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Power to the People

An Integrated Approach to Clean
Energy and Climate Innovation

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Executive summary

Against the backdrop of global concern about climate change and the immediate and accelerated action required to restrict temperature rises to below two degrees, Climate-KIC identified '**climate innovation clusters**' as an approach to catalyse new solutions. The University of Birmingham leads one such cluster approach for the **Birmingham Energy Climate Innovation Cluster** – a collaboration of parties spanning academia and the public sector bringing in expertise and investment from the private sector focused on the Birmingham and West Midlands area.

Through the cluster programme, this piece of work was commissioned to be a 'deep-dive' into the opportunity that is emerging through the development of an Energy Innovation Zone (EIZ) at Tyseley and that presents spatially as the central core of Birmingham and the Eastern corridor – referred to as the East Birmingham and North Solihull Inclusive Growth Corridor. The commission has sought the input of interested local and national parties across the public and private sectors as well as by engagement with the communities of Birmingham through the Climate-KIC Climathon 2018.

With clean energy the principal ingredient, this commission has examined the delivery of heat, power and transportation on a commercially efficient basis to address the immediate issues around fuel poverty, energy security and decarbonisation whilst also considering the impact that could be had on addressing the public health emergency that surrounds poor air quality.

The region has a rich industrial heritage and is a national focus for energy with the Energy Systems Catapult locating its headquarters locally – meaning that there is a strong high-level skills base around energy and transportation. Numerous public sector studies have been undertaken that have examined potential activity across the energy value chain: renewable energy generation and energy from waste; energy supply through the establishment of a public sector-owned energy supplier, and energy efficiency through the government programmes of Energy Company Obligation (ECO) and Green Deal. The region is also a hub for transportation through the headquarters of Jaguar Land Rover and the recent and upcoming investments in electrification, the expansion of hydrogen programmes and autonomous vehicles.

Physical development has largely been along very typical lines – of private commercial developments and public sector-led schemes. There has been the roll-out of solar to public housing within Birmingham and some degree of centralised heating in towers through the now ceased Birmingham Energy Savers. Birmingham District Energy Company (BDEC) – run under concession to Birmingham City Council by Engie – is a working scheme that could show significant opportunity in time to decarbonise the city. The report sets out to deal with traditional development models and potential integrated approaches that could become a pace-setter for energy development through the region and country.

In 2008, the West Midlands Task Force identified the transition to a low-carbon

economy as an opportunity for the region. The foundation of Energy Capital in 2016 was a significant potential step to centralise and galvanise local joined-up energy activity. Forming part of the Local Industrial Strategy for the region, Energy Capital has raised the profile of energy and aims to ensure that energy is seen as an important pillar for economic growth.

There is seen to be a lack of integrated development within the region with most projects developed in isolation and with little engagement even with consumers. What has evolved is a system that is largely externally funded with most of the flows of money away from the region – something that could potentially be arrested through a strategic and joined-up approach to future development. Through a deep dive into the existing development of energy in the region, it was identified that there are several levers that can help to assess the relative quality of outputs and of most importance to assess the potential opportunities to reshape and develop. The levers are seen to be **integration, investment and community**.

Seeking to join up the inputs and outputs of energy developments should enable increased efficiency, for example, leveraging the power output of one development as the power source of another, or using waste heat from one plant as a source of heat for an industrial or domestic heat requirement. Typically, energy development sees low levels of integration between projects, something that can be addressed through the intensification of energy development in local areas – in parks or cities, for example, seeking to match inputs and outputs.



Necessarily, investors will seek to secure the inputs and outputs of projects that they invest in – which means contractual relationships with strong counterparties. A collaboration supported via distributed leadership within the public and private sectors and a coherent frame that sets out the required outcomes and conditions for engagement could provide a platform that enables investment that retains cash flows within the local economy, unlocking potential future development and inclusive growth.

There is a need to create relationships between the innovators, investors and communities to create the uplift and catalyst to drive action on climate change. Empowering communities and gaining better understanding of what is collectively valued is seen to be critical to the wider debate on climate change. The language of the low-carbon sector and institutional innovators is largely incomprehensible and irrelevant to communities of place and practice in the city. When ‘heat or eat’ is a daily dilemma for many residents and where austerity has shaken the very foundations of public service provision – a ‘valued’ cluster will be one that is able to understand the needs of today’s social system and connect its value with that of the communities it serves.

Building upon the levers to reshape the system and the existing energy infrastructure of the region, this commission identified three transitional scenarios for further evaluation and development, ideally to be delivered sequentially but with planning for the final scenario:

Scenario 1 – harness the waste heat from Tyseley Energy Park and Tyseley Energy Recovery Facility to feed the Birmingham District Energy Company heat network. Leveraging waste heat decarbonises heat supply to the city centre whilst enabling significant new connections. This has the potential to enable Engie to switch off their gas CHP generation facilities, removing all emissions from the centralised heating system in Birmingham.

Scenario 2 – further harness waste heat in the Tyseley area to develop a localised heat network for the area. Consider an energy supply licence and drive out a digitisation strategy to ramp up local engagement and drive forward efficiency schemes. This opens up the potential to take many thousands of homes off gas central heating to a waste heat-fed scheme, driving down emissions and improving air quality. Further, through a supply licence and digitisation, it can be possible to drive down energy spend through a combination of lower energy costs and smart energy programmes.

Scenario 3 – regionalise. Create a linkage between Tyseley and Solihull, driving low-carbon energy development along the corridor. Increase the pace of digitisation, accelerate the reduction in domestic heating through leveraging increased waste heat. Make the move to being an entirely self-energised region – locally generating and utilising all the heat and power required by the corridor.

Scenarios and strategies are fine but the embedded system constraints and contractual issues need to be resolved. Better co-ordination is critical to the delivery of any of the scenarios. Capability and capacity issues amongst potential system drivers need to be addressed. Both commercial suppliers to Scenario 1 have time-bound contractual issues with delivery. These need to be addressed either by contract extension or intervention by the public sector. This should be considered through the lens of creating a structure to enable joined up commercial decision-making – whether through joint ownership or participation.

The Local Industrial Strategy and Regional Energy Strategy provide the relevant platform for taking a co-ordinated strategic regional approach to leveraging in funding. Recently, the Heat Network Investment Programme has been launched. That, in conjunction with Industrial Strategy funding, Strength in Places, ECO, Public Works Loans Board and many

other programmes can provide significant public funding to support development. Smart technology is almost limitless in how it can support an ever-increasingly efficient system and drive carbon reduction through demand management. Thought needs to be given now to how digitisation can underpin the whole system in capturing data and enabling the development of algorithms to test and develop the overall system to drive the circular economy.

There is an opportunity to move forward on a process of re-industrialisation through transition to a low-carbon economy to capture this, there is a need to break the cycle of securing innovation and investment in isolation from fundamental place-based system change. The identification of corridors such as the East Birmingham and North Solihull Corridor that connect very distinct and different communities offers a ready ‘place’ that can be a frame for much wider system change. The capturing and sweating of the existing asset base to facilitate mutual benefit and shared understanding amongst communities of place and practice has the potential to take system change beyond energy to one that is a process of whole-place, whole-system change. Collaborative leadership and the development of real partnership with the capacity and capability to work across large and complex city systems with multiple stakeholders will be required. This will need to happen at speed if opportunities are to be harnessed and the system shaped to address the needs and requirements of the local community.

A shift of perspective is required – from unconditional economic growth to a point where growth is in balance with the social and environmental requirements of all the city’s communities. Current approaches to growth, whether tagged with the term inclusive or not, are not equipped to meet the challenge. Investment is required in the shaping of a system that will facilitate transition to an economy that is both sustainable and inclusive. In order to secure acceptance and drive transition, the relationship between economic growth and community well-being needs to be re-established. Investment in the development of a skills and employment pathway to drive and underpin transition to address societal and environmental change will be required.

Introduction

The Paris Agreement (COP21) marked a significant step change in global acceptance of the need to take immediate and accelerated action on carbon reduction to avoid catastrophic climate change. Challenging carbon reduction goals were established to limit global temperature rise to well below two degrees¹.

Delivery on the Paris commitment will require an unprecedented depth and breadth of change – not just within sectors but across city systems and nation states. This was recognised at Katowice (COP24), with an emphasis emerging for the private sector to take action². Climate-KIC UK and Ireland, in a series of 'Insight Papers', identified 'climate innovation clusters' as an effective way to catalyse new solutions for carbon reduction.

The OECD (Organisation for Economic Co-operation and Development) defines a cluster as a geographic concentration of inter-connected firms and related actors such as service providers and universities, etc³. Clusters are seen to have the potential to bring people together in virtual and physical space to enable co-creation of novel solutions; cross-cluster activity has the potential to expand this further, either by bringing in expertise that is lacking or by providing a cross-fertilisation of ideas from one area to another.

This work forms part of the Climate-KIC Connected Cluster project led by the University of Birmingham (UoB) and was commissioned to look at how the cluster approach could be developed and taken forward within what has been identified as the Birmingham Energy Capital Climate Innovation Cluster (BECCIC).

Climate-KIC's Connected Clusters project is an alliance of five city regions – Birmingham, Edinburgh, Frankfurt, London and Valencia – committed to sharing, replicating and scaling what works in developing innovation ecosystems for delivering effective climate action. The partners are of five innovation clusters: the Edinburgh Centre for Carbon Innovation (ECCI), Energy Capital (EC) in Birmingham, Cleantech: London, Provalidis in Frankfurt and the Asociación Valenciana Empresas Sector Energía (AVAESEN) in Valencia.

Our approach

This report is intended to help facilitate a conversation between leaders, citizens and participants to confront the challenge of a changing climate and look at how a transition to a green future could be more quickly secured within an equitable framework.

