the gearbox sit – have not been established (McNeil et al 2013[1]).

Recommendation
Energy stakeholders in the north of England, working in conjunction with central government and Innovate UK, should establish a 'Northern Energy Accelerator' tasked with achieving the 2050 economic goals

The Northern Energy Accelerator (NEA) will be the principal agency for ensuring that northern energy innovation can be translated into both commercial and social success. It will have two main objectives.

1. To support northern energy innovation from early-stage innovation, through mid-stage demonstrator projects, to late stage commercialisation and scale-up.

2. To coordinate ideas, activities and project development across different LEP areas and, where appropriate, to support integration between universities, catapults and other centres of expertise.

Further details of the NEA are set out in chapter 5.

Priority 2: Transmission, distribution and systems integration

The way that energy is transmitted and distributed to homes and businesses is changing. Electricity, heat and transport systems are becoming increasingly integrated with more intermittent power generation and electricity and gas storage posing new challenges for the way our energy systems work. In simple terms, our energy system needs to become 'smarter', but this represents a huge opportunity for innovation where northern stakeholders could take the lead.

Pioneering smart grid systems will provide both economic gains and more efficient use of energy reduces costs for consumers too. It will decrease the need for building large, centralised power plants, and managing the demand for energy could avoid having to make expensive reinforcements to the traditional network.

The North is already leading in terms of technological innovation in the 'smart' area. The region is home to the CESI at the University of Newcastle (Newcastle University 2017). CESI is seeking to understand and pioneer the future of the energy system and can become an anchor for future projects.

Case study: National Centre for Energy Systems Integration (CESI), University of Newcastle

Based at the University of Newcastle, CESI is a key asset for the north of England in the transition to a smarter energy system. The institution, funded by the Engineering and Physical Sciences Research Council (EPSRC), is focussed on examining and testing the future of the energy system. They are seeking to understand how a smarter energy system will deliver security of supply and cost efficiency while integrating more renewables. This requires a whole systems approach – focussing on power, heat and transport together.

One example of its work is the £30 million InteGReL facility (Integrated Electricity and Gas Research Laboratory). InteGReL is owned by Northern Gas networks who are working in partnership with CESI and Northern Powergrid, and is a utility-scale demonstrator which allows researchers and industry to carry out grid scale trials on coupled gas, electricity and heat systems. Located in Gateshead, this is a nationally unique asset.

But developing a smart grid will require a significant shift in the current system, particularly on the part of Distribution Network Operators (DNOs) who currently have responsibility for passively transmitting electricity. This has already been recognised and government is consulting on the formation of new Distribution System Operators (DSOs) who can play a more active role in managing electricity.

Distribution System Operators (DSOs)

Historically, the energy system has been built around the transmission of power from where it is generated centrally to where it is used locally via the National Grid and regional Network Operators. The increase in distributed supply means more renewable energy is now being generated on the local electricity grid close to where it is used. Along with new uses of electricity such as the charging of electric vehicles, this is creating a more dynamic and complex system, leading to the need for a new Distribution System Operator role - managing the local system to ensure security of supply at least cost, allowing customers to access the system and receive value from their distributed energy resources.

Ofgem are currently consulting on the future arrangements for electricity system operators, its role and structure. In their proposals, which are currently being considered, Ofgem have proposed that there is a need for separation between those who own the infrastructure and those who managed it to avoid conflicts of interest. They also believe that the systems operators will need to take on new roles with regards the management of the energy system including facilitating a whole systems approach, and therefore may need new powers (Ofgem 2017).

The DNOs in the North are already taking a more active role in the management of the electricity networks (as outlined in the box below), however this is inhibited in some respects by the regulatory framework which surrounds them. While real-time data on energy use is available for an increasing number of households' energy though the introduction of smart metering, the DNOs are prohibited by regulation from accessing this, limiting their ability to manage energy use more efficiently.

Case study: Northern Powergrid and Northern Gas Networks Green Doctor scheme

Northern Powergrid and Northern Gas Networks are working together and aiming to help 350 households to improve their energy efficiency, with an average per-household benefit of £328. The service is structured around home visits, during which small energy efficiency measures are installed and assistance is offered to apply for grants for more major improvements. The reach of the service has been extended by training volunteers to act as 'Green Doctors', who are able to provide advice to neighbours and community groups on energy efficiency.

Recommendation
Lead the smart grid transition from the north of England

The Department for Business, Energy & Industrial Strategy (BEIS) should work with the northern DNOs to lead the transition to a smarter grid system in the region. This approach should involve four elements.

1. Giving existing DNOs the responsibility for the DSO role. The three DNOs operating in the North of England have significant knowledge over the infrastructure they own and operate. A more local approach, rather than a national one, allows accountable organisations to utilise this knowledge to ensure the energy system is effectively managed, while ensuring that the incentives in play drive effective and efficient choices around technological and commercial responses to new generation and demand.

2. Ensure future RIIO reviews, the framewok Ofgem's uses to set price controls for network companies, are designed to allow and incentivise DNOs to respond more quickly to technology and behaviour changes. Some have argued that an eight-year price control framework, which allows the DNOs to plan infrastructure delivery, would in the future be too long-term to reflect the rapidly changing nature of the energy system and would therefore impede the deployment of new technologies. While break clauses are present in price control agreements within the power sector, these have historically had a high bar for clearance. In this period of transition within the electricity and heat sectors, future agreements should be designed with greater levels of flexibility in order to encourage DNOs to address developing trends.

3. Developing a framework for closer DNO/DSO integration with LEPs and combined authorities. LEPs and combined authorities should be brought more actively into the RIIO process, and into the strategic operations of the DNOs/DSO allowing them to input local intelligence into the process. Building on today's best practice, this will ensure two-way communication about infrastructure plans relaying what local businesses and other stakeholders are doing, or are planning to do, in the region, meaning that the correct infrastructure is built in the right places.

4. Considering all energy vectors in the design of future systems. Smarter energy systems will need to consider all energy vectors, not just electricity, in their design and operation. The need for new or altered regulation should be considered so as to build on existing practice of collaboration between the power and gas distribution networks and relevant transport bodies and authorities. This may include bringing district heat networks within the remit of Ofgem. Currently, gas and electricity networks are heavily regulated, while it is left for those who own and operate heat networks to ensure that they are run effectively. As new heat technologies become commonplace, it is necessary for these to be effectively regulated, ensuring a good level of service for customers in all areas and allowing good practice to be shared. Again, this could be led by the North.

Priority 3: Supporting the North's energy intensive industries

Energy intensive industries are those that produce chemicals, steel, aluminium, cement, ceramics, paper etc., and which require large inputs of energy for power, heat or fuels as feedstock (e.g. petroleum products for organic chemical production). There are significant clusters of energy intensives in the North; especially in the Tees Valley, Liverpool and Humber regions where there are particular concentrations of metals, chemicals and minerals manufacturing.

Energy intensives employ large numbers across the region, but they also account for almost half (45 per cent) of all the UK's carbon emissions and have therefore been seen as a key challenge for decarbonisation. Given their historic reliance on fossil fuel energy sources they are particularly vulnerable to changes in global energy prices.

However, it is rarely noted that resource intensives can play a key role in supporting a low carbon economy. For example, in the production of steel for heavy and light rail, and for the manufacture of electric vehicles or wind turbines; and in the production of chemicals important for batteries for energy storage or vehicle use, and processes that produce hydrogen.

Supporting energy intensives will require the coordination of energy policy and industrial strategy which is best done through local and energy devolution deals (see chapter 3). The City of Stoke-on-Trent and Staffordshire councils, for example, have sought to coordinate their ceramics sector businesses with a view to reducing their exposure to energy costs and volatility.

Other mechanisms that could be explored include the development of private wire networks between low carbon generation and intensive uses;[5] power purchasing agreements and sleeving to 'tie' low carbon to specific intensive uses; or more specific investment by intensive users (solely or in groups) to produce their own low carbon energy.

Recommendation
Support for northern energy intensive industries

Local Enterprise Partnerships and other local partners must give active consideration to energy intensive industries as part of local economic strategies and work with energy companies, distributors and regulators to develop more flexible and permissive approaches to energy pricing and supply.

5 Sleeving involves a firm buying energy in increments so as not to fix the price. They are then able to shop around for the best price from the market at varying points and therefore always get the cheapest energy possible.

CHAPTER 3.
THE LOCAL ENERGY REVOLUTION

2050 VISION

Our 2050 vision for local energy comprises four key dimensions.

- Domestic energy demand in the North will have fallen faster than the national average due to a transformation in energy efficiency measures and the use of smart appliances.
- Energy costs and poor housing stock will no longer be a source of fuel poverty with public agencies in the North reaping the benefits of improved health and social outcomes.
- Decentralised energy generation will account for one half of all energy supply in the North.[6]
- The north of England will be at the vanguard of low carbon transport systems, with significant reductions in private vehicle use and 80 percent of all public and private transportation generating ultra-low emissions.

Context

An energy strategy for the north of England needs to put households and communities at its heart; it is, after all, their demands, uses and expectations of energy that drive the whole system. It is through technologies deployed in homes and businesses that energy generation will be brought closer to those who consume it, and which will ensure that they have an opportunity to manage it more efficiently and intelligently.

This could have a major impact on citizens by saving and even earning them money, as well as reducing their impact on the climate. For those on the lowest incomes, this could also reduce the incidence of fuel poverty, which is an important means of unlocking wider social benefits. Living in cold homes costs the NHS around £1.36 billion per year, and so reducing fuel poverty will have notable impacts on the health and wellbeing of much of the region's population, and on public spending (Age UK 2014).

