Financing the Transition:

Harnessing UK Cities' Ambition for Clean Energy

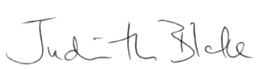
UK: 100

Foreword:

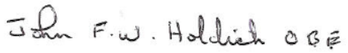
As leaders of cities that want our residents and businesses to benefit from the transition to clean renewable energy and away from fossil fuels, we are keen to find solutions to some of the barriers that are preventing communities in the UK from creating the jobs and industries of the future. This research identifies potential interventions, support and policies that should enable more of us to make the transition faster: creating jobs, promoting better public health, generating income and helping our residents save money. In particular it outlines what is needed to bridge that gap and to ensure our clean energy and energy efficiency projects are "investor-ready".

These findings and recommendations are rooted in the experience of local leaders and reflect the realities we all face. They are designed to meet not only our ambitions but also national ambition to deliver a Clean Growth Plan and Industrial Strategy that supports economic growth and innovation, and enables us all to contribute effectively to the UK's commitments to reduce emissions as outlined at Paris. We believe the UK has a great opportunity to lead the world in an early shift to a fossil fuel free economy, just as we have led the world in previous industrial transitions. If adopted, these recommendations will enable local authorities to lead the way in adopting clean and smart technologies and industries.

Leeds and Peterborough have both adopted innovative policies and want to be able to go further. This should no longer be a political battleground, but one of cross-party consensus, where local priorities are aligned with the necessary and desirable goal of creating prosperity without emitting carbon dioxide.



Cllr Judith Blake
Leader, Leeds City Council



Cllr John Holdich
Leader, Peterborough City Council

Acknowledgements:

The authors are extremely grateful to the many people who have contributed their time and expertise via written responses, interviews and participation in challenge sessions. In particular the work of E3G on New Energy Zones and that of Edinburgh University, commissioned by the Energy Technologies Institute, on Local Authority Engagement in UK Energy Systems - conducted in parallel to ours - has been extremely helpful to developing our proposals. Both pieces of research provided insights and evidence to support the growing consensus on the need for active government to facilitate the clean energy transformation the UK requires. A special mention also for Sepi Golzari-Munro, who designed the specification for the research and helped drive the project forward. Thank you.

We are grateful to the Purpose Climate Lab and the European Climate Foundation for their financial support for this work.

We would also like to dedicate this work to the memory of Cllr Alan Clark who sadly died during the period of this research. As energy portfolio holder in Nottingham City Council his insight and thoughtful political leadership enabled the city to become a pioneer in this area. We look forward to his legacy being built on across the UK.

Co-authors

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About UK100

UK100 is a highly ambitious network of local government leaders, which seeks to devise and implement plans for the transition to clean energy that are ambitious, cost effective and take the public and business with them.

It supports decision-makers in UK towns and cities in their transition to 100% clean energy by 2050. It is the only network for UK cities focused solely on climate and clean energy policy. More than 70 local leaders have already committed to 100% clean energy and more are signing up. The shift to clean energy is happening, here in the UK.

The leaders made the commitment as part of the momentum around the Paris Agreement in 2015, reflecting the leadership shown by mayors globally on climate change and clean energy. Turning those commitments into reality is the goal of the network. Launched in the presence of Nick Hurd, Minister of State for Climate Change and Industrial Strategy in 2016, UK100 connects local leaders to each other, to business and to national government, enabling them to showcase their achievements and learn from each other. It enables them to speak collectively on how to accelerate the transition to clean energy locally and nationally.

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Summary:

> "There is so much we could do. Scaling our existing and planned projects would be transformational. We know there are investors out there, but getting our projects ready for them, requires expertise we just don't have."
>
> **- Cllr Helen Holland, Cabinet member, Bristol**

The ambition of local leaders to facilitate the transition to clean energy is high. But that ambition is stymied by a lack of capacity and capability when it comes to turning that ambition into reality. Access to development finance for local projects is an issue, and the disparity between private finance and local authorities in their attitudes towards risk continues to be a barrier. However, the development of the global infrastructure finance market has created a large pool of investors with a strong desire to invest in clean energy projects which can generate an appropriate return for the risks involved.

Without clear direction in terms of policy and regulation, the market on its own won't deliver. Business needs strong signals and active leadership from government, locally and nationally.

The ability of local leaders to avoid the siloed approach that can come from focusing on one particular technology is potentially transformative. Integrated "whole systems" thinking is what clean energy transition requires and local leaders are well placed to deliver. They think across the whole economy, have levers on a range of sectors that are important to decarbonisation (transport, housing, planning, regeneration, waste management). They are also closer to their community than national government, and are thus able to bring their communities with them, emphasising the economic and wellbeing benefits for their residents and businesses.

We need to create solutions that can work at a sufficiently large scale to address our national clean energy challenge and develop solutions we can export globally. Whilst our report focuses on cities, because of their concentrations of population and economic activity, we recognise the importance of developing solutions that work for rural areas. For example, Cornwall has an ambitious vision of the opportunities presented by the new clean energy economy. UK100's members cover a broad range of urban and rural communities.

Our researchers, Malcolm Ball and Charles Abel Smith, are both previous employees of Arup and the Green Investment Bank. They have decades of experience in finance and industry especially in low carbon projects, including the design of the government's Heat Networks Delivery Unit in DECC (now BEIS), and with local authorities.

This report includes the evidence that they have gathered from the following sources.

- Desktop review of relevant reports
- Written responses from and structured interviews with 10 cities and regions across the UK which are committed to achieve a transition to 100% clean energy by 2050
- Two challenge sessions with leading industry participants across the public and private sectors which considered their emerging findings
- Interviews with elected councillors from a number of cities: Bristol, Leeds, Leicester, Newcastle, Nottingham, Peterborough, Stoke. These cities were chosen as they varied on a number of measures: size of community, ambition and record on clean energy, different party administrations
- Interviews with people involved with some of the leading low carbon support programmes.

The results of this work confirm the strong desire by ambitious local authorities to play a key role in the delivery of a low carbon industrial strategy. Local leaders want to support the national government in devising appropriate mechanisms to meet the identified gaps in capacity. This approach will enable local and national government to form a new mutually beneficial partnership on clean energy that could facilitate global exports in clean energy.

Whilst other European countries may have developed leadership with individual technologies, the real prize is using smart technology to help us integrate existing and emerging technologies into the new energy systems of tomorrow. The UK has pioneered the development of new energy markets and the integration of these technologies provides us with a great opportunity to become a leader in the development of new energy systems. Local authorities have a very important role to play in helping to achieve this in partnership with business and academic institutions.

Building on the findings of our research, this report outlines a specific proposal for central government to support local authorities in financing the development of the low carbon infrastructure we need to achieve the transition to a clean energy economy.

The Proposal:

We recommend the creation of Clean Energy Action Partnerships. These would offer access to technical and development expertise for clean energy projects from a crack central team with regional reach. As part of the compact, local authorities will offer integrated scaleable, replicable, deliverable clean