The initial focus of the work was the energy system. Early engagement led the study to a place-based approach that allowed for the identification of the levers and drivers of change and the perceived barriers and opportunities. It was then considered how these could be shaped to secure benefit for the community as well as those who drive and currently benefit from the system(s) that frames it. The Birmingham Energy Capital Climate Innovation Cluster's spatial focus in terms of an Energy Innovation Zone is seen to be the central core and eastern corridor of Birmingham. This area falls within the proposed East Birmingham and North Solihull (EBNS) Inclusive Growth Corridor – an area where there is to be major investment including major sites such as:

- Smithfield
- HS2
- Metro expansion to UK Central – another growth point location for associated transport measures and intensive energy uses – including Jaguar Land Rover and Birmingham Airport

This is also an area of the city–region where the differential experience and impact of current approaches to growth, for example, in terms of air quality and fuel poverty are at the most acute. In terms of the alignment of need and opportunity, it was seen to be both relevant and pragmatic to frame this work within the context of the EBNS.

The work has been informed at various stages by the 'Cluster convenors' – University of Birmingham (UoB), Climate-KIC and Energy Capital and Birmingham City Council (BCC). A series of semi-structured interviews/ conversations have been conducted with businesses who form part of the cluster opportunity, policy leads and strategic agencies at a local, regional and national level. The value and potential for the cluster to connect and act as a catalyst for system change was tested with council and West Midlands Combined Authority (WMCA) leaders. The shared commitment to see growth through the lens of inclusivity and sustainability framed the key lines of enquiry.

As our thinking and the working proposition has evolved it has been shared with the Cluster and wider community through attendance at Tyseley Energy Park (TEP) co-creation meetings and at the 2018 Energy Capital Conference. There has also been engagement within WMCA working groups. The frame and proposition were further shaped and informed by Birmingham Climathon 2018. This was a day-long event where Climathon participants from communities of practice and interest including major businesses, academia and innovators were immersed in different communities of place undertaking different activities and modes of engagement. The objective was to test existing assumptions on effective methods of climate-related behaviour change and better identify what barriers exist.

Climathon participants were invited to score their perception of their environment whilst pursuing key lines of inquiry around waste, energy, transport air quality and regenerative change within the community.

The delivery of clean energy is the principal ingredient in the operation of providing heat, power and transport that will deliver clean air. Clean air is the 21st century's public health challenge that is increasingly driving system change in our cities and regions. It is the view of BECCIC that the current narrative around air quality and clean growth alongside challenges within the waste system provides an opportunity to position Birmingham and its partners at the forefront of securing a clean transition through integrated place-based approaches to heat, power and transport. This will require a shift in perspective and a degree of system change that is yet to be achieved within the city–region. Given the potential cumulative impact of Brexit – global uncertainty, austerity and the challenge of climate change upon the communities of the city and region, there is a once-in-a-generation opportunity to reconcile conflicting and competing drivers and build a common cause that secures a socially just transition.

The journey so far

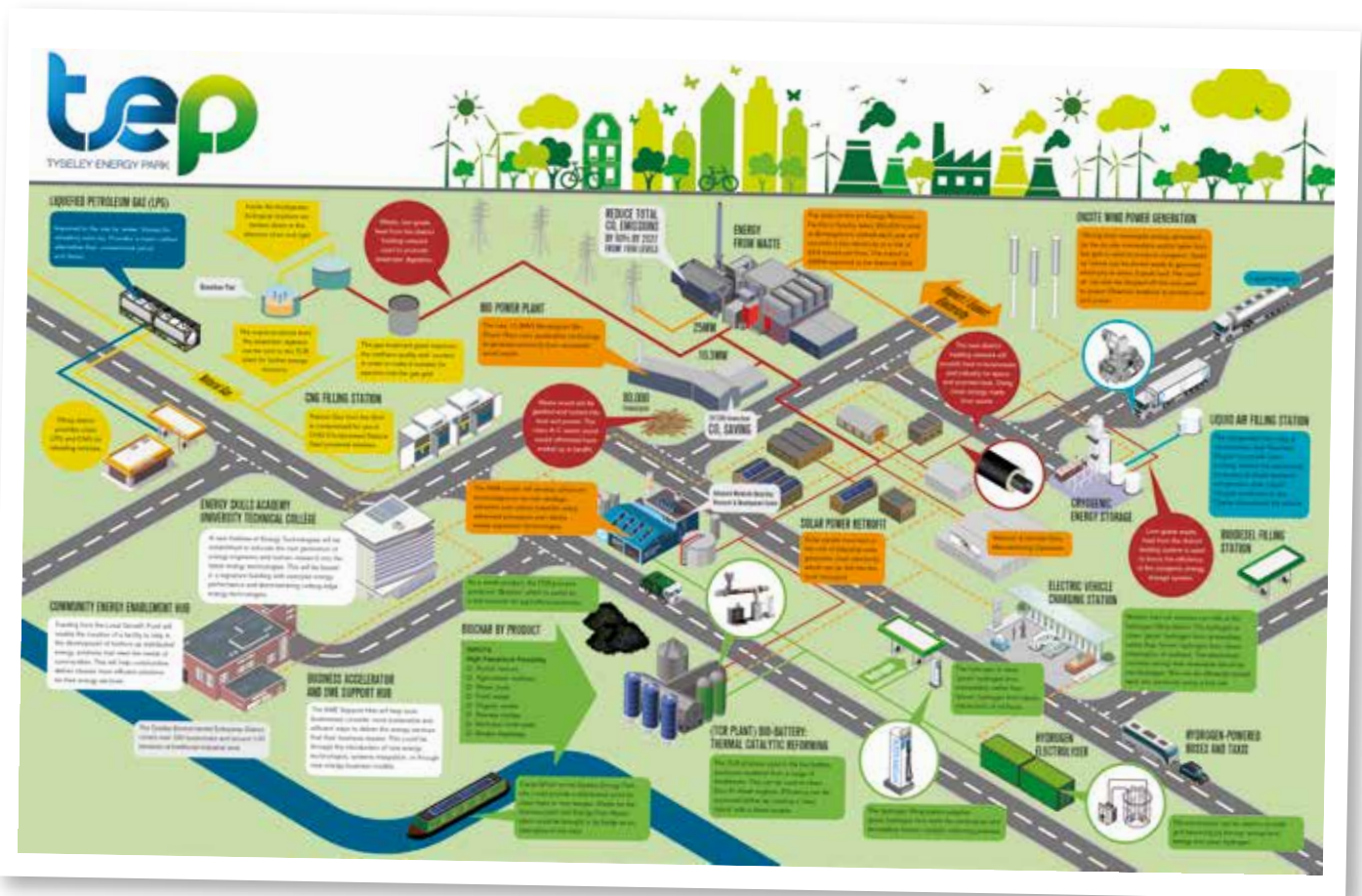
Birmingham's Green Commission set out the city's transition to a low-carbon future within **Birmingham's Carbon Road Map**⁴. The scale of need and challenge was seen to be significant but so was the corresponding opportunity in terms of planned development and cross-sector capacity and capability. There was seen to be a concentration of world-class academic and commercial expertise and know-how in the field of energy. This embedded partner-capacity, capability and opportunity for transition to a clean energy system informed the location of the Energy Systems Catapult in 2016.

Around this time, BCC with its partners established Energy Capital, a public-private partnership now located within the WMCA. Energy Capital aims to establish the region as the global capital for energy system innovation and market development, associated with energy, waste and transport infrastructure for the region. Its focus is primarily on the new regulatory and financial drivers to delivering the energy transition locally.

The actors and agencies that formed part of Birmingham's Green Commission and drove the formation of Energy Capital are at the core of BECCIC, which has focused its attention on the Tyseley Energy Park adjacent to the Council-owned Energy from Waste Facility. Bringing together a coalition of interests into a single location has supported investment in energy solutions that focus on waste and the development of a district heating network.

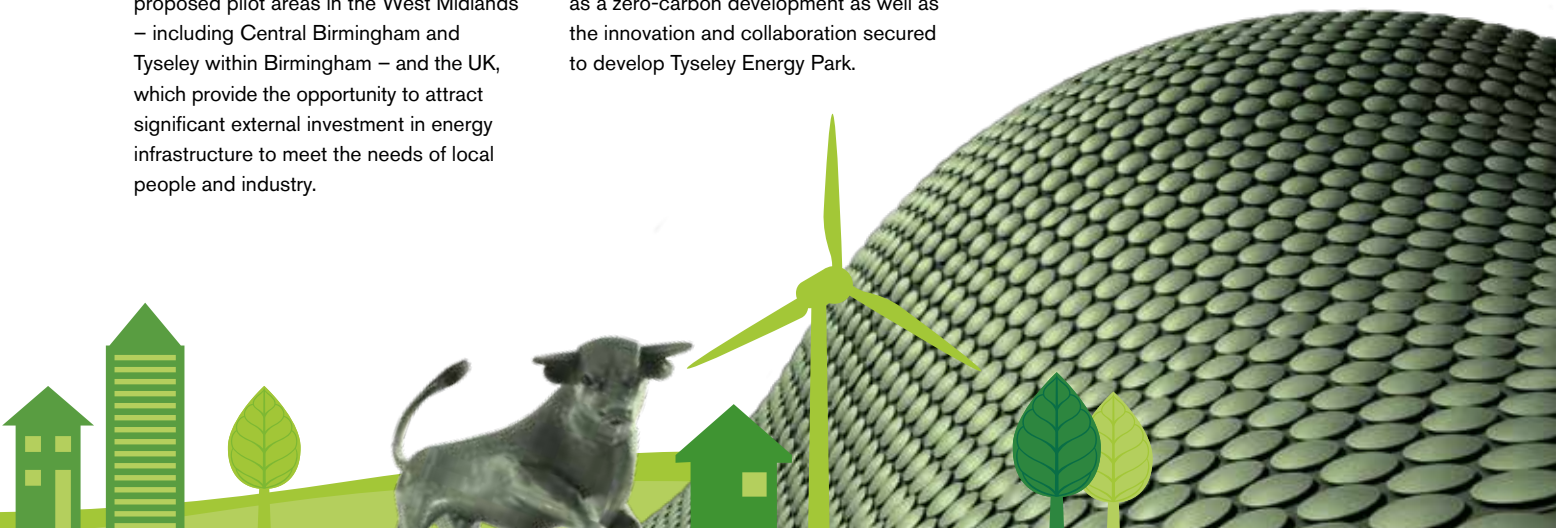
- The Birmingham Energy Institute – Aston and Warwick universities are the founding members and main drivers behind the formation of the Energy Research Accelerator, an Innovate UK multi-million-pound collaboration with Loughborough, Leicester and Nottingham universities plus the British Geological Society to address the major energy challenges facing the UK.
- Birmingham District Energy Company (BDEC)/Engie – district heating network established in 2007 provides financial and carbon savings to several high-profile city buildings and dwellings accounting for a distribution network of over 12km and 18,000 tonnes of CO₂ savings. The most recent expansion was the connection of Birmingham New Street station to the district energy scheme generating significant carbon savings, which is now the prototype for low-carbon investment by Network Rail.
- Webster and Horsfall – Birmingham's oldest manufacturing business and whose founder was one of the city's pioneers is now transforming its business base and site, working to bring forward Tyseley Energy Park, a site adjacent to the Council-owned Energy from Waste Plant, as the energy and waste nexus for Birmingham. Collaborative action has already secured the public-private partnership that led to the low- and zero-carbon refuelling station and the hydrogen refuelling infrastructure at Tyseley Energy Park – investment that will be critical to the delivery of the Clean Air Zone (CAZ) and compliance in the city. In addition, the University of Birmingham has put in investment and is seeking match-funding to secure the development of an innovation and research centre for sustainable energy to enable the development and testing of locality-based solutions and the provision of meeting space for innovation and collaboration for the members of the Cluster and community.
- The Local Development Order at Tyseley Environmental Enterprise District (TEED) – one of the city's economic zones has paved the way for significant private-sector investment – most recently by Birmingham Biopower locating the Biomass Facility within the TEED. Two further developments are planned by the developer of Birmingham Biopower – within TEP and on Hay Hall Road – both capable of processing significant amounts of municipal waste.
- Birmingham City Council has undertaken a review of the potential energy supply routes to market and has produced the full business case (FBC) for the establishment of a fully licensed energy supply company. The Council is now looking to develop an Energy Plan for Birmingham.