A key element of previous strategies for dealing with fuel poverty has been to address the thermal efficiency of the homes of the fuel poor, reducing the amount it takes to heat a home and therefore saving households money. More generally, improving the thermal efficiency of the UKs housing stock is a necessary step in meeting carbon budgets.

The North has been something of a trailblazer in delivering these schemes. The region was home to

Kirklees Warm Front scheme, perhaps the most comprehensive energy efficiency programme in the England to date. More recently, in mid-2015 there were 49 live Green Deal plans for every 1,000 of the population compared to 24 per 1,000 in England as a whole (DECC 2015). Similarly, 67 out of every 1,000 households in the region were in receipt of energy efficiency improvements funded through the Energy Company Obligation (ECO) measures against 46 per 1,000 nationally. This is reflected in figures relating to the region's low carbon economy, where there is an average of 22 low carbon goods and services (LCGS) jobs per 1,000 employees in the North compared with an English average of 17 (DECC 2015).

6 Based on FES Two Degrees scenario; National Grid (2017)

However, policy failures have meant that energy efficiency deployment has been weak to date and there remains a huge amount of progress to be made to get northern homes to a desired level of thermal efficiency.

Alongside energy use in homes and businesses, there needs to be a local revolution in the way individuals travel around cities, towns and villages. Transport is responsible for 41 per cent of total energy consumption in the UK (DfT 2017). Within this, road transport accounts for 29 per cent, railways for 1 percent, shipping for 2 per cent and aviation for 9 percent. As well as energy costs, vehicle emissions are responsible for much wider human and social costs with as many as 40,000 deaths being attributed to poor air quality each year (Quilter-Pinner and Laybourn-Langton 2016).

For this reason, a key part of any local energy revolution will involve a 'mobility transition' with very different ways in which we travel through the greater use of public transport, cycling and walking and a new generation of clean and connected vehicles powered through electricity and ultra-low emission fuels. The north of England is well positioned to take advantage of this challenge, with its high renewables potential, industrial assets and first-mover advantage in new fuel technologies.

Our approach

Households and businesses are already driving the low carbon transition through the choices they are making about energy supply, energy efficiency and transport. But market mechanisms are moving slowly, and top-down energy policy is sending out mixed messages. A more decentralised energy system needs a strong consumer-focus and a more bottom-up approach

Local government is already playing a leading role in the low carbon transition, but it could be empowered to go much further. Many local authorities have local plans and strategies already but often these are rather parochial and piecemeal. Despite containing many grand visions, their scale and scope limits their impact as local authorities simply don't have the capacity or resources to do very much, and over a decade of austerity has taken its toll.

Some of the best developments are taking place where local authorities are working together. Combined authorities, as well as county-district collaborations, have developed a wide range of municipal energy initiatives and innovative community energy schemes. With newly-elected metro mayors in some key city-regions including Greater Manchester, Liverpool and the Tees Valley, and with 'devolution deals' presenting opportunities for new ways of working with central government, there is an opportunity for local leadership to galvanise local action and coordinate local and regional players to drive forward a more decentralised energy system.

KEY PRIORITIES

Priority 1: Energy efficiency

Policy which supports the uptake of energy efficiency measures, while delivered at a local level, has been driven by national policy in the form of measures such as the Green Deal and ECO (the Energy Company Obligation). Collectively these policies have had poor outcomes, in part driven by policy uncertainty, in part by policy weaknesses. What is more, the estimated annual impact of national energy efficiency measures fell by 89 percent between 2012 and 2013, and this hasn't recovered since (Green Alliance 2017). This is largely attributable to the failure and subsequent removal of policy support.

The Green Deal which began in 2013 intended to incentivise energy efficiency improvements by householders by offering them loans. Those taking out a Green Deal loan needed to meet the 'golden rule', which dictated that the savings made through installing energy efficiency measures must be larger per month than the cost of the repayments. Meanwhile, ECO is administered by energy companies and provides support to those on low incomes or who are in 'Hard to Treat' homes.

Both schemes have drastically underperformed, largely due to the failure to gather enough local intelligence and support local engagement (Platt et al 2013). ECO failed to effectively target those in fuel poverty and has been piecemeal in its operation, while the Green Deal failed to adequately encourage enough sign ups to meet its targets (ibid). In both cases, there is a case to be made that such policy could be driven more effectively at a local level, by actors who are trusted, who understand their local housing stock and those that live within it.

Approximately 2,750,000 homes in the north of England are suitable for cavity or solid wall insulation and 1,140,000 homes are suitable for loft insulation. Using figures from the Kirklees Warm Front scheme (see below), it is calculated that insulating these homes would cost approximately £120m per year; less than half of the Emissions Trading Scheme and Carbon Floor Price receipts paid by the region.

Case study
The Kirklees Warmfront Scheme: An example of the local approach

A more locally oriented approach can be seen in the Kirklees Warm Front scheme. Kirklees Council invested capital alongside Scottish Power, as part of its CERT obligations, to invest in the energy efficiency homes. What made this scheme unique is that it was universal; it targeted homes regardless of household income and based on the suitability of properties for retrofit measures. 166,000 thousand households were visited, 134,000 assessments carried out, 111,000 referred for insulation and 51,000 measures installed (Beagley et al 2011).

This achieved a reduction in energy use and associated carbon emissions alongside improvements to health and quality of life. These positive social gains also sat alongside the creation of jobs and the expansion of local energy efficiency firms.

Manchester Carbon Coop

The Manchester Carbon Coop is a community benefit society founded to improve the standard of homes to 2050 standards. It is owned and run by the householders involved in the scheme, aiming to make whole house retro-fit appealing and affordable by pooling together houses and sharing experience, knowledge and reducing costs through bulk purchase (Manchester Carbon Coop 2017).

The Carbon Coop have found that whole-house retrofit can reducing energy use by half, saving 60 per cent of carbon emissions. This can save households up to £1,100 a year in energy bills (ibid).

Recommendation
Switching responsibility for energy efficiency from energy companies to energy distributors

Currently, the responsibility for energy efficiency is placed on energy suppliers through the ECO scheme. Energy companies have proved inefficient in terms of managing this funding, running up high administration costs and struggling to identify those in need. The scheme has also been criticised for entrenching the power of the big energy companies, stifling entry to the market by smaller players. More fundamentally, there are few incentives for energy providers to drive down energy consumption as they profit from the energy use of their customers.

For these reasons, we propose that the revenues from this levy and associated responsibilities should be shifted from energy suppliers to the DNOs who would be given responsibility for the roll-out of energy efficiency and price through their RIIO review. DNOs should then work closely with local and combined authorities to deliver energy efficiency and distributed energy projects. This should be part of the wider shift to a smarter grid system in the north of England (as described in chapter 2) and could also be wrapped into Local Energy Devolution Deals (see below).

In a similar way, there has been uncertainty about the energy efficiency standards of new-build housing. In 2013, the government pledged to legislate to require that all newly built homes offset their carbon output. This would have required house-builders to ensure that that measures, such as solar PV, were built on site to reduce carbon emissions, and that remaining carbon emissions were mitigated through allowable off-site solutions. However, these plans were dropped by the Coalition government in 2015, just months before they were set to be rolled out (House of Commons Library 2016).

Once again, while there is clearly a need for national guidance on building standards, many local authorities would like to have greater control over over standards through the planning system in order to generate the economic and social benefits that come with building 21st century homes and communities.

Recommendation
Introducing a new Northern Low carbon Homes Commitment

Working together, local authorities in the North can show strong leadership in delivering low carbon homes and neighbourhoods. We propose that they should follow the Mayor of London's example, and each local or combined authority should then seek further powers over planning and standards with regards to energy efficiency to drive up local standards through its Local Energy Devolution Deal (see below). These powers should seek to encourage new-build developers to improve the carbon efficiency of homes through installing distribution power and heat generation on homes and on site. This could include compelling developers to link into district heat networks where they exist and it is feasible to do so.

Priority 2 : Distributed generation, distribution and heat

The future of the energy system will be much more decentralised. Alongside adopting measures to ensure homes in the north of England use energy more efficiently, increasing numbers have and will install local devices on their homes which generate low carbon electricity and heat, thereby becoming what some people call 'prosumers'.

The capacity for distributed energy generation is huge and has the potential to meet a large proportion of domestic demand. Analysis conducted in our interim report – Leading, adopting or drifting? (Baxter and Cox 2017) – showed that were the technical capacity of rooftop solar and wind to be reached in ten Northern cities then 1,187GWhs of power would be generated. This is enough to power almost 280,000[7] homes; around 20 per cent of total dwelling stock in these cities. For reference, a Solar PV roll out on this scale would be 14 times cheaper than the expected capital cost of Hinckley point C and would get 26 times as much installed capacity online.[8]

The potential of local solar energy

It is calculated that if northern combined authorities together committed to installing solar panels to 15,000 households per year up to 2030 and provided support for a third of the capital costs, the capital costs of such a scheme would be around £30 million per year, or 11 per cent of the ETS and CFP tax regional tax receipts.

Generation of this scale would have the technical potential to provide as much as 1,187 GWhs of power per year by 2030, decarbonising a large amount of household energy consumption and reducing overall demand.

Beyond a simple capacity argument, local generation could transform the way households interact with and manage their energy, unlocking social benefits, such as reduced costs, greater energy efficiency and reframing their place in broken energy markets. It also has the benefit of reducing dependency on large-scale, centralised generation and finance and opens the energy system to more diverse forms of investment and the involvement of small and medium sized enterprises (SMEs), municipalities and community organisations.