Earlier in 2018, a Policy Commission chaired by Sir David King was established by Energy Capital and key partners. It reported in March 2018⁵. The report places the government's policy drivers and ambition for clean growth within a local framework and advocates a requirement for system change with the development of Energy Innovation Zones (EIZs) to act as a stimulus to local action and system change. EIZs are significant geographic areas where energy market regulations might be varied to encourage investment in infrastructure to meet specific local needs. There are five proposed pilot areas in the West Midlands – including Central Birmingham and Tyseley within Birmingham – and the UK, which provide the opportunity to attract significant external investment in energy infrastructure to meet the needs of local people and industry.

There is the potential to connect this capability to the ambition for inclusive sustainable growth in the East Birmingham and North Solihull Corridor. To do this, a change of perspective will be required alongside the development of real partnership working across large and complex city systems with multiple stakeholders. This will also need to happen at speed if opportunities are to be harnessed and the system to be shaped to address the needs and requirements of the local community. The ability to shift perspectives and drive a low-carbon future has been evidenced through the cross-sector approach that helped redefine the vision for Smithfield in Birmingham as a zero-carbon development as well as the innovation and collaboration secured to develop Tyseley Energy Park.



Climate change and the challenge for growth

In 2017, global GDP grew by 3.8%, largely due to rapid growth in emerging economies such as China and India. This economic growth went hand in hand with a rise in global energy demand of 2.1%; more than twice the increase in 2016⁶.

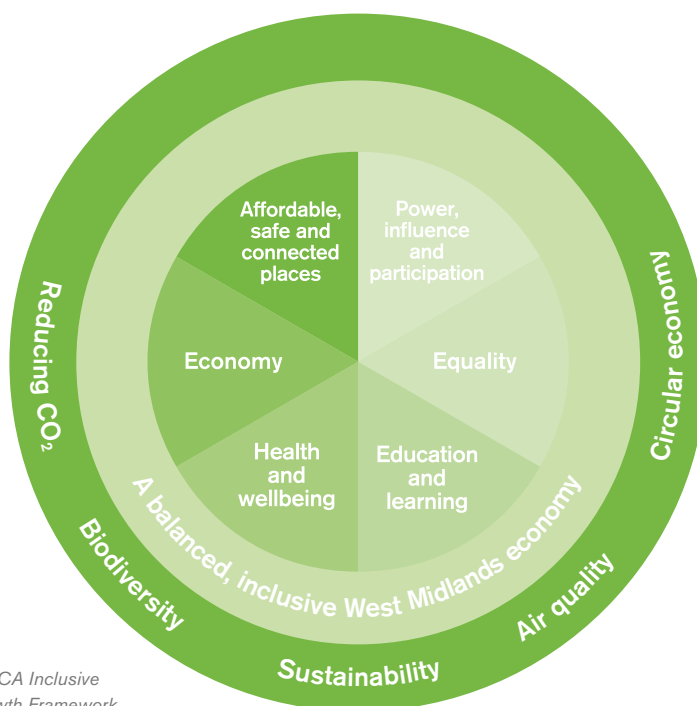
As most of the increased energy demand was met with fossil fuels, global emissions are now on the rise again – by 1.1% – having plateaued for the past three years. The UN Intergovernmental Panel on Climate Change's (IPCC) landmark 2018 report⁷ has warned that urgent changes are needed to our energy and transport systems if climate change goals are to be reached and the impact of catastrophic climate change mitigated. Making clear that climate change is already happening, the report references specific weather events, droughts and floods – it highlights the impact upon global poverty and migration. The report argues that actions and investments made over the next 12 years will in effect determine whether catastrophic climate change can be avoided, and temperature rises kept below 1.5 degrees Celsius.

By the time the child that is born today reaches secondary school, the development decisions taken now and the growth pathways pursued tomorrow will have determined whether that child has a secure future⁸. Current approaches to growth, whether tagged with the term inclusive or not, are ill-equipped to meet the challenge – perspective needs to change to start shaping a system that will facilitate transition to an economy that is both sustainable and inclusive. Arguably, the relationship between economic growth and the growth in community well-being must be re-established.

The government's Industrial Strategy and 'Clean Growth' Grand Challenge, alongside the formation of the WMCA, provides the setting for the integration of housing, waste, energy and transport policy at city and regional level. The Birmingham Development Plan (BDP) 2031⁹ set out the spatial vision and intent for Birmingham to become known as an enterprising, innovative and green city that has delivered sustainable growth whilst meeting the needs of its population and strengthening its global competitiveness. The *Birmingham Economic Review 2018*¹⁰ suggests that Birmingham is some way on that journey with high levels of inward investment – and an increase in jobs in the professional services and a vibrant visitor economy. Set against this is an increasing polarisation in employment and the underpinning challenge of addressing low skills in sectors of strength that are to be targeted for accelerated growth within the Local Industrial Strategy. There is an urgent need to shift perspective from unconditional

economic growth to a point where growth is in balance with the social and environmental requirements of all communities. The various skills challenges and the absence of strategic investment suggest the city–region has some way to go.

However, the emerging Inclusive Growth Framework developed by WMCA is an important contribution. The framework, aligned to the concept of *Doughnut Economics* put forward by Kate Raworth¹¹, seeks to reframe thinking on the economy and see it as an integral part of the society in which it operates and the environment in which it is embedded. Taking this thinking forward in terms of energy, it is arguable that the technological drive, knowledge and ability exists – innovation will now be best captured through place-based system change where innovation is driven within communities allowing all to experience the benefits of rising prosperity.



WMCA Inclusive Growth Framework

The development of a skills and employment pathway to drive and underpin the transition to address societal and environmental requirements is a pre-requisite, but one which has the potential to be delivered. The identification of corridors such as the East Birmingham and North Solihull Corridor that connect very distinct and different communities, needs and requirement for growth and opportunity offers a ready 'place' that can be a frame for much wider system change.

The West Midlands Task Force – set up in 2008 in the wake of the global economic downturn and the need to build business resilience – saw the transition to the low-carbon economy as a key opportunity for the region. Whilst the need for investment or subsidy by public agencies was not ignored, great emphasis was given to the importance of providing certainty by clearly and consistently setting out expectations and collaborating across sectors to actively intervene to grow the market. Whilst the immediate drivers may be different, Brexit-heightened uncertainty and the threat of climate change to financial market stability create similar conditions and the aspiration and opportunity for the region remains. There is a very real opportunity to move forward on a process of re-industrialisation through transition to a low-carbon economy.

The energy sector is a critical enabler of productivity and inclusive growth for the West Midlands economy supporting more than 50,000 jobs and 10,000 companies in energy-intensive sectors including transport, manufacturing and construction and is the most concentrated market for energy services in the UK outside London. Compared to other sectors, there is also a strong alignment of demand and supply within the region, with businesses and citizens spending over £10 billion a year on energy. This represents 10% of the local economy and regional businesses need access to globally competitive state-of-

the-art energy systems to remain competitive and expand. Households need low-cost energy to contribute economically to society and escape spirals of energy poverty, deprivation and debt. Birmingham's annual energy bill is approaching £1.3 billion with only 1% being generated in the city. This represents a massive loss of revenue to the regional economy.

Fossil fuels remain the dominant source of energy and still account for 80% of the UK's primary energy in 2017, a drop of 1% compared to 2016¹². Oil and gas dominated the fossil fuel share with coal only accounting for 5% of the total energy mix due to rapid reductions in the use of coal for power generation. The UK has continued to scale-up electricity supply from renewable sources. The UK saw a 33% increase in wind energy, and a 22% increase in solar capacity. On 22 April 2017, Britain went a full day without using coal to generate electricity for the first time since 1882. On 26 May 2017, Britain generated a record amount of solar power – 8.7GW, representing 24.3% of total generation across the UK.

The 'Road to Zero' Strategy¹³ will see £1.5 billion of investment into electric vehicle development in order to phase out all fossil fuel car sales by 2040. Whilst continuing to decarbonise the electricity sector is vital, achieving the UK's Clean Growth Strategy will depend on investments in other sectors, such as transport, buildings and industry. Each of those sectors accounts for one-third of energy usage and infrastructure support. For example, whilst record growth in electric vehicle sales was seen in 2017, accelerating use of electrified transport will require large investments in charging infrastructure.

The UK green economy is a sector that is growing fast and is predicted to grow faster still. Recent figures from the Office for National Statistics (ONS) show the growth rate for low-carbon and renewable energy (LCRE) sectors stood at almost treble that of the

wider economy¹⁴. The Clean Growth Strategy published last year predicts the low-carbon economy could grow 11% a year between 2015 and 2030, four times faster than the projected growth of the economy. The sector's contribution to employment and jobs growth is significant with some 2.5 million additional jobs secured across the EU in the last decade. Transition, including carbon reduction towards electric and low-carbon vehicles, embedded in smarter cleaner, healthier communities supported by a more distributed, locally optimised energy system has the potential to create significant business growth, shared prosperity and job opportunity if underpinned by a coherent skills and employment-creation opportunity.

Existing energy-related measures for Birmingham

Addressing fuel poverty

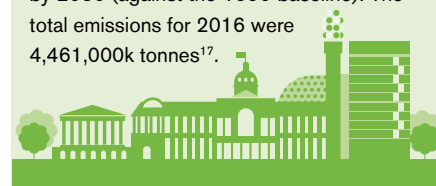
Birmingham has 1 in 5 households classed as in fuel poverty, considerably higher than the national average of 1 in 10¹⁵.

Improving energy security

To address increased energy requirements to enable Birmingham's continued growth, as well as CO₂ reductions, where currently more than 99% of the £1.3 billion Birmingham spends on energy, flows out of the city¹⁶.

Decarbonisation

In order to meet the Council's own target of 60% reduction in carbon emissions by 2027 (a reduction from 6.874 million tonnes baseline in 1990 to 2.7496 million tonnes by 2027), as well as national targets set through The Climate Change Act 2008, where the 'legally binding' targets are a reduction of at least 51% by 2025 and 80% by 2050 (against the 1990 baseline). The total emissions for 2016 were 4,461,000k tonnes¹⁷.



Breaking the cycle – securing the system for change

Energy is fundamental to the way that a city works and how its citizens live their lives – readily available energy supply enables residents to heat and power their homes, fuel the vehicles that they travel around in and produce and provide the goods and services that we all use and enjoy daily.

The way that energy is used – where it comes from, how it is managed and ultimately consumed has a direct impact on the quality of life and prosperity of cities and regions. Yet in comparison to other key infrastructure, the inherent social, economic and environmental challenges within the sourcing, supply and servicing of this infrastructure requirement still gets comparatively little attention from the policy-makers and, importantly, the place shapers in the cities and regions.

The right funding and commercial frameworks can be put in place but if local people are apathetic and do not connect with the opportunity the effort and resource in terms of long-term outcomes will be wasted.

The need to empower communities and better understand what is collectively valued is critical to the wider debate on climate change. The language of the low-carbon sector and institutional innovators is often incomprehensible and irrelevant to communities of place and practice in the city. When 'heat or eat' is a daily dilemma for many residents and where austerity has shaken the very foundations of public service provision – a 'valued' cluster will be one that is able to understand the needs of today's social system and connect its value with that of the communities it serves.

Intergenerational reconciliation is required where co-benefits can be identified for current and future generations. Air quality and the need to bring cities into legal limits has received much attention. For Birmingham, this will involve a chargeable clean air zone for polluting cars. Champions of improvements to air quality quite rightly highlight the preventable deaths caused by poor air quality. The policy community saw this as a clear area where the debate on changing the way we move people and products around the city and the need to act now and address climate change could be made real and relevant to communities. However, locally derived case studies compiled by Ashden and considered by those engaged in driving climate change in communities highlighted that the current policy construct and narrative is seen to be to the detriment of deprived communities and small business¹⁸. Since the days of the industrial revolution, small family businesses have been the backbone of Birmingham's economy and often do not have the resources or capacity to transition to clean vehicles within required timescales. This is a classic case of a risk of a lost opportunity where the potential to gain shared perspective is lost in the drive for legal compliance and the fudging of the actual costs of transition.

The model of engagement, participation and deliberation must go beyond traditional policy-making processes. For policy-makers, there is a need to challenge and change the prevailing culture and provide space to explore new platforms for collaboration and fundamentally build common cause.

Phil New, the Chief Executive of the Energy Systems Catapult (ESC), highlighted this dilemma in a recent blog emphasising the need to put the consumer at the heart of the conversation and speak to them in a language relevant to their own lives¹⁹. He went on to say that it was necessary to frame the 'offer' in terms of something they value. Other sectors, from transport and logistics to telecommunications and IT – high-performing companies – are developing offerings based on a forensic

understanding of their customers' needs and increasingly involve 'co-creation' of new products. Even if it is not possible to go as far as Microsoft's new corporate indicator of success – 'building stuff that people love' – it should at least be ensured that the offer is real and relevant to the consumer and in the context of place the citizen and the community's daily lives.

In terms of the delivery on clean energy, Birmingham is not operating with a blank canvas – the obvious challenge of retrofitting a 19th-century industrial city to 21st-century need aside – several energy initiatives have been piloted over the years which provide for valuable learning and an established infrastructure. These include:

- Solar schemes – Birmingham City Council piloted a feed-in tariff scheme on Council housing stock. This generates renewable energy for the homes on which the solar systems are installed and generates an income for the Council.
- Centralised boilers – as part of its now-defunct BES scheme, centralised boilers were installed in tower blocks owned by the Council. This provides a more efficient heating system which saves money for the tenants, is self-funding and lowers carbon emission.
- Birmingham District Energy Company – the centralised district heating system that provides heat to Council offices and buildings throughout the city. By taking heat from the district heating system there are carbon and cost savings when compared to heating individual buildings. This scheme is run by Engie with a benefit programme in place for the Council for new connections. There has not been significant growth in the system over recent years, meaning limited income for the Council. Engie reports significant potential new demand for heat connections although have a limited ability to supply through their existing generation technologies.

- Birmingham Biopower – this is a facility developed by Cogen in the Tyseley Energy Park. The facility processes 75,000 tonnes of waste wood annually, generating 10MW of power and approximately 30MW of heat. The power is mainly sold to the grid with some power supplied by private wire to the refuelling station next door.
 - Tyseley Energy Recovery Facility – this is the Council's main waste processing plant, operated under concession by Veolia. The facility processes some 350,000 tonnes of waste per year and generates 25MW of power output – sold to the grid – and approximately 80MW of heat output.
 - Tyseley low-carbon refuelling station.
- In addition to the existing facilities, there are several potential and planned developments for the future:
- Solar roll-out – in early 2017, Birmingham City Council (BCC) had a study carried out which identified some 30MW of potential solar PV opportunity across the city.
 - Electric vehicle charging scheme – currently in procurement, the Council is planning to implement a street-based EV charging scheme.
 - Clean air zones/charging zones within the local authority areas should drive a more concerted push into the electrification of transportation and various schemes are understood to be in discussion for the provision of larger-scale fast electric vehicle charging.
 - Energy supply company – backed by the significant size of the Council's own demand and the size of the city, BCC constructed a business case for the creation of an energy supply company in 2017 to drive a better deal to the people and businesses of Birmingham. This was committed to in the Labour Party manifesto for the Local Elections in 2018.
 - Hay Hall Road energy from waste – Cogen has secured a site on Hay Hall Road in Tyseley, which is planned to process some 250,000 tonnes of refuse-derived fuel (RDF) to generate 25MW of power output and approximately 75MW of heat output.
 - Tyseley Energy Park – Cogen has recently secured a further plot on the Tyseley Energy Park to deploy a Lockheed Martin-backed technology – Concord Blue – to process RDF fuel to generate a choice of heat, power or hydrogen.



What are the levers?

Integration

Discussions have suggested that each scheme or development that has been delivered or is in planning has had limited, if any, engagement with other parties or the relevant communities. Partly as a result of investor requirements, this limits the overall scalability and impact of projects, which could see return on investment improved through integration with other sources and uses.

A well-integrated energy system could be summarised as completing the cycle for a circular economy – for example, a waste processing facility that processes local waste into electricity and heat that is supplied back to the local community. This would require an energy supply licence that would enable local purchasing of electricity and access to a billing system for local heat. Within East Birmingham and North Solihull (EBNS), there are options to fulfil these.

A fully integrated system would build on the circular economy concept and be combined with an engaged digital strategy that enables two-way data communication between generation and demand. This offers the implementation of demand-side response which is a much-discussed concept that enables a more balanced energy system with fewer peaks and troughs.

Thus, the first main lever for change is integration and the level of integration with third parties and wider opportunities.

Investment

The traditional approach to energy investment tends to encourage an isolated approach to project and system development. This, in turn, leads to the outcomes by scheme that achieve benefits for the energy system but not necessarily for the broader local market.

By blending the investment approach across sectors, it would open up the opportunity for integrated development. Joint investment would encourage increased stakeholder engagement

which, in turn, would ensure that the energy system starts to be strategically developed rather than an energy system that emerges disjointedly.

The current landscape within EBNS is one that matches the traditional approach exactly, but through some integrated thinking on the part of Tyseley Energy Park, presents an opportunity to join up thinking and drive forward a strategic systems-based approach to energy in the local area. This will require engagement by the private and public sector to really push forward a system that has the participation of local interests and stakeholders that becomes significantly more efficient and promotes the retention of funds within the local area. This, in turn, could be used to drive forward digitisation and integration projects generally.

Community

Further to the more functional aspects of energy system development, it has been identified that engagement with the local community is critical to really driving forward the successful development of an energy strategy. In the schemes that have been looked at, there has been some early local engagement – often through the planning process – but limited ongoing participation.

The greater the levels of local community engagement the deeper within the community deployment of energy strategy can reach. By creating positive and engaging two-way communication, communities can understand the opportunities available to them in terms of improved efficiency and reduced costs whilst addressing the key issues of the day around air quality and reducing carbon emissions. A positive local community also accelerates the planning process, thus enabling far greater development of opportunities and local integration. It also brings cost saving to the developer.



Re-shaping the energy system

The figure below graphically represents the reshaping model which was used to assess current and planned projects along with their direction of travel by which they will grow and improve the quality of the projects' inputs and outputs to achieve better investments, better integrated outputs, engaged communities and better outcomes.

Assessment of integration is from low to high, with low being a standalone project that operates in isolation to the local economy. This could be, for example, a Council-run solar scheme such as that rolled out by Birmingham City Council, or Birmingham Biopower – a scheme that processes nationally sourced waste wood feedstock and has a standard connection to the grid for power output.