To date, the main mechanism for encouraging and supporting households to install such technologies has been the Feed in Tariff (FiT), which pays a set amount per kWh generated and consumed by households and businesses, plus a smaller amount for that exported to the grid. High uptake has resulted in several reforms to the scheme, with the value of the payment reduced each time. This has led a number to argue that the FiT no longer sufficiently incentivises uptake. However, the cost of solar is dropping dramatically, and attitudes towards local generation are more concerned with reducing domestic costs than selling energy back to the grid. For these reasons, it is likely that some forms of micro-generation will soon become economically viable without subsidy (KPMG 2015).

The shift to a distributed energy system opens up greater opportunities for community-owned energy projects where local people, very often at the neighbourhood level, take a stake in the generation and distribution of their energy (normally in conjunction with other measures to increase energy efficiency and reduce carbon).

Community Energy England's recent state of the sector report shows that community owned energy assets represent 121MW of capacity in England, 265GWh of generation since 2002, and have created £680,000 income for community benefit in the twelve months preceding its publication (Community Energy England 2017). However, much of England's community energy activity to date has taken place in the South, with lower uptake in the North (ibid).

7 Based on annual household consumption of 43000 KWH. See: https://www.ofgem.gov.uk/gas/retail-market/monitoring-data-and-statistics/typical-domestic-consumption-values
8 Authors' analysis

Case study: Examples of community energy in the north of England

There are a number of ways in which community projects can be structured, financed and owned, such as cooperatives, social enterprises, community charities, development trusts and community interest companies (DECC 2014). Some examples are set out below.

Energise Barnsley

Energise Barnsley is a community energy project delivering renewable power and heat. It is a partnership between Barnsley Metropolitan Borough Council, Generation Community Ventures, Northern Powergrid and Ignite and British Gas Solar (Energise Barnsley 2017). The project has installed solar PV on 321 council owned homes at no cost to the resident. Tenants have saved £40,000 in energy bills, generated 800 MWhs of power, and averted the emission of 400 tonnes of carbon. Surplus profits generated by the scheme are being reinvested into a community fund. This can be bid into by local residents and organisation to alleviate fuel poverty, promote and improve environmental sustainability and support vulnerable people. The partnership has built further on its success, working with others, including Northern Powergrid, to act as a trusted intermediary on a local scheme to install battery storage into the homes of those living on a housing estate in the Borough (ibid).

Whitby Esk Energy

Whitby Esk Energy is a volunteer-run energy project who have developed a 50Kw Archimedes screw hydroelectric turbine in the River Esk, Whitby. The project was funded from a range of sources, including a share offer to local residents (Whitby Esk Energy 2017). The project is estimated to generate around 160MWh annual, enough to power 45 houses and avert the emission of 70 tonnes of CO2 (ibid). Surplus profits from the project are being used to:

- develop and operate a grant system towards the installation of solar, wind and water energy generating systems in the Esk Valley
- promote green energy educational programmes
- pioneer green energy apprenticeships

HoTTwind@Longley

HoTTwind@Longley is a Community Interest Company (CIC) which owns a wind turbine on the Longley Dairy site (HOTT 2017). This turbine is generating low carbon energy to supply the dairy, feeding into the grid when there is low or no demand. It is estimated that the turbine will generate 582MWh per year, saving 286 tonnes of CO2 per year.

HoTTwind@Longley has 180 members, 80 per cent of whom are resident in the local area and have raised £625,000 to support the project. The CIC will pay interest to its members and make an annual donation to a separate trust which will fund separate low carbon projects.

To date, the development of distributed energy generation and community energy projects more generally has relied mainly upon householders and community groups taking their own initiative. There is huge scope for a much more extensive roll-out of such schemes and, as with energy efficiency, this local energy revolution is far more likely to take hold if promoted and supported by local agencies that have the knowledge and trust of local communities. But, at present, neither local authorities nor the handful of local and national umbrella organisations have the capacity to drive the transformative change that could be possible.

9 This is not to say that such deals couldn't be signed with other groups of authorities, but it assumes such arrangements would be covered by the provisions of the Cities and Local Government Devolution Act (2016).
10 National Energy Action analysis made available to IPPR.
11 Own analysis using data supplied by NEA

Recommendation
Local Energy Devolution Deals

In order to drive a northern local energy revolution, government must strike new devolution deals with combined authorities[9], with a big focus on stimulating decentralised approaches to energy efficiency and generation.

As the centrepiece of Local Energy Devolution Deals, we propose that receipts from the Carbon Floor Price (CFP) and Emissions Trading Scheme (ETS) should be devolved. In aggregate, currently households in the North pay around £260 million in carbon taxes though fuel bills, with an average cost of £70 per bill payer. These tax receipts are not currently deployed to address major infrastructure projects which could deliver the transition to a low carbon system.

The 'deal' element of the negotiation is that, in return for devolved CFP and ETS receipts, combined authorities would commit to local investment in low carbon infrastructure projects, with a big focus on improving the energy efficiency of local housing stock. Such projects could also include the roll out of solar panels, community energy schemes or providing relevant advice and support for businesses or social enterprises seeking to enter the micro-generation market.

Devolving this funding to combined authorities would provide significant cash for local actors to implement energy efficiency and energy generation projects. This would equate to approximately £47.9 million in Greater Manchester and £42.6 million in the Liverpool City Region alone. Across the five combined authorities in the North, this cash is the equivalent to insulating 406,000 homes a year or supporting approximately 100,000MW of community solar.

Combined authority area	Value of devolved receipts
Leeds City Region	£42,659,440
Sheffield City Region	£32,391,460
Greater Manchester	£47,539,713
Liverpool City Region	£27,693,720
Tees Valley	£12,048,373

Deals could also be associated with carbon reductions, perhaps as part of the overall Northern Carbon Budget (see chapter 5), as well as considering the opportunities created for local employment, skills development and other health or social benefits.

Energy deals and devolution

This proposal is limited, at least for now, to those areas in the north of England who have already negotiated some kind of devolution deal insofar as it assumes such arrangements would be covered by the provisions of the Cities and Local Government Devolution Act (2016). However, that is not to say that such deals couldn't be signed with other groups of authorities in the future and that such provision might be a further incentive for deal-making.

IPPR North has previously published work which argues that the process of devolution has largely stalled due to a lack of a clear timescale, purpose or process. To spur on the devolution process, government needs to set out a series of clear and explicit principles concerning the geography and scale of devolution areas; a 'menu' or framework of the powers that could be devolved; and a range of options for reforms to governance that are commensurate with the level of devolution an area is seeking (Hunter 2017).

Another significant obstacle to local energy generation is the way in which the system is currently regulated. The ability for local energy schemes to enter the market is limited by their ability to secure Power Purchase Agreements (PPAs) at a reasonable rate of return and to acquire a supplier's license. In countries where there is a much stronger distributed energy sector, this has been achieved through the involvement of municipally-owned energy services companies (MO-ESCos).

Municipal energy companies	MO-ESCos
Municipal energy companies are energy suppliers owned by local authorities. These are fully licensed companies which purchase electricity or gas from the wholesale market and sell it on to their customers. Municipal energy companies may also operate as 'white labels', where a local authority owned company who does not hold a supply license works in partnership with an existing supplier to offer tariffs under a different, local brand.	MO-ESCos are licenced energy suppliers owned by local authorities. While, like municipal energy companies, they purchase electricity and gas from the wholesale market, one of their key aims is to link local supply and generation. In doing so, they pool together local generators, from individual households and municipally owned assets, selling this on to local consumers and back into the grid.

MO-ESCos typically operate at the city-region level and work closely with local energy generators to provide them with an affordable route to market through their ability to offer PPAs and service licences through energy supply contracts (ESCs). However, as public-private bodies they can also have wider obligations around demand-side reduction and tackling fuel poverty through energy performance contracts (EPCs). MO-ESCos can operate for both power and heat (Barton et al 2015).

Case study: Ecopower Belgium

Eco power is one of many energy cooperatives found in Belgium, Germany and Scandinavia. Operating in the Flanders region of Belgium, it is owned by its 50,000 members and generates and supplies energy for its approximately 40,000 customers (Simcock et al 2016). Driven by the decisions of its members, Ecopower is 100 per cent renewable, investing in and operating wind, solar, hydroelectric and biomass generation, and works with other cooperatives to expand low carbon generation and the cooperative movement (Ecopower 2017). Ecopower is different to many other cooperatives in that it is both a supplier and generator, making it a key example of the MO-ESCo model this strategy suggests should be established in a northern city.

Recommendation
Pilot a MO-ESCo in a northern city

We propose that as part of a Local Energy Devolution Deal, central government and Ofgem should form a partnership with a combined authority to pilot the UK's first Municipally-Owned Energy Services Company at a regional scale.

In the UK, there have been various attempts to develop municipal energy companies, such as Robin Hood Energy in Nottingham and White Rose Energy in Leeds. However, these have struggled to compete with the Big Six energy companies. This has been largely due to their local focus which only provides access to a relatively small customer base. The municipal energy companies currently in the market are also narrowly focussed on supply and have as yet not made the move into other service areas, such as purchasing and facilitating local supply and selling this back to consumers. This also misses the opportunity to drive the transition to a lower carbon energy supply.

The MO-ESCo model, delivered at a regional level and therefore capturing a much larger customer base, might provide an opportunity to build on the successes of local suppliers and drive the local energy revolution further.

Priority 3: Local Energy Strategies

Whether or not a combined authority strikes a Local Energy Devolution Deal or forms a MO-ESCo, there would be many benefits to developing a local energy strategy with a particular focus on bringing forward a portfolio of investable energy projects. A number of local authorities have already demonstrated the success of such an approach.