As integration points are increased, the rating here increases. Examples of integration points to the local community could include a private wire arrangement for power offtake, a local waste contract – processing waste from the local community – or a heat offtake from a thermal power plant that is utilised in a district heating network. Birmingham Biopower has introduced integration to their operations through a private wire arrangement to the refuelling station within Tyseley Energy Park. There is also a willingness to see waste heat recycled for local use if possible.

Investment is assessed on a continuum of public sector participation, from predominately private invested to public sector driven through to a partnered approach.

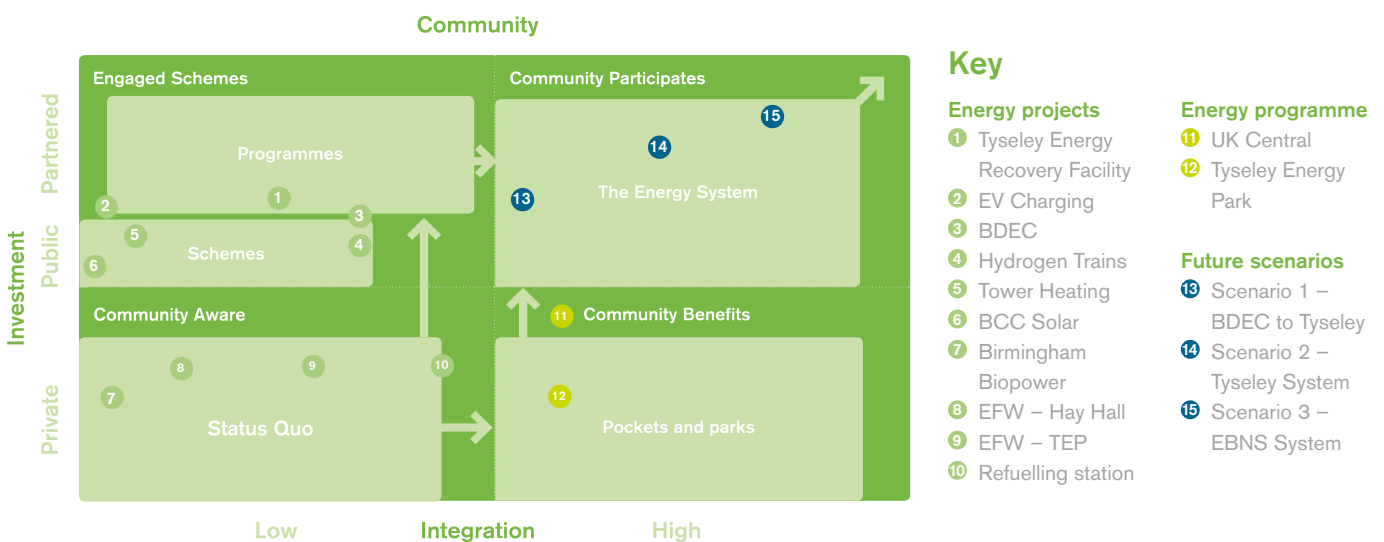
The scoring mechanism for community engagement starts with no engagement – for example, through the implementation of a solar scheme that has no statutory planning requirements. Increasing levels of community engagement lift the scoring from statutory engagement such as the planning process through to full engagement where communities can invest and participate in an energy development. Full engagement would include an ongoing two-way dialogue through digital channels that fully enable an energy system – where communities also could invest and participate in programmes. This could mean giving a community the right to decide to whom energy is sold, being able to purchase the energy themselves or to allow demand-side response systems to automate the switching up and down of demand to balance the system.

Energy system mapping

Given the levers identified, the projects and programmes that have been delivered to date have been mapped against the model – as well as those that are planned to the extent that information has been shared. Also identified are areas that can be adjusted to reshape and improve the outputs of the energy system to make positive developments towards full integration and maximum efficiency.

What has been found to date is that projects have generally been developed in isolation with limited local benefit. This is not surprising given the approach to date has been very much traditional and in line with energy development elsewhere across the country. However, what is apparent is that there are a few scenarios where a few simple changes could elicit a more integrated, locally focused and efficient system.

Potential integration points and opportunities for co-investment and community initiatives are identified in the mapping which, in turn, forms the recommendations for next steps beyond the scope of this commission.



Key

Energy projects

- 1 Tyseley Energy Recovery Facility
- 2 EV Charging
- 3 BDEC
- 4 Hydrogen Trains
- 5 Tower Heating
- 6 BCC Solar
- 7 Birmingham Biopower
- 8 EFW – Hay Hall
- 9 EFW – TEP
- 10 Refuelling station

Energy programme

- 11 UK Central
- 12 Tyseley Energy Park

Future scenarios

- 13 Scenario 1 – BDEC to Tyseley
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- 15 Scenario 3 – EBNS System

East Birmingham and North Solihull (EBNS Corridor) scenarios

Scenario 1 – Tyseley heat network to Birmingham District Energy Company (BDEC)

Engie reports that within the scope of the Birmingham District Energy Scheme there is demand for some 70MWt of new connections for heat. They report that within the current scheme they are unable to fulfil the new demand. In addition, there is a drive towards decarbonising the system which is currently powered by gas-fired combined heat and power (CHP).

It is reported that the Tyseley ERF plant that currently processes 350,000 tonnes of municipal waste per year generates approximately 85MWt of heat. The report also details the business case for laying the pipework to connect the facility to BDEC. There would seem to be a clear case for building this link although contractually the position is complex. We await approval from Birmingham City Council to engage in a discussion with Veolia (the plant operator) and the Council themselves.

Further to this, Birmingham Biopower generates approximately 25MWt of heat as an output to its facility. Cogen – their owner – is also developing two further sites in the Tyseley area, both of which will generate significant heat output – to a similar level of that at the Tyseley ERF. Cogen has expressed an interest in connecting their heat output on the basis that the commercial arrangements are acceptable.

Given the demand reported by Engie alongside their drive to decarbonise, there would seem to be a clear business case for the construction of a link between the Tyseley Energy Park and Tyseley ERF and the main BDEC scheme. Given the limitation presented by timescales, the recommendation of this report would be to explore in more detail whether Tyseley ERF can be connected to BDEC. A further matter for exploration is whether a heat network connection could be built from Tyseley Energy Park (Birmingham Biopower and Cogen's

planned development) and Hay Hall Road (Cogen's planned site). The Heat Network Investment Programme (HNIP)²⁰ has recently been set up to bridge commercial gaps to the development of district heating schemes so this should also be explored as a route to funding.

The introduction of hydrogen should also be considered at this point – showing potential to decarbonise both the transportation system (through hydrogen-powered trains and road vehicles) and by the injection of hydrogen into the natural gas system to allowable levels. The power required to create hydrogen could be taken from local generation sources – Birmingham Biopower or Tyseley ERF in the short term with longer-term potential as projects are developed from Tyseley Energy Park.

Scenario 2 – Tyseley energy for the local community

Further to the integrated scenario described previously, it is possible to leverage the heat output concentrated in Tyseley and through the link to BDEC to deliver a heat network to the surrounding area of Tyseley – a relatively densely populated local community of mainly terraced-type housing and low-income–fuel-poor households.

In addition to the heat network, there is a potential to gain access to an energy supply licence to enable the sale of locally generated electricity to the local area. This would close the circular economy loop: locally generated waste being processed locally and delivering the resultant heat and electricity to the local people and businesses of the area.

To support development and increase efficiency, initialising a digitisation programme to capture usage, demand and generation patterns would permit the evolution of a dynamic system which will enable the area to move towards lower costs, lower carbon, cleaner air and a fully engaged community.

To fully deliver a digital vision will take time. Through the installation of a growing heat network, technology will be installed in consumer premises that will help to improve the quality of data that in turn can help to balance the system more effectively.

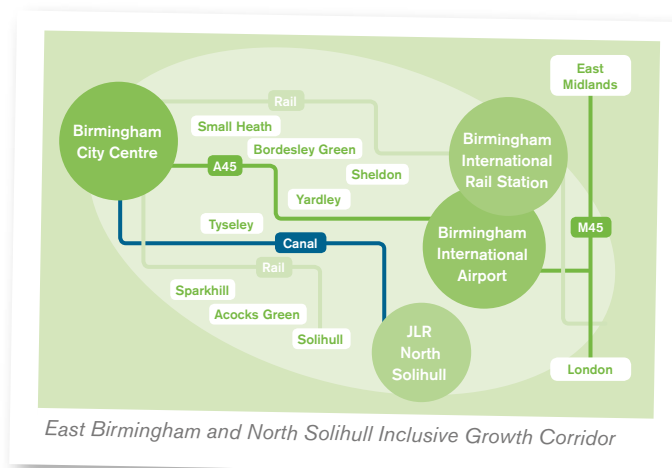
Scenario 3 – Tyseley to North Solihull and proposed UK Central Energy Innovation Zone

A further scenario is linking into the North Solihull and the proposed UK Central Energy Innovation Zone. By integrating the power and heat sources of Birmingham through Tyseley to North Solihull there is the potential to deliver a fully inclusive energy system at scale. This would entail leveraging public and private sector investment to drive a genuinely community-focused system for the benefit of the local area.

The surplus funds that will be generated should be used to increase the pace of digitisation to start driving demand-side response and balancing the energy system such that it becomes less subservient to the often-volatile capacity market. Designed as an integrated strategy, the system would evolve as the local economy develops, generating specialist employment opportunities and creating a hub for energy-based innovation.

Through linking Tyseley to BDEC, developing a local heat network, initialising an energy supply company or partnership and rolling out a digital programme to residents and businesses, EBNS will be able to focus on driving a clean energy system approach to the area. The impact will be delivering clean air benefits and generating the economic benefits of skilled jobs, improved housing stock, increased disposable income and reduced fuel poverty. Ultimately, it would deliver an exemplar urban energy system to the EBNS inclusive growth corridor.

What is needed to unlock the scenarios?



There are many energy projects within the corridor. They are at various stages of the development process or already in operation. This ensures a steady pipeline over the coming years of new generating capacity coming online. These are summarised in the earlier section but can be addressed in the following themes/objectives.