Case study: Example of local energy strategies

Stoke-on-Trent's 'Mandate for Change'

Following the election of a new administration in 2011, the City Council of Stoke-on-Trent developed a 'Mandate for Change', which emphasised local jobs and growth and included an ambition to be energy self-sufficient by 2030 in delivering 'A Great Working City' (Deputy Prime Ministers Office, 2014).

A local Green Enterprise team and the authority, carried out a city-wide assessment of their energy assets, highlighting a wide range of opportunities and technologies with potential, including geothermal, waste industrial heat, warm mine water for heat exchange, local wind, solar and other renewables, energy from waste, energy efficiency retrofit, district heating, technologies to convert wastes into synthetic and bio-fuels, and biomass AD.

The team developed an authority-wide collaboration to involve colleagues in finance, legal, planning and other functions with an interest or role in delivering energy self-sufficiency. Similarly, key local stakeholders; from the ceramics businesses whose kilns exhausted significant volumes of high temperature heat to atmosphere were engaged in the opportunities their site could offer to the wider ambition.

This was supported by a prospectus which showcased £150 million worth of investable projects, covering many of the opportunities identified above, and which was designed to target potential partners and investors.

Case study: Examples of local energy strategies

Green Growth Wales

Green Growth Wales (GGW) is a Welsh Government programme which supports green energy projects across the Welsh public sector, providing technical, legal and financial support to project promoters, while also acting to grow the project pipeline across Wales.

This includes bringing together practitioners within – and between – different localities to explore best emerging practice, providing both support and challenge to the ambition of public bodies. To date, GGW has supported the deployment of wind, solar (PV), micro-hydro, LED street lighting and district heating, and the pipeline has an overall capital value of around £500 million. Delivery of all the projects in the pipeline would be expected to generate – or, in in the case of energy efficiency, save – around 650 GWh of energy and 200,000 tonnes of carbon dioxide each year.

Case study:
Examples of local energy strategies

Greater Manchester low carbon investment opportunities

The Association of Greater Manchester Authorities has published a low carbon investment opportunities prospectus (AGMA 2016). This document highlights and quantities the opportunities in the low carbon sector in the Greater Manchester area. It covers the following:

- housing retrofit
- heat networks
- public sector estate
- electric vehicles.

The total value of this prospectus is £8–10 billion, which could create almost 70,000 jobs, £1.5 billion in GVA, and save 6.1 million tonnes of CO2 from buildings (ibid).

Manchester City Council have also created a bespoke city-level procurement body to negotiate with suppliers on behalf of different local authorities and help to standardise contractual arrangements.

These examples from across the UK highlight the benefits of aggregating expertise across an area of greater scale, the importance of taking both a strategy view of the energy potential of a place, and building a pipeline of projects over time which delivers that potential, shares lessons between participating organisations, and seeks to build critical mass of collaboration across delivery, investment and skills.

In developing this strategy, it has become clear that many Local Enterprise Partnerships and combined authorities are facing very similar challenges and bottlenecks as regards project development and investment. Often this is down to the relatively small scale of the venture or the lack of local capacity or expertise. It is widely recognised that in relation to certain types of project or investment, there would be considerable benefit in closer collaboration. Our proposal to form a Northern Energy Accelerator (see chapter 6) includes the proposal that this new body would facilitate more effective coordination between LEP and combined authority plans.

Priority 4: Transport and air quality

Elsewhere in this strategy, we show how the North is well positioned to take advantage of key developments in the transport sector with developments in vehicle and battery technologies, industrial assets and 'first-mover' advantage in new fuel technologies. But a key part of any local energy revolution will involve a 'mobility transition' with very different ways in which we travel through the greater use of public transport, cycling and walking and a new generation of clean and connected vehicles powered through electricity and ultra-low emission fuels.

At a very simple level, the mobility transition requires a modal shift from private motor vehicles to the use of public and 'active' transport (cycling and walking). One of the growing imperatives for making such a transition is the growing awareness of air pollution which is particularly bad in parts of the North. Nine of the eleven UK air quality reporting zones in the North exceed legal limits on nitrogen dioxide (NO_2). The Teesside Urban Area and North West & Merseyside zones are, respectively, the third and fourth worst offenders, with maximum annual mean NO_2 concentrations exceeding 150 per cent of the legal limit.

Vehicle-to-grid technology

In addition to technologies which empower consumers to manage their electricity and heat use and generate their own power at home, there is scope for them to use vehicles as part of the 'smart grid'. New vehicle-to-grid technologies being developed at CESI in the North, working with Northern Powergrid, will allow households both to generate power to charge their cars and then feed this back into the grid when it is not in use. These efforts come alongside the North's major role in European ULEV production, with Nissan's flagship plant at Sunderland playing a leading role in the manufacture and export of the Nissan Leaf, the world's top selling EV.

Developing local and regional transport strategies for enabling modal shift and tackling air pollution are central to transforming energy use and decarbonising the energy system. As part of the Northern Energy Taskforce's work, we have produced a separate paper on this topic (Laybourn-Langton 2017). But our final strategy is not the place to set out a low carbon transport strategy for the North or its cities and regions. That is the responsibility of Transport for the North (TfN) and its constituent local transport authorities.

Our strategy confines itself to two issues concerning transport. First, at its launch, there was some criticism that TfN's Strategic Transport Plan Position Statement had too little regard for concerns about future energy supply and the challenges of decarbonisation.

Recommendation
Transport for the North - Energy and sustainability workstream

We propose that TfN establishes a dedicated energy and sustainability workstream, with a clear remit to increase the focus on the climatic, material asset and air quality objectives of its Integrated Sustainability Appraisal and to ensure that these are properly accounted for in the ongoing development and delivery of the Strategic Transport Plan. We propose that TfN works closely with the proposed Northern Energy Accelerator to maximise the economic opportunities arising from new and more sustainable approaches to the mobility revolution in areas such as smart grid, biofuels and new marine technologies.

Secondly, local transport authorities have a critical role to play in supporting the mobility transition, and all of them have local transport plans which – to greater and lesser degrees – have objectives which address modal shift, the drive for low carbon transport and the challenges of poor air quality. However, too few acknowledge either the opportunities or the challenges of electric vehicles as regards the grid and the importance of 'systems integration' between the transport and energy sectors.

Recommendation
More integrated local transport, energy and strategic planning

We recommend that local and combined authorities do more to integrate their statutory planning processes with regarding transport, air quality, energy supply and demand and smart grid development. As well as addressing land use and local development sites, local plans should better reflect local transport and energy strategies (see above). This, in turn, has implications for economic development policy, procurement, investment and public service provision.

CHAPTER 4.
EXPANDING LOW CARBON ENERGY GENERATION

2050 VISION

Our 2050 vision for **low carbon energy generation** in the North can be summarised as follows.

- The North will have achieved almost complete decarbonisation of its energy system with 100 percent of all energy consumed delivered from low carbon intensity sources.[12]
- The north of England will be leading the nation in making the transition from traditional fuels to renewable energy sources, not least in decarbonising our heating systems through pioneering large-scale innovations in gas technologies alongside carbon capture and storage or utilisation.
- The north of England will have regained its role as the nation's powerhouse, maximising energy security through a smart, flexible grid system and large-scale nuclear, tidal and offshore wind generation while minimising our dependency on imported energy from overseas.
- Non-domestic buildings and our manufacturing and industrial sectors will have significantly enhanced their competitiveness through improved energy efficiency and a reduced reliance on carbon intensive feedstocks.

Context

Previous chapters have shown how the north of England has key opportunities for innovation and technological change and could lead the nation's local energy revolution, but the foundations upon which the North can develop these world-leading strengths are its geological and geographic assets which can be utilised to generate large amounts of low carbon energy. This chapter explores how best to utilise these resources.

Historically, the North has always had geological assets crucial for energy generation. However, with coal-fired power stations due to be phased out by 2025 and many combined cycle gas turbines reaching the end of their working lives, some might question its role in a low carbon energy future. It is fair to say that in the short and medium term, such traditional fuels will remain important sources of energy, but as we look to the future, the north of England also has the geography and geology to play a vital role in renewable energy generation.

Many would argue that the north of England has missed opportunities to become a global leader in renewable energy generation as government policy has not provided the support or certainty required to enable investment and scale-up. But it has not drifted altogether and its potential remains. With huge opportunities for offshore and onshore wind, tidal power, solar and renewable heat, the North has a huge amount of renewable potential. Add to this its ongoing role in nuclear generation, and it is clear that the north of England will long remain a literal powerhouse for the nation, minimising our dependency on imported energy.

Our approach

The transition to a low carbon energy system in the North must be a bold one, there is little time for much else. This will require the uptake of renewable energy sources in tandem with the support to the technological innovations to the system (as set out in chapter 3) and the reduction in demand brought by increasing energy efficiency (as set out in chapter 4).

But the approach must remain flexible. Rather than backing any single technology for energy generation, we must support a balanced combination of energy sources and continually adapt to technological developments and changes to market conditions. Where the North cannot be a global leader, it must still adopt new technologies quickly and efficiently in order to maximise its geographical assets, but in order to do so the policy context needs to provide confidence and certainty.

The adoption of a regional energy strategy, and the development of the institutions to deliver, will provide this certainty. A regional approach to energy will, through the promotion of local interests, counter the uncertainty of a national focus, offering a long term picture for investment.

12 Adapted from SES, using National Grid FES Two Degrees scenario

KEY PRIORITIES

Priority 1 - The traditional fuel transition

The north of England has been home to many of the nation's coal fired power stations with plant at Drax, Eggborough, Fiddlers Ferry and Lynemouth, to name but a few. Latest data shows that the region accounts for 41 per cent of England's total coal generation capacity BEIS (2016a).

The policy framework for coal in the UK sets a pathway for unabated coal fired stations to be phased out by 2030, and economic pressures mean that this is likely to occur by 2025 (BEIS 2016b). 2017 saw the UK's first coal-free day since the industrial revolution, and reductions in the carbon emissions from power generation have largely been attributed to the diminishing role of coal in the energy mix (CCC 2017).

While positive from a climate change perspective, this transition has other costs including the short-medium term downward impact on GVA and jobs, both directly and in the wider supply chain. It is likely that, in England at least, the coal phase-out has, and will continue to have, a particularly regionalised impact (Baxter and Cox 2016).

The transition away from coal has led to some mid-term opportunities; for example, the growth of biomass conversion. The region accounts for 92 per cent of the nation's electricity generation capacity from biomass. This has been driven largely by two large biomass conversions of coal plant at Drax and Lynemouth. Proponents have argued that has brought significant economic opportunity to the region, while generating lower-carbon power. This has brought indirect benefits to the region's ports where there has been major investment in biomass warehousing and distribution facilities.

Biomass in the UK

The conversion of Drax and Lynemouth power stations to biomass has enabled a dramatic reduction in coal consumption whilst maintaining significant generating capacity in the North. As well as large-scale generation, there is a wide range of small-scale applications for biomass power including combined heat and power (CHP) projects. Biomass also brings a series of indirect benefits: power station conversions have saved jobs and supported new supply chains and the success of a flourishing biomass sector represents an incentive for sustainable forest management too. There remains a lively debate as to the extent to which biomass drives carbon reduction which depends heavily on how biomass is sourced and transported but there is little doubt that it represents a vital transitional technology which could be better supported through government policy.

The North has also seen a significant growth in the use of natural gas as part of the electricity generation mix, with 11 plants across the region, including three built since 2000, representing 26 per cent of the North's electricity capacity (BEIS 2016a). However, while this growth in Close-Cycle Gas Turbines (CCGT) has supported the significant reductions in UK based emissions since the 1990s, it will, in turn need to be decarbonised in order to meet future carbon budgets.

Gas also currently accounts for 80 per cent of the UK's heating needs (BERR 2017), and progress in decarbonising heat is less developed than in electricity generation and therefore presents a significant challenge and opportunity.

Another challenge with gas is the decline in North Sea gas and the impact this may have on security of supply and cost. It has been suggested that UK shale gas would present a significant opportunity to ensure security of supply and drive regional economic growth. But shale gas has garnered significant opposition from local communities and may be too environmentally risky to proceed with. In a separate report, the Northern Energy Taskforce argued that, should shale gas exploitation be pursued, this can only happen in conjunction with a major step forward in carbon capture and storage (CCS).

Another transitional gas fuel is Liquefied Natural Gas (LNG). Innovative LNG-fuelled ships are sailed to and from Teesport in the North East, and LNG bunkering infrastructure is being developed. Studies are now being conducted into scaling up these efforts, allowing the region to import, store and road load this gas.

Looking towards the future, the region has a significant potential in the form of hydrogen. As set out in chapter 3, a range of actors, led by Northern Gas Networks, have developed a plan to convert the gas grid in Leeds to run on hydrogen. This would involve a pan-northern supply chain, with the hydrogen produced by Steam Methane Reformer in Tees Valley, stored in salt caverns in the Humber, and piped to Leeds for use, before being rolled out to other regions (Northern Gas Networks 2016). In addition, ITM power, a Sheffield based company, are developing electrolysis technology to produce hydrogen, particularly for local or vehicle use (e.g. in fuel cells). This opens up the opportunity for embedding such technology in a decentralised system (ITM Power 2017).

Between now and 2050, traditional fuels are likely to play a continued role in the northern energy system and support many jobs and economic opportunities. However, if it is the case that we are to achieve our decarbonisation targets and the 2050 vision set out above, the focus of the Northern Energy Strategy must remain on how best we make a swift and effective transition away from coal, gas and biomass towards more renewable heat and power sources.

Recommendation
A northern energy skills programme

In responding to the energy transition and the historic skills base found in the North, the region should aim to redeploy the skills of those employed in running and maintaining traditional generation plant to other relevant and productive work within the emerging energy sector.

To achieve this, the North should establish a northern energy skills programme which will maximise the opportunities for skills redeployment through identifying skills gaps in emerging energy businesses and linking these up with opportunities for training. This programme should provide the necessary training and support to both those accessing post-16 education and help those employed in declining fossil fuel industries to deploy their skills and experience elsewhere. This should draw together the skills plans of LEPs, sharing best practice from each LEP area.

Recommendation
Transitioning from natural gas

a) Carbon capture and storage (CCS)
Carbon capture and storage or utilisation (CCS) technology is recognised as a significant opportunity for the north of England, not just for its hydrogen potential, but also as it is the only economical way for the regions resource intensive industries to reduce their environmental impacts. For this reason, government must reinvigorate its interest in CCS technology and establish some form of catapult centre for CCS in the North.

b) Shale gas extraction
If hale gas is to go ahead then a number of conditions should be met by government, including:

- that government should lay out a clear, consistent and universally applied regulatory framework for shale gas extraction (within the remit of the Environment Agency)
- that shale gas use should displace, rather than add to imported gas consumption, as argued by the Committee on Climate Change (2016)
- that the government should establish a Sovereign Wealth Fund to 'bank' the benefits of government revenues on shale gas and use them to forward fund the continued development of the energy system of the North, as well as offering individual and community benefits.

Develop a northern hydrogen-for-heat demonstrator

The UK government, through the Department for Business, Energy and Industrial Strategy, is currently tendering for a programme to trial hydrogen for heating in domestic buildings and businesses.[13] This programme will take place between now and March 2021, and will be worth £4.3 million. This will comprise of a number of packages, including:

- programme management
- definition of a hydrogen quality standard
- establishing an appliance and equipment testing capability
- development of domestic hydrogen appliances
- understanding commercial appliances
- understanding industrial appliances
- assessment of suitability of existing buildings
- trialling hydrogen appliances in unoccupied buildings
- preparations for occupied consumer trial.

Given that the North has such a competitive advantage in manufacturing, and organisations and institutions in the region have been at the forefront of developing plans for a domestic hydrogen heating system, the government should:

a) commit to establishing the trial in the north of England, drawing on the region's expertise

b) pledge to fund a parallel trial examining the most effective means of manufacturing hydrogen and delivering it to homes and businesses.

13 https://www.sell2wales.gov.wales/search/show/Search_View.aspx?id=JUL206471

Priority 2 – Renewable energy

The north of England is already generating large amounts of renewable energy. 48 per cent of England's renewable power is generated in the three northern regions (BEIS 2016c). In addition, the region has seen a faster uptake of renewables, rising by 93 per cent between 2003 and 2015 (4 per cent faster than the UK average) (ibid).

If we are to achieve our 2050 vision – not to mention the broader decarbonisation targets agreed in Paris – then renewable energy sources will play a critical role. The table below sets out the key technologies in the region, their potential and what could be done to further support them.

Technology	Opportunities and action points
Offshore wind 	The north of England is already a key generator of electricity through offshore wind, and there is the potential for a further 22.5GW of capacity in the region. A northern operations and maintenance industry has established itself and many northern firms are part of the associated supply chains. Going forward, there are new opportunities for improving the efficiency of the existing installations, both through improving the hardware of wind turbines, their blades etc., and through integrating them into the energy system in smarter ways. Already, DONG energy has pioneered the world's first integrated batter storage into Burbo Bank in Merseyside . **Action** › The Northern Energy Accelerator and LEPs should collaborate to highlight next generation offshore wind opportunities and gear up northern firms to tackle them. They should develop joint plans, identifying opportunities, profiling local businesses who could supply into these opportunities, and develop plans and funding to support them to do so. Next generation offshore wind should be a key priority area for joint action under the Northern Energy Accelerator. › Energy for the North should work with UK and devolved governments to provide policy certainty to ensure a pipeline of offshore wind project thereby sustaining the industry, jobs, skills, investment and innovation which are hampered by a stop and start approach.

Onshore Wind

Onshore wind is a technology which could generate notable amounts of low carbon energy. However, it is presently subject to planning barriers in the UK largely driven by the current government's response to local objections. However, there is evidence to suggest that public acceptance for onshore wind is greater in the North than in the rest of England (Devine-Wright 2007).

Actions

- Planning regulations governing consent for onshore wind should be devolved to combined authorities in the North as part of Local Energy Devolution Deals, allowing the region to decide for itself if it wants to pursue the technology.
- New ownership models should be adopted and encouraged, to give local communities a share in the profits of wind farms. A number of community ownerships models are already commonplace, including community benefit payments per MW installed or generated, shared ownership with a community investing in a commercial scheme, for example through a share office, or a partnership model (as with HoTTwind@Langley as described previously) (DECC 2014). Additionally, this could be supported as part of a MO-ESCo pilot. (see chapter 3).

Marine and Tidal

There is a large potential for Marine and Tidal Lagoon technologies which offer the potential for 16GW of capacity to be built in and around the north of England, the equivalent of five Hinckley Point Cs (Baxter and Cox 2017). One key site is located in West Cumbria, representing a significant advantage to the north of England. In addition, there are other notable opportunities for tidal barrage schemes across the North West.

Actions

- Regional actors including LEPs and a future Energy for the North body should set out a supportive framework for developing marine renewables and press the government for more support.
- LEPs and combined authorities in areas where tidal energy could be consented should work with local businesses to ensure they are able to maximise the local supply chain opportunities.

Solar PV

Solar PV is one of the lowest cost means of generating electricity and the costs are projected to fall further (BEIS 2016d). The deployment of solar has been limited in the North compared to elsewhere in the UK, with the region accounting for just 2 percent of the UK's installed solar capacity (BEIS 2016a). However, what the North lacks in sun it may make up for in infrastructure and land.