Integration

Through the discussions with those currently engaged in BECCIC it was evident that most parties understood the opportunities available in the local area and were interested in participating and collaborating to create a benefit greater than that produced by the 'sum of the parts'. There seem to be a number of quite clear opportunities emerging but various commercial/contractual obstacles will need to be worked through:

Contractual

- Engie's concession to run BDEC expires in 14 years. This leaves Engie unable to invest significantly in new infrastructure as their return on investment prerequisites could not be met. HNIP (Heat Networks Investment Project) could be considered as a possible route to funding.
- Veolia's concession to run Tyseley ERF expires in early 2019 – although it is envisaged the existing contract will run over for two to five years. It is unclear what the future operating model will be for this site.
- There is no local entity that can trade energy to fully benefit from the power output of the various generating facilities. This means that all the power generated is exported to the grid via Power Purchase Agreements, which means the energy and capital contractually leave the region.

Commercial

- Given the case for connecting Tyseley ERF to BDEC, commercial arrangements would need to be put in place for the trading of heat from one to the other.
- Arrangements would need to be put in place for the construction of a pipeline. This would require determination of who would build, own and operate it and how it would recover investment costs through operation.
- Tyseley Energy Park and Hay Hall Road provide additional opportunity for the connection of heat into BDEC and each would be open to exploring a commercial position. This could result in the opportunity to develop a heat network around Tyseley.
- Similar arrangements would be needed for the trading of hydrogen between Tyseley Energy Park and a possible hydrogen train depot at Tyseley – as well as to construct a pipeline, provide power for the generation of hydrogen and supply to the gas grid.

Digitisation, demand-side response and carbon neutrality

Taking a city to carbon neutrality through Scenario 3 is a challenge that will encompass all aspects of the energy and transportation system as well as carbon trading, efficiency programmes and energy system-balancing through digital interconnection and demand-side management. It is widely recognised that there is much inefficiency in the energy system through a lack of integration between systems and technologies. This is largely a result of grid systems around the world being designed with future proofing in mind such that they have been able to handle and grow with the demand for energy over time.

However, the grid system does not discriminate between energy sources which have driven generation on a global basis towards the

least-cost option for generation – traditionally, this has been coal. The side cost of coal-fired generation is an impact on air quality and it has been seen that many fast-growing cities in the 21st century suffer significant air quality issues manifesting often as smog. There is also a significant health consequence in that air quality-related illnesses and deaths rise in any growing city. Further, with the advent of lower-cost renewables driven by government incentives the energy system has been changing.

With a large renewables footprint, however, comes intermittency – it is not always sunny and/or windy so generation from renewables does come with a requirement for base-load generation to ensure enough energy is in the system. Base-load in the developing world does tend to be coal-fired but increasingly in the developed world, this is fulfilled by gas-fired generation and/or storage – whether battery or some form of pumped storage (air, water, tidal). Further to this, demand tends also to be quite 'peaky' with demand curves showing significant variation through the day – between mornings and evenings as domestic use peaks as people leave for and return home from daily activities – work, education, leisure, etc.

Demands on the energy system are most significant in cities – in terms of the 'peakiness' of energy demand as well as the pure volume. This has started to put strain on the transmission and distribution grids which, in turn, has started to drive the energy system towards a more distributed model – local generation which balances demand through the local grid. Local generation tends to be more flexible to demand variation which, in turn, means that the system naturally starts to become more efficient. It is this which has driven the current trend towards decentralised energy, district energy and energy parks – such as at Tyseley.

Further to this, it is recognised that addressing the peaks and troughs within a city can and should be addressed through demand-side management – which as a concept moves the system away from being demand-led – ie, over-generating power so as to ensure that the grid always carries enough power – to being generation-led and starting to match the demands of a city to the available generation. Countries and cities that have grids which do not generate power enough to fulfil their demands will experience black-outs and instability in the grid – which, in turn, will drive businesses and mission-critical services in particular towards backup generation and the relative pollution that can cause.

Thus, demand-side management as a concept should help to address cities that have capacity issues whilst also protecting the grids that currently do not have capacity problems from becoming vulnerable as energy demands of cities continue to increase. Demand-side management is often referred to as demand-side response (DSR), which is an advanced representation of the change that is required within the energy system. This is where the demand side becomes part of the energy system and is responsive to it – for example, at times of stress the system can turn down demand for energy.

In the UK market, there is a drive towards the blanket roll-out of smart meters to all consumers of energy by the end of 2020²¹. Despite reporting to be behind schedule, the government expects the roll-out to be complete at this stage. Smart meters enable two-way communication between a central database (Data Communications Centre – DCC) and all consumers, enabling real-time (in practice half-hourly) measurement of energy consumption. Through the enablement of close to real-time data it will be possible in time to communicate back to smart meters at times of stress to instruct home-based devices to operate differently – for example, turning a fridge off for 30 minutes, delaying a wash cycle in a washing

machine or switching on an immersion heater at times of excess supply.

Key to accessing such data is the supply of energy to consumers. The actual data is 'owned' by the consumers and accessed by suppliers. Thus, with such access to the data, suppliers can influence how their customers use energy. It is through such access that suppliers can drive innovation into households. Recent examples of this include the likes of the British Gas Hive solution, OVO Energy's Vehicle to Grid innovation and Amazon's rumoured intent to enter the energy supply market linking supply to home appliances through the Amazon Echo product.

Alternative and more direct forms of demand-side response include aggregating backup power from commercial or municipal buildings or participating in the Capacity Market through the delivery of fast response generation – able to respond to National Grid and DNO triggers for additional power.

Digitisation is key to the future of energy and thus local programmes run by the local authorities in conjunction with the energy system should be embraced. The use of data for 'good' intent has current resonance with the public. Given the public 'own' their data and have the potential to trade this within a supply relationship – for marginalised and deprived communities to effectively participate there will be a need to bridge the digital divide and evidence real-time benefits.

The role of education within this fast-developing arena should also be considered – with the level of data that will become increasingly available, the thinking that will be required to analyse complex data, shape and flex options and make decisions will become paramount. The capacity and capability to do this within 'real time' is an exploitable market lever. Combining public- and private-sector thinking with academia and community know-how could be the key to a low-carbon future.





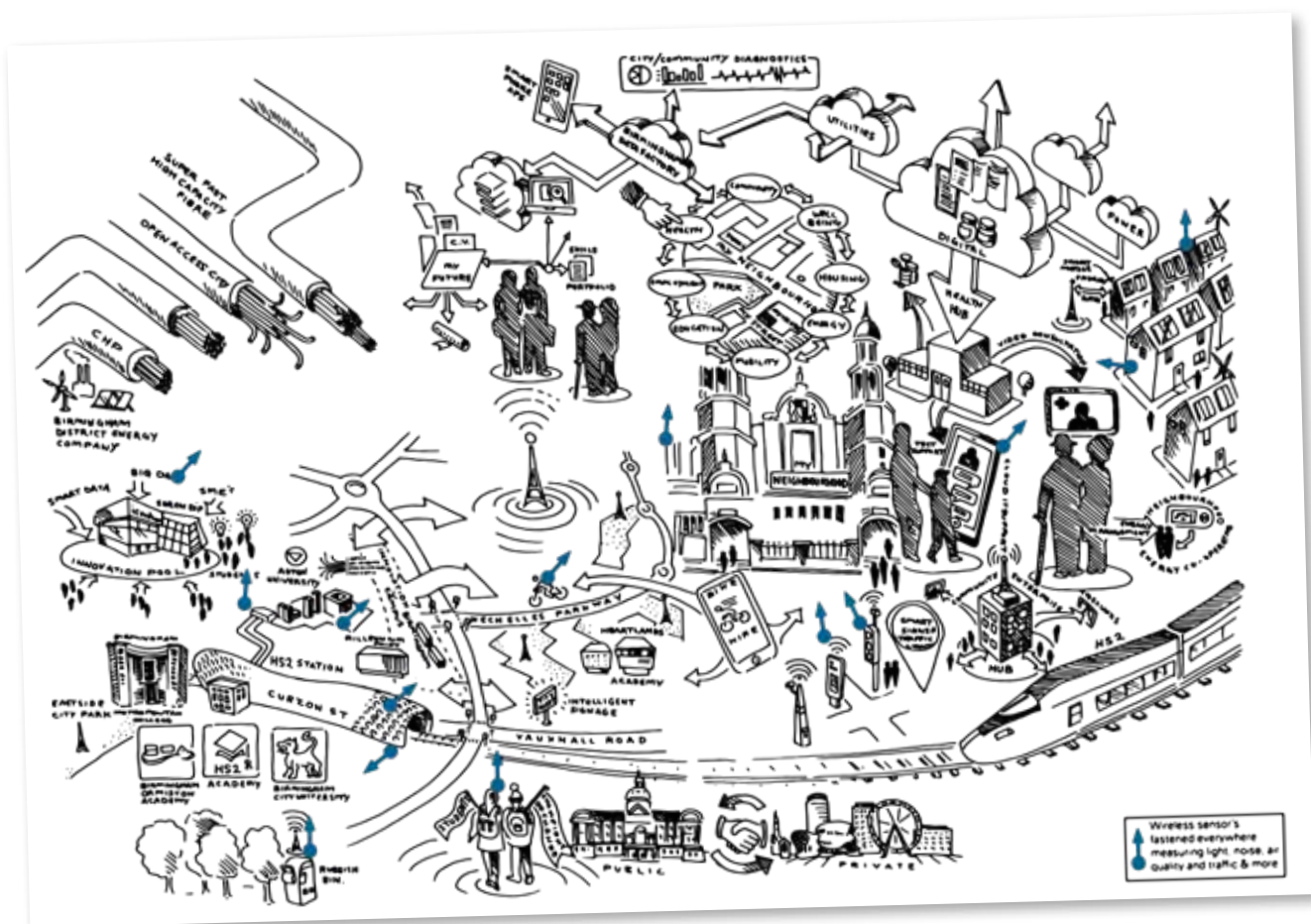
Powered by a cluster? The agenda for change

Programmes within BECCIC are commercially viable. There is the required knowledge and know-how to drive system change within the energy system. That will be a good thing. However, impactful innovation and capacity to drive action on climate change will only be secured if this capability is connected to the communities and corridor within which it is located and the system shaped to be sensitive to and supportive of all those communities.