Given the North's historic strengths in energy generation and history of significant energy use, the region has significant transmission and distribution assets at its disposal. Much of this existing infrastructure is well placed to connect, transmit and distribute for these new generator and users. Where an older technology or plant has been taken off the grid and a site remains with good connectivity, and useful life, there are opportunities to reconnect new plant or technology, such as solar.

Actions

- Through Local Energy Devolution Deals and other measures set out in chapter 4, DNOs, combined authorities and LEPs in the North should work together to map, identify and plan the regional deployment of solar PV.

Renewable heat and thermal storage

The North has considerable potential for heat networks, which, even with gas Combined Heat and Power units, can at least reduce the carbon intensity of the heat produced. There are of course also opportunities for directly renewable heat supply to such networks, be that from the capture of waste industrial heat (e.g. in the Tees Valley) or geothermal heat sinks. These are all emerging as important elements of a renewable heat story for the North, though they will require continued support and investment to ensure they are fully commercialised across the region.

The use of mine water also presents a particularly northern opportunity. When mines become abandoned, ground water enters the workings, filling voids and fissured rock. This water network provides an accelerated route for energy from the Earth's core to reach the surface. Mine water therefore represents an ideal source of low carbon heat and can be cost effectively elevated to temperatures of 55°C to 85°C, ideal for district heating schemes or commercial heating.

Over 30 per cent of the UK's coalfields are in the north of England and so there is considerable opportunity to benefit from mine energy initiatives. For example, the Coal Authority estimates that one-third of Sheffield's built environment sits on worked coal and that, within the shallow workings beneath the city, there is 11MW of carbon-free, geothermal heat available for abstraction. This could be fed into the city's existing district heat networks. Ground

	and air source heat pumps also provide the opportunity for decarbonising the heat consumption of households. These, among other technologies, have been supported by the Renewable Heat Incentive (RHI). **Actions** › The Northern Energy Accelerator should act in the procurement process which surrounds heat network delivery. It should work on the behalf of local authorities to pursue and negotiate standardised contracts (DECC 2015b), and, where relevant, provide training on how to appraise projects suitable for procurement. It should also examine the viability of the re-utilisation of mine water for heat and thermal storage and the Department for Business, Energy and Industrial Strategy should work actively with relevant partners to deliver this.
Bio-fuels 	In addition to heat networks there are emerging technologies for the injection of non-fossil fuel gas to the gas grid to reduce the carbon intensity of home gas use (domestic boilers, cooking etc), including bio-gas, syn-gas and hydrogen injection. Liquid biofuels – the majority of which are derived from waste feedstocks – play an important role in the transport fuels market with considerable scope for future growth subject to government's approach to the 'crop cap'. **Actions** › The Northern Energy Accelerator should work with LEPs to explore and develop bio-fuel opportunities in the north of England and assess how best to support innovation in this area.

Priority 3 - Nuclear

The north of England has a significant history in the civil nuclear industry, particularly centred around Cumbria. The region was the location for the world's first commercial nuclear power station at Sellafield and – including the nuclear plants at Heysham and Hartlepool – it is home to 40 per cent of the UK's installed nuclear capacity. Cumbria is the largest regional concentration of nuclear capability in the UK; 27,000 people work in the sector in Cumbria which is 34% of the UKs nuclear workforce.

The North is also home to some of the world's leading research and development hubs for the nuclear sector. The Dalton Nuclear Institute and the Centre for Nuclear Energy Technologies (C-NET) at the University of Manchester, for example, sit at the cutting edge of industrial research which supports the civil nuclear programme through the development of current and future nuclear reactor technologies. The Nuclear Advanced Manufacturing Research Centre (Nuclear AMRC), led by the University of Sheffield as part of the wider High Value Manufacturing Catapult, and supports UK manufacturers in the civil nuclear sector win work at home and worldwide.

As regards energy generation, there are currently plans for a new nuclear power plant for Cumbria at Moorside which could bring a further 3.4GW of capacity online, although this remains in considerable doubt both as to whether its private sector sponsors will be able to bring forward viable plans for its development and whether these will receive the necessary government support. This only reinforces the need for the Northern Energy Strategy approach to remain balanced and flexible as to future energy supply.

However, irrespective of whether or not the North will be the site for future generation, it has immediate opportunities concerning decommissioning. The National Audit Office (NAO) estimate that the cost of decommissioning nationally will be over £100 billion, but this presents substantial supply chain opportunities. More than this, the market for decommissioning services is estimated to be £253 billion in the EU alone (European Commission 2016). Given Sellafield's status as a public-private body, this creates the opportunity to develop and test innovative new technologies, capturing value which could be re-invested into the region.

Recommendation
Industrial strategy should make use of Sellafield as a catalyst institution for innovation

The EU nuclear clean up market is worth an approximate £253 billion (European Commission 2016), offering those firms, regions and countries which develop new technologies a significant export opportunities. Local LEPs, Sellafield, the Centre of Nuclear Excellence (CONE), the Nuclear Decommissioning Authority, regional research centres and universities, and BEIS should use the opportunity presented by the government's focus on industrial strategy to work together to utilise the Sellafield site as an innovation test bed for new innovations in the nuclear sector and develop wider supply chains in the northern energy sector. This should seek to develop experimental technologies and lead on commercialisation of high hazard remediation..

Priority 4 - Policy certainty and investor confidence

In the UK, the energy sector – and energy generation in particular – is generally left to private markets to a much greater degree than is the case in many other developed nations. It is driven by private sector investment – far more than is the case in the transport sector, for example – and yet most observers recognise the critical importance of government policy and direction in creating the conditions for such investment to take place. This has become all the more pressing given global commitments to addressing climate change.

In February 2016, the House of Commons Energy and Climate Change Committee published a report into investor confidence in the UK energy sector. Its findings are summarised in the box below.

Six factors that have combined to damage investor confidence

1. Sudden and numerous policy announcements have marred the UK's reputation for stable and predictable policy development.
2. A lack of transparency in the decision-making process has led investors to question the government's rationale for policy changes and to wonder: "What will be next?"
3. There has been insufficient consideration of investor impacts, exemplified by insufficient consultation and engagement ahead of policy decisions.
4. Policy inconsistency and contradictory approaches have sent mixed messages to the investment community about the direction of travel. Examples of this include:
   - claiming to want to decarbonise at lowest cost while simultaneously halting onshore wind
   - giving local people a say in wind consents but not shale gas
   - emphasising the important role of gas while scrapping support for carbon capture and storage or utilisation.
5. The lack of a long-term vision has made it more difficult for investment committees to make decisions about projects that are, by their nature, long-term endeavours.
6. A policy 'cliff-edge' in 2020 does not provide sufficient visibility about the size of the future Levy Control Framework (LCF) budget or what will happen to the Carbon Price Floor. This is a problem when projects can take five years or longer to go from conception to completion.

Many of these factors have had a particular impact in the north of England, not least in relation to offshore and onshore wind development but also in relation to opportunities for carbon capture and storage or utilisation and other technologies which have particular regional potential.

The Committee concluded that "the process of developing a 'Carbon Plan' to deliver the fifth carbon budget presents an ideal opportunity for the government to build a shared vision of the direction of travel", and it set out a number of principles for doing so. The committee also raised particular concerns about the nature and role of the Levy Control Framework.

Recommendation
Energy policy certainty at the heart of a modern industrial strategy

For the North to maximise the opportunities it has for expanding low carbon energy generation, the broad critique and principles suggested by the House of Commons Committee need to be properly understood and taken on board by the government both in terms of energy policy but also as part of its emerging industrial strategy.

It is for the North to ensure confidence and make the most of its energy sector opportunities. However, in order to support the regional and local dimensions of such an approach and to provide the basis upon which sub-national partners can develop and respond to new opportunities for energy generation, government must devolve key aspects of energy policy in two ways:

a) Through Local Energy Devolution Deals (as set out in chapter 3)

b) Through a Northern Carbon Budget and Northern Energy Compact (as set out in chapter 5).

However, even if we cannot rely on central government to deliver such a commitment, there may be some actions that can be taken at a sub-national and local level that could support greater investor confidence, not least through building the institutional capacity for sub-national partners to act in a strategic and coherent fashion. This is the subject of the final chapter of the strategy.

CHAPTER 5.
DELIVERING A NORTHERN ENERGY STRATEGY

If the north of England is going to make the transition suggested by our grand vision, then it needs the levers and the institutions to drive forward change. In the previous sections of the strategy we have identified a wide range of activities that need to be taken by people living and working in the North, and we have identified powers and responsibilities that need to be exercised by Northern institutions. In this chapter, we set out the institutional 'framework' that could develop, implement and support a Northern Energy Strategy and we highlight a small number of new mechanisms through which the North's energy sector can flourish.

It is important to recognise that many of the actions described in this strategy can be delivered through existing bodies and arrangements. Central government, together with a wide range of other national bodies such as Ofgem, the Climate Change Committee and the National Grid, will always play a vital role providing an overarching context for national energy policy and economic strategy. This will be even more the case as Britain leaves the European Union and begins to develop and adapt its own approach to energy and climate change.

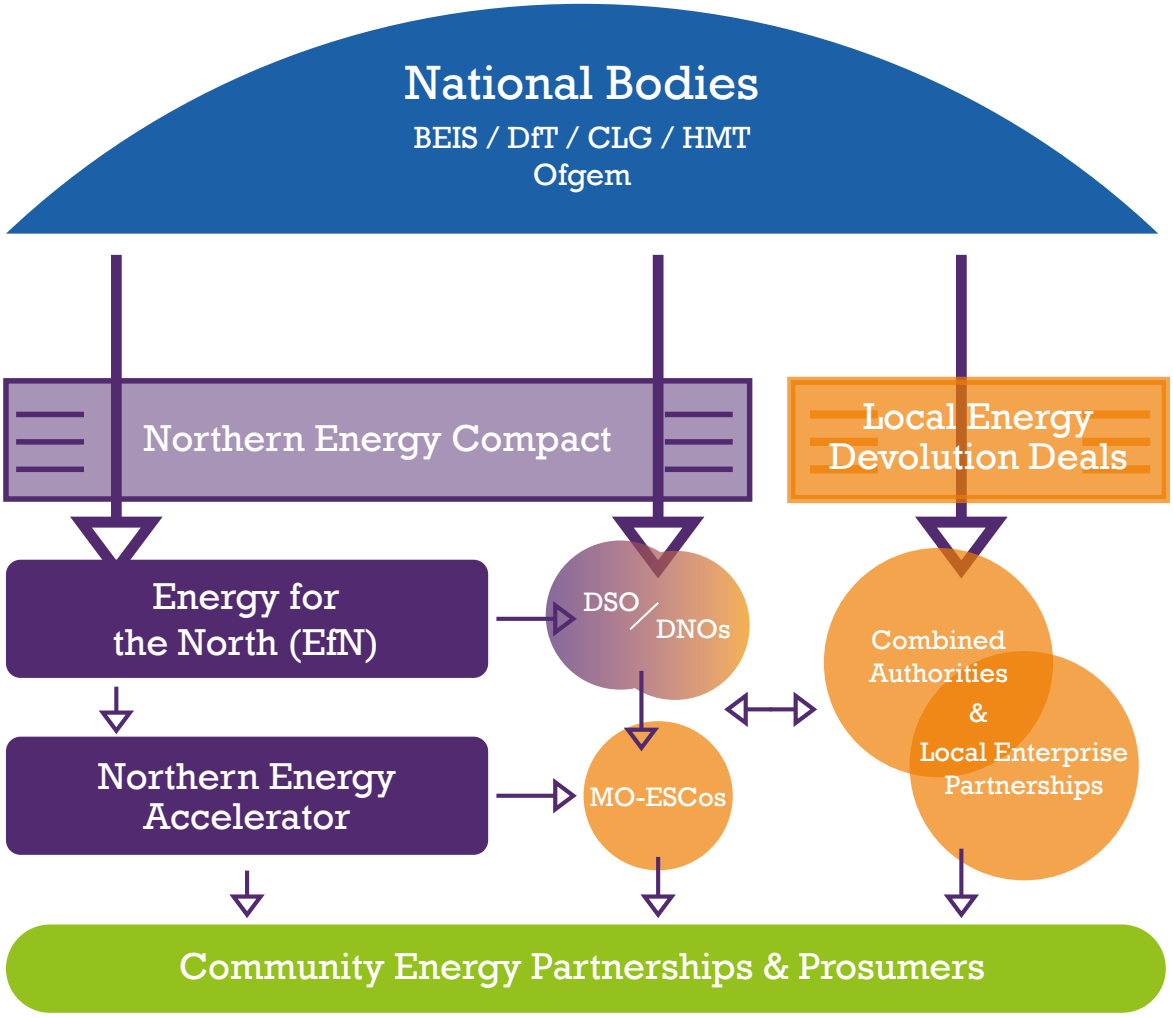
The impact of Brexit on the northern energy sector

Our working paper, the Impact of Brexit on Energy in the North (Emden 2017), examined the potential impact of Britain's withdrawal from the EU on its energy sector, arguing that key risks exist including from leaving the internal energy market, Euratom and mechanisms for innovation and research funding. In this context, it is argued that if the focus on energy policy previously provided by the EU – and the financial and technical support associated with this – is to diminish, then the only way in which the UK will be able to meet its international obligations and drive forward the energy sector in the North will be through the development of a long-term, coherent industrial and energy strategy, led by and from the north of England.

As we have described in chapter 4, combined authorities, local authorities and LEPs will have a crucial role in driving forward the local energy revolution. We propose that each LEP area develops its own local energy strategy and government then agrees city energy devolution deals to give combined authorities and their partners the means to invest in them.

But, unlike almost any other developed nation, there is very little institutional capacity that lies between central and local government which is at a large enough scale for strategic economic planning but not so big as to overlook regional economic strengths. In the devolved nations – and arguably in Greater London – strategic planning at scale has proved fairly effective. In Scotland, for example, the government is maximising its energy and low carbon opportunities through a bespoke Scottish Energy Strategy led by the government itself. In the north of England in recent years, the value of such a regional tier has been exemplified by Transport for the North, which has recently published its Strategic Transport Plan and is now coordinating more detailed corridor appraisals.

In order to drive forward a Northern Energy Strategy and maximise the opportunities that currently exist for the northern economy we are proposing two new regional bodies working alongside the Northern DSO described in chapter 2: Energy for the North and a Northern Energy Accelerator.



Energy for the North (EfN)

Energy for the North will be a strategic body with overall responsibility for the Northern Energy Strategy. Within this overall responsibility it will have the following responsibilities.

- Responsibility for negotiating and then delivering on the Northern Energy Compact (NEC) – see below. This will include putting in place arrangements for monitoring the Northern Carbon Budget and evaluating progress against a range of strategic goals.
- Oversight of a Northern Energy Generation Framework which in the short term requires supporting different forms of generation and co-ordinating specific projects and collaborative activities; in the longer term this might mean taking on devolved responsibilities for the Levy Control Framework (or any other future scheme).
- Oversight of the Northern Energy Accelerator (see below and chapter 2) – the body which will be responsible for driving energy innovation, development and commercialisation in the North. In the short term, this will involve providing a form of direction and accountability for its early development; in the longer term this might become a statutory responsibility.
- Oversight of the Northern Energy Jobs and Skills Programme (see chapter 4).
- Liaison with other pan-northern strategic bodies, including Transport for the North and business partnership bodies, with a view to integrating energy issues within other strategic planning issues including the Strategic Transport Plan and any spatial strategy as it emerges.

In the short term, it is proposed that EfN is formed in a similar way to Transport for the North, eventually developing statutory status as this becomes a necessary condition for further devolution. As is the case for TfN, it is proposed that representatives from the same 19 constituent bodies (six combined authorities, three county councils and 10 unitary authorities) form an executive board. Decisions will be taken by consensus as far as possible but where voting is required there will be weighted voting according to population bandings of one vote for 200,000 people.

Alongside the executive board, there will be a wider partnership board including representatives of some of the key national bodies, including government departments, and other regional stakeholders including the network operators, catapults and university representatives.

EfN might also establish wider private sector reference groups, consumer engagement processes and specific task and finish groups.

As regards officer capacity, initially it will need a small secretariat which could be developed through secondments from combined authorities, LEPs and national bodies. Over time, and through the Northern Energy Compact, it will receive investments through which it can resource a dedicated team but the EfN secretariat should remain small in relation to the Northern Energy Accelerator.

The Northern Energy Accelerator

The Northern Energy Accelerator (NEA) will be the principal agency for ensuring Northern energy innovation can be translated into both commercial and social success. It will have two main objectives.

- To support northern energy innovation from early-stage innovation, through mid-stage demonstrator projects, to late stage commercialisation and scale-up.
- To coordinate ideas, activities and project development across different LEP areas and, where appropriate, to support integration between universities, catapults and other centres of expertise.

There are many mechanisms through which these activities might happen, from simple 'networks' of good practice and shared learning, to large-scale collaborative ventures such as the Nuclear Advanced Manufacturing Research Centre in Rotherham, but there are four opportunities that deserve particular consideration:

a) Support for commercialisation and supply chain development: While there are several demonstrator projects and catapults across the North, there appear to be significant challenges moving key projects from mid-stage development to commercial rollout.

b) Funding: Much innovation and mid-late stage investment is distributed on a national basis and feedback suggests that this is rarely tailored to address some of the particular assets and opportunities in the North. As stated elsewhere, the North also looks set to suffer disproportionately from the withdrawal of European research funding. For this reason, it is suggested that the NEA work closely with Innovate UK to develop a more dedicated Northern Energy Innovation Fund that is better tailored to the opportunities and challenges facing Northern business development and with northern universities to maximise leverage over future research funding in whatever for it takes after Brexit.

c) Investment opportunities: It is proposed that the NEA plays a leading role in developing a Northern Energy Prospectus (see chapter 2), setting out details of key Northern energy assets and opportunities for investment. This will need to be developed in conjunction with the Department for International Trade Northern Powerhouse team. In addition, a key partnership should be formed between the NEA and Transport for the North. This will generate innovation opportunities in supporting the latter's needs to ensure the decarbonisation of transport in the region.

d) Skills: In delivering the ambitious aims of the Northern Energy Stategy the region will need to ensure its workforce is appropriately skilled. The NEA, through the Northern Energy Skills Programme, should work with employers, universities and LEPs to identify regional energy skills gaps, shortages and weaknesses and put in place provision to address these.

Although it might perform some of the functions historically undertaken by regional development agencies, the NEA must be a private-sector led body working closely with Innovate UK and Northern universities. It will need significant seedcorn funding, both to establish a core team (much like a Local Enterprise Partnership) but also to have funds to distribute and to deliver different forms of business support. This need not be new funding but could come from the top-slicing and pooling of existing national funds, such as Innovate UK. Ultimately though, the region needs the powers to raise capital in an organised way.