The contention of this study is that place is the correct organising frame for energy and climate-related system change. A cluster has a spatial context and the opportunity connecting spatial frame in the context of BECCIC is seen to be the East Birmingham and North Solihull (EBNS) Corridor through to the Birmingham central core eastern quarters.

The OECD and Climate-KIC have identified a number of 'critical success factors' and risks for clusters²² – these have been applied as a benchmark to shape the articulation of the 'value' and requirements to connect and embed BECCIC as a driver of inclusive and sustainable growth within the EBNS corridor.

It is already acknowledged that BECCIC brings together globally renowned research and innovation in the field of energy. Some £300 million worth of investment has been secured on the Tyseley Energy Park along with a pipeline investment approaching £400 million. The multimodal refuelling hub could be



dramatically lifted with the development of the hydrogen-fuelled rail service. The potential five-year roll-over on the waste disposal contract gives a frame in which the plant can be re-engineered to deliver on the circular economy and support the ambition of zero-waste. But how do these connect and relate to the concerns of the community and help accelerate the delivery on climate change?

Symbolism is important in place shaping and place helps to shape our identity – Birmingham grew out of the industrial revolution. Significant contemporary factors include niche business and communities forming across the city, the complexity created by the demise of manufacturing and a requirement to re-industrialise at times competing with the renaissance of the city region as a major draw for inward investment and the development of a professional service sector. At a time of austerity, Birmingham and the region is having to come to terms with how best to retrofit a 19th-century city to 21st-century needs. The fact that the TEP has grown out of a Birmingham family business slowly but surely leveraging its equity and restructuring that family business to be supportive of the future and local economy provides a blueprint for other family businesses to consider. Importantly, it is a trajectory to which other key SMEs could relate. Local businesses are already looking to new markets with modular housing construction and a shift into energy-efficient building materials being noted examples.

The locating of both a research and innovation cluster and the Sustainable Energy Systems Research and Innovation Centre in the heartland of Birmingham's industrial past and its young inner-city community has the potential to offer a tangible and meaningful experience for local communities and smaller local businesses wary of change.

Uncertainty creates barriers. For example, UK energy policy and regulation deals with electricity, heat and transport separately. This means that areas with system synergies such as integration of heat and electricity production, electricity and transport or waste and energy receive less attention than simple 'single system' policy measures or areas with none. The importance of understanding and sweating the existing asset base is seen to be a significant success factor. It is arguable that in East Birmingham, the established assets are neither capitalised nor utilised to the full – partly suffering from an absence of a connecting narrative. For example, there are already opportunities within the locality to secure modal shift and enable connection to growth and investment.

If we look at the location of the TEP it is adjacent to Tyseley station, which is just 14 minutes from Birmingham Moor Street station and will be at the core of the HS2 Curzon Street interchange. There is the ambition to develop hydrogen trains at Birmingham and there is an ongoing project to develop retrofit of standard electric to hydrogen trains. The canal network and cycle pathway connect the east of the city with a creative quarter and is an area of interest and engagement for businesses within the Custard Factory, a creative cluster within its own right.

Birmingham City University, Birmingham Metropolitan College, Aston University and technical colleges are similarly connected, providing an opportunity to develop the educational 'offer' out of the central core and connect it to the community and place where young people reside. The Future Cities Catapult in its work for Birmingham Smart Commission took forward the asset-backed community development (ABCD) principle put forward by the Bishop of Birmingham's Social Inclusion

Process and in particular identified illumination of the canal-based cycle pathways and the development of pocket parks to address the deficit in green space as an early win.

The Wildlife Life Trust has looked at opportunities for connecting the investment in HS2 to assets on the corridor either side of the River Cole, encompassing South Yardley, Bordesley Green, Washwood Heath, Hodge Hill, Stechford and Yardley North and Shard End continuing into north Solihull. Covering 3,250 hectares of land, the project has the potential to reach a population of over 178,000.

Major investment areas like Curzon, Smithfield and Eastside are located at the central core of the central Birmingham end of the corridor, whilst UK Central, a large growth-focused multimodal transport hub – with significant development opportunity and intensive energy users including HS2 and established uses such as Birmingham Airport, Jaguar Land Rover, Solihull and Birmingham Business Park lies at its periphery. Considerations of grid capacity and the viability of a heat network are within current development proposals. UK Central is currently exploring the opportunities of securing designation as an EIZ.

The EBNS baseline report undertaken by Peter Brett Associates²³ highlights how major planned investments in connectivity including investment in Metro, rapid bus transit routes, enhanced services on existing rail and new stations will create new accessibility to major job opportunities. The WMCA Housing and Land Report²⁴ sets out the significant development and growth opportunity within the corridor. In terms of OECD success criteria, there is a significant asset base and a major opportunity to leverage investment and drive system change in terms of integrated approaches to heat, power and transport.

In terms of social capital and community capacity, the Climathon evidenced a desire for change and an increased frustration with the status quo. If appropriately resourced and equipped there are identifiable change-makers amongst the school leaders and community development facilitators such as The Active Wellbeing Society (TAWS). The local political and cultural leadership, as well as leadership across all spatial scales and spheres of governance in the public and private sector, is key. In terms of political leadership, the commitment to acknowledge the need for system change and then commit to being part of making that change is critical.

Whilst historic approaches have had early reliance on formal governance for regeneration programmes, it is the personal relationships between a few committed 'shapers' that has often driven success and this experience is mirrored within the BECCIC. The knowledge exchange and relationships developed across the cluster are strong and this has been evidenced through the sustained participation by key actors in taking forward the low-carbon-clean energy agenda within the city. A shared understanding of drivers has been gained and participants have acknowledged the shared risk and personal investment that has gone in to deliver on the key outputs that have taken forward this agenda in the city and region. There is shared ownership of the successes and shared recognition of the barriers and blockages to increasing the impact and connecting the cluster's assets to the delivery of sustainable, inclusive growth in the city and region.

This work was commissioned to help in the navigation of the wider system and establish a narrative that could promote a connection across communities and catalyse the development of common cause. If opportunity is to be harnessed and the system reshaped, then there is a need to embed and engage

within the cluster and any ensuing collaboration with key actors who can navigate the political and commercial landscape to deliver integrated systems and thinking.

The potential to deliver a sustainable future is underpinned by strong legacy and shared benefit. The evolution of the Tyseley Environmental Enterprise District as a place for environmental innovation and enterprise has survived a market crash and various changes to the political administration of the City Council. The knowledge of the area, the challenges it faces and the impact of the failure to address these on the resilience of the city are well researched and increasingly articulated.

Within the city-region and EBNS there is strong collective memory. Solihull Metropolitan Borough Council (SMBC) provided senior political representation to the Green commission and the delivery on the low-carbon agenda is a key driver for the administration. Investment by Greater Birmingham and Solihull Local Enterprise Partnership (GBSLEP) secured the road that opened the Webster and Horsfall site facilitating its development as an energy park. The Chair of the LEP notably advocated strongly for a focus on clean energy within the Local Industrial Strategy. There is emerging cross-boundary, community-based collaboration with BCC and SMBC co-sponsoring an Active Communities collaboration with TAWS and Sports England. The delivery of physical activity and supporting modal shift within a framework that supports system change and community cohesion is a key driver for this programme.

The chance to combine the need for change with the potential opportunities to be secured through a deliberative shift to new areas of growth like the low-carbon economy is something where the perspectives of policy-maker, politician and community of place and practice can coalesce.

It became apparent to the Council leadership during the development of the FBC for the energy company that the culture and capacity within BCC was not of an appropriate level to deliver such an ambitious project alongside other major commitments such as the Commonwealth Games 2022 (CWG2022). Capability and collective memory have been lost through austerity. The leadership of the Council is, however, keen to develop collaborative approaches that provide a return for Birmingham citizens. WMCA has a public service reform agenda and framework for inclusive growth that needs real-world testing. There is an opportunity to align these two drivers and draw in resources to help facilitate change and resource early transition. The local industrial strategy provides the strategic framework for taking forward delivery on clean energy and new collaborative approaches to transition, which would equally support BEIS (Department for Business, Energy and Industrial Strategy) and ESC (Energy Systems Catapult) priorities and capabilities.

Those of a technological or strategic bent tend to play down the complexity of place shaping. Data-driven analytical approaches have their role but reconciling the often competing and conflicting priorities of public administrations, the market and the regulator is challenging. It can become a rationale for keeping the decisions and deliberations separate from the experience-driven holistic lens of the resident or community – yet that is ultimately the context for the system change. As the most successful businesses have found, delivering on consumer need and requirement is the pathway to success.

The scenarios for the reshaping of the energy system set out here are technically deliverable, financially viable and have the potential to provide measurable benefit to system architects and the communities the systems serve. The capturing and sweating of the existing asset

base to facilitate mutual benefit and shared understanding amongst communities of place and practice has the potential to take system change beyond energy to one that is a process of whole-place, whole-system change.

Open facilitated dialogue is required that enables reconciliation of conflicting and competing plans and programmes into an overall system change, transition plan for EBNS. Critically this process must be iterative, seizing opportunity and bringing forward delivery with clear outcomes to maintain engagement. It will need demonstrable activity

as the 'glue' to bring the various aspects of the public and private systems together with residents and community. There is a need to remove current blockages within the system and understand that transition is both a process of reconciliation and mutual readjustment.

Past procurement practice and imposed constraints are a major barrier and too often become a brake on innovation and collaboration. Public procurement is concerned with the purchasing of services that are available here and now when what is required is the capacity to bring forward to the 'market' or

community innovation and technology as it develops. Combined purchasing power and public investment should support approaches that are further away from the typical operation of markets as well as those that are directly transferable.