This body will complement the existing structure of LEPs, taking on those projects which sit at a higher spatial scale than travel to work areas. This will allow a focus on large infrastructure projects with sit across these boundaries, exemplified by the activities such as Northern Gas Networks H21 project, or for the pooling of similar opportunities. For example, at least three LEPs have a significant interest in offshore wind. Taking a strategic look across these areas allows for a number of potential sites for future innovative activities, such as installing storage or improving the efficiency of turbine blades.

The organisation should also seek to support the coordination of LEP activates which are of advantage for regional energy activities. LEPs could share experience in and follow similar approaches in skills development for example.

The Northern Energy Accelerator should be staffed by private and public sector staff. Public sector staff could be seconded in from LEPs, where those staff members have experience in particular areas. This will allow lessons from one area to be shared across the region.

A Northern Carbon Budget and Northern Energy Compact

Throughout this strategy, we have identified aspects of energy policy that are inhibiting the development of key opportunities for economic development and sustainable growth. Although many aspects of energy policy should remain within the purview of central or local government – or indeed should be governed by international agreements – the Northern Energy Taskforce has identified a limited number of policy levers and powers that could and should be devolved to Energy for the North through what we are calling a Northern Energy Compact.

Given that EfN has yet to be formed and that it will need to build its capacity and authority in order to take on significant responsibilities it is proposed that such powers are devolved in stages as EfN develops its capacity and, ultimately, takes on some form of statutory status as is happening with Transport for the North.

A central element of the Northern Energy Compact is the adoption of a Northern Carbon Budget (see below). It is proposed that the extent to which further powers might be devolved to EfN could be aligned to the progress EfN makes against its carbon budget its future 'offer' by way of meeting decarbonisation targets.

The scheme might therefore work in stages relating to the third, fourth and fifth carbon budgets as set out in the Climate Change Act (2008), and in a similar way to the agreements secured with the UK's devolved administrations in Scotland, Wales and Northern Ireland.

Recommendation: A Northern Carbon Budget

Energy for the North should adopt a pan-northern carbon budget, binding the region to reduce carbon emissions by an agreed amount over five year periods across all areas of emissions from energy generation and use to transport to agriculture.[14] This should complement national targets, but galvanise local buy-in and drive regional ambition. For the North, this would mean that the region, its communities, businesses and leaders, would have to make decisions over how it emits carbon. If the region wanted to support a more energy intensive industry, for example, it would have to take much more ambitious action to reduce carbon emissions elsewhere, or look at technologies to abate those emissions. In practice, this would place greater responsibility and accountability onto regional leaders and allow them to make the best of local opportunities, while allowing central government to focus their resources on facilitating these efforts. However, in return, central government will give northern leaders greater powers to do so.

Northern leaders should work with the Committee on Climate Change (CCC) to set regional carbon budgets, beginning with the third budget period covering 2018–2022, and which requires government to reduce UK emissions by 37 per cent of 1990 levels by 2020. A regional approach should aim to identify where the north of England can be more ambitious in line with this strategy. If the region is to move to high levels of distributed generation quicker than the rest of the country, given the trial of a smarter grid system in the region proposed in chapter 4, it may be possible to be more ambitious in making the reductions necessary to meet the fourth carbon budget. Ultimately, this would be a technical assessment involving the CCC.

14 IPPR North has previously argued that, after leaving the EU, in replacing the Common Agricultural Policy a place-based approach to rural policy offers the best mechanism to deliver rural policy which, amongst other things, would address the environmental issues associated with agriculture and the rural economy (Round 2017).

Phase 1: 2018–2022 (Third Carbon Budget)	
To reduce carbon emissions by 37 per cent of 1990 levels by 2020. This will involve reducing the North's carbon emissions from 97.32mtCO2 per year in 2015 to 87.10mtCO2 per year in 2020.	The first phase of a Northern Energy Compact should be to devolve tax receipts from the Carbon Floor Price (CFP) and Emissions Trading Scheme (ETS) to fund energy efficiency improvements and community energy projects in combined authority areas (Local Energy Devolution Deals – chapter 3). Such carbon taxes would be worth £261 million per annum. At the same time the Energy Company Obligation (ECO) should be shifted from energy companies to Distribution Network Operators (DNOs), who should work to support energy efficiency roll out. This would in its own right see the associated revenues devolved regionally, given the geography of DNOs, and would allow local strategic approaches. Devolving ECO would provide c.£240m annually.

Phase 2: 2023–2027 (Fourth Carbon Budget)	
To reduce carbon emissions by 51 per cent of 1990 levels by 2025. This will involve reducing the North's carbon emissions from 87.10mtCO2 per year in 2020 to 76.88mtCO2 per year in 2025.	To support and enable the north of England to make a bold and quick transition to low carbon transition, levers to control the Contract for Difference (CFD) process should be devolved to the regional level. The North should be given the opportunity to differentiate levels of support, through the strike price, to energy generation technologies which offer advantage to the north of England. This may be technologies which have a social or economic advantage for the region. The cost of this will be kept within the limits of that collected by the CFD supplier obligation levy. This should be coupled with the devolution of planning powers so the region is able to consent major power plant (over 50MW), allowing it to identify and pursue technologies of interest.

Phase 3: 2028–2032 (Fifth Carbon Budget)	
To reduce carbon emissions by 57 per cent of 1990 levels by 2030. This will involve reducing the North's carbon emissions from 76.88mtCO2 per year in 2025 to 67.65mtCO2 per year in 2030.	As new technologies become commonplace and a decentralised grid system manages the energy which flows to homes and businesses, it will be necessary for new regulatory institutions to emerge. As energy generation and management gets closer to home, we propose that the most effective approach is a more 'federal' system. While a national regulatory body should be retained to deal with those aspects of the energy market which are national and international, such as ensuring a good level of service across all areas and management of the interconnection between countries, the body should be structured regionally. A regional approach, matched with devolved powers, will allow for it to respond to the technical geographies which emerge, addressing more effectively the nuances between different areas and how these affect energy use, generation and infrastructure.

SUMMARY OF RECOMMENDATIONS

SUMMARY OF RECOMMENDATIONS

For national government, Ofgem and national stakeholders:

1. Government should put energy policy at the heart of its modern industrial strategy, however to unlock regional and local potential it should devolve key aspects of policy through:

- A Northern Energy Compact and Northern Carbon Budget.
- Local Energy Devolution Deals.

2. Government should switch responsibility for energy efficiency from energy companies to energy distributors and devolve receipts from the Carbon Floor Price (CFP) and Emissions Trading Scheme (ETS) through Local Devolution Deals.

3. Ofgem should work with the northern DNOs to lead the transition to a smarter grid system in the region. This approach should involve four elements:

- Give existing DNOs the responsibility for the DSO role.
- Ensure future RIIO reviews, the framewok Ofgem's uses to set price controls for network companies, are designed to allow and incentivise DNOs to respond more quickly to technology and behaviour changes
- Develop a framework for closer DNO/DSO integration with LEPs and combined authorities.
- Consider all energy vectors in the design of future systems.

4. Government must reinvigorate its interest in CCS technology and establish some form of Catapult Centre for CCS in the North as one of a number of pre-conditions to any extraction of shale gas.

5. Government should commit to its hydrogen-for-heat demonstrator project to the north of England which has been at the forefront of developing plans for a domestic hydrogen heating system.

6. Government should utilise the Sellafield site as an innovation test bed for new innovations in the nuclear sector, particularly regarding high hazard remediation, and develop wider supply chains in the northern energy sector.

For Energy for the North and regional stakeholders:

7. Energy stakeholders in the north of England, working in conjunction with central government, should establish Energy for the North, a new strategic body with overall responsibility for the Northern Energy Strategy.

8. Energy for the North, working in conjunction with central government, Ofgem and the Climate Change Committee, should develop a Northern Energy Compact involving:

a) A pan-northern carbon budget, binding the region to reduce carbon emissions by an agreed amount over five year periods across all areas of emissions from energy generation and use to transport to agriculture.

b) Greater regulatory freedoms and flexibilities in order to promote and support low carbon energy generation in the north and other key technologies.

9. Energy stakeholders in the north of England, working in conjunction with central government and Innovate UK, should establish a 'Northern Energy Accelerator' tasked with achieving the 2050 economic goals.

10. Energy for the North should establish a northern energy skills programme which will maximise the opportunities for skills redeployment through identifying skills gaps in emerging energy businesses and linking these up with opportunities for training.

11. Local authorities in the North should show strong leadership in delivering low carbon homes and neighbourhoods through committing to a new Northern Low Carbon Homes Commitment.

12. Transport for the North should establish a dedicated energy and sustainability workstream, with a clear remit to increase the focus on the climatic, material asset and air quality objectives of its Integrated Sustainability Appraisal.

For Combined Authorities, Local Enterprise Partnerships and local stakeholders:

13. In order to drive a northern local energy revolution, combined authorities should work with DNOs to bring forward new Local Energy Devolution Deals to central government with a big focus on stimulating decentralised approaches to energy efficiency and generation in return for receipts from the Carbon Floor Price (CFP) and Emissions Trading Scheme (ETS). Deals could also be associated with carbon reductions, perhaps as part of the overall Northern Carbon Budget, as well as considering the opportunities created for local employment, skills development and other health or social benefits.

14. We propose that as part of a Local Energy Devolution Deal, central government and Ofgem should form a partnership with a combined authority to pilot the UK's first Municipally-Owned Energy Services Company at a regional scale.

15. Local Enterprise Partnerships and other local partners must give active consideration to energy intensive industries as part of local economic strategies and work with energy companies, distributors and regulators to develop more flexible and permissive approaches to energy pricing and supply.

16. Local and combined authorities should do more to integrate their statutory planning processes with transport, air quality, energy supply and demand and smart grid development.

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