Energy Mapping: East Birmingham and North Solihull Inclusive Growth Corridor

Key

Energy projects

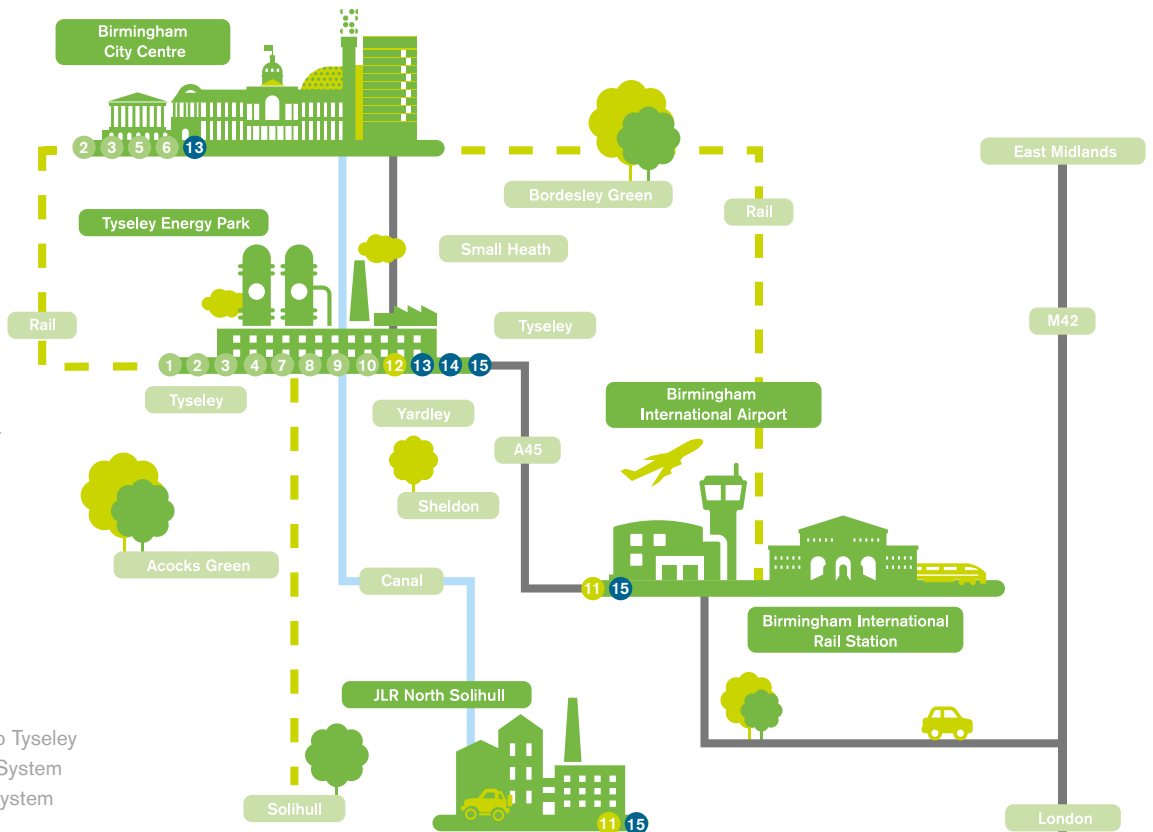
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Conclusion

For the objective commentator, the Paris Agreement and transition to a low-carbon economy are seen to be positive drivers of change for all our communities. Clean growth is increasingly seen to be 'non-negotiable' if the future growth of cities is to deliver increased prosperity and reduced inequality. Yet we are not seeing the good words and well-intentioned deeds translate into a willingness to embrace the change required in terms of the functionality and growth of place in our major cities. All too often patterns of investment and intervention seem to perpetuate the status quo. That is understandable given the current system structure and the power of incumbency.

The system of policy development, regulation consultation and engagement within the city region has promoted innovation and secured significant investment but over time this has grown into a complex web. In terms of the energy system, detailed rules designed for the existing industry structure can be overwhelming for potential entrants, who don't know where to start. Procurement processes and platforms for networking are outside the scope of many smaller start-up and community innovators. This gives substantial advantage to incumbents who understand the detail, have the resources and can frustrate radical change. Whilst the region and key stakeholders have their sights on this transition with the possibility of significant inward investment, there must be an underlying understanding that transition will require a distribution of power and leadership of the process cannot be nominal.

Transition cannot be forced or simply left to the market – neither the market nor the regulator (whether a local or national entity) are equipped to drive deliberative system change. There is an opportunity to re-industrialise and capitalise on embedded assets such as BECCIC and the growth planned within the surrounding area. The challenge is to build

upon the established assets and planned development, to purposefully collaborate across sectors, to co-create, deliberate and develop a meaningful scalable programme of intervention and investment that will drive system change and deliver tangible measurable benefit for the communities of East Birmingham and North Solihull (EBNS). There is a need to change 'the conversation' and use language that is understandable to all communities. Rather than promoting fear to engender change, we need to turn the narrative and our business models on their head and shape a system and programme that can deliver change today whilst building in resilience and opportunity in the future. There are examples of cities and regions that have gone some way down this route across Europe.

The size of EBNS is comparable to Nottingham – it has scale and major relevance. Whilst the corridor has deep-rooted challenges there is planned growth that could be re-focused to be inclusive and sustainable. Ambition and commitment to change from the current incumbents combined with a deliberative planned process that combines investment in community well-being alongside education, skills, enterprise and employment could well be the required catalyst.

The Local Industrial Strategy offers a frame by which the city–region can set out to capture this and glue the various parts of the system together for a sustainable inclusive future for the communities of EBNS. The scale of development and associated timescales, combined with loss of capacity and capability within the local authority to support such an approach, highlights the need for initial investment and collaboration to harness the embedded assets drawing within this the breadth and depth of partner expertise.

This proposition puts down the tracks for transition and climate innovation being at the heart of the future economy and provides a leading role for the city–region in a post-Brexit changing global economy. Critically it puts forward the rationale and opportunity to be secured from place-based system change and integration. As was referenced at the start – this report is not an end but is meant to support and stimulate conversation and reflective practice. Decarbonisation and the investment pull are critical drivers. Energy is the golden thread. Cross-community gain and the need to act now on climate change the catalyst.

Recommended next steps

The establishment of a series of briefings and open dialogues to take forward learning from this work, building common cause and shared understanding with communities of place, the change makers and place shapers at a local, regional and national scale.

Construction of a team framework for future development activities which will address strategic and process-based activities, including navigation of the political and commercial landscape to deliver benefits to all stakeholders through joined-up/integrated systems thinking – unblocking the blockages and facilitating investment in transitional pathways. Early project requirements will include:

- The creation of a central projects repository that enables cross-fertilisation of developments and the sharing of inputs, outputs and timelines – to unlock integration issues.
- Circular economy planning and delivery – focusing on the delivery of an integrated waste to energy process and system – achieving the return of the output of waste processing to citizens in the form of energy.
- Updating the business case for the delivery of a heat connection between Central Birmingham and Tyseley drawing on de-carbonised waste heat to displace carbon-intensive heat generation – thus reducing the reliance on natural gas. Open conversations with the Heat Networks Infrastructure Project regarding funding for heat links.

- Engagement with appropriate bodies regarding digitisation.
- Examine energy retail as an opportunity to drive public-sector savings through self-supply and derive local benefits – helping to address fuel poverty, driving public-sector reform, unlocking investment and enabling new forms of community ownership.


A review of data sources and community engagement opportunities to develop a plan for consumer-driven innovation and citizen engagement. Early engagement across the education and skills sector will be required to develop a skills pathway and route for citizens' participation in the low-carbon economy.

Development of an energy hub concept for the city and the region with a view to building a physical presence at Tyseley, becoming a focus for academic, commercial and community innovation in delivery of energy systems and forming a blueprint for future energy systems development and citizen-led action on climate change.

Explore options for the set-up of a jointly owned collaborative entity to drive forward developments and unlock contractual and commercial issues, to include:

- Structural options (CIC, CBS, Ltd Company, JV and others)
- Legal assessment and state aid consideration
- Potential parties to be included in structure
- Funding options and routes – private sector and government-led

References

- ¹ <https://climatefocus.com/sites/default/files/20151228%20COP%2021%20briefing%20FIN.pdf>
- ² www.ethicalcorp.com/csr-cheat-sheet-business-ramps-climate-action-despite-weak-cop24
- ³ 2010: Cluster Policies – OECD
- ⁴ 2013 – Making Birmingham a leading Green City
- ⁵ Powering West Midlands Growth: A Regional Approach to Clean Energy Innovation – Energy Capital
- ⁶ 2017: Global Energy & CO₂ Status Report: The latest trends in energy and emissions in 2017 – IEA
- ⁷ 2018: Special Report: Global Warming of 1.5 degrees – IPCC
- ⁸ 2018: Kirsten Cexec of Climate-KIC – at Climathon 2018
- ⁹ Jan 2017 – Birmingham Development Plan 2031 – Birmingham City Council
- ¹⁰ 2018 – Birmingham Economic Review 2018 – University of Birmingham: City-REDI; Greater Birmingham Chambers of Commerce; West Midlands Growth Company
- ¹¹ 2017 – www.kateraworth.com/doughnut
- ¹² October 2017: The Clean Growth Strategy: Leading the way to a low carbon future – HM Government
- ¹³ July 2018: The Road to Zero – Next steps towards cleaner road transport and delivering our Industrial Strategy – HM Government
- ¹⁴ www.businessgreen.com/bg/news/3025699/official-uk-low-carbon-economy-growing-at-almost-treble-the-rate-of-the-wider-economy
- ¹⁵ June 2018: SUB-REGIONAL FUEL POVERTY, 2018 – Department for Business, Energy and Industrial Strategy (BEIS)
- ¹⁶ 2017: Full Business case for Energy Supply Company – Birmingham City Council
- ¹⁷ National Atmospheric Emissions Inventory – <http://naei.beis.gov.uk/laco2app/>
- ¹⁸ 2018 – Liveable cities programme – Ashden.org
- ¹⁹ Hot showers, warm drinks and heating – let's talk about energy how consumers do – by Phil New
- ²⁰ 2018: Delivering financial support for heat networks: England and Wales – BEIS
- ²¹ 2018: Transition to smart meters – Ofgem
- ²² www.climate-kic.org/wp-content/uploads/2017/03/Insight07_Proof4.pdf
- ²³ July 2017: East Birmingham and North Solihull (EBNS) Baseline – Peter Brett Associates
- ²⁴ July 2018: Housing and Land report – WMCA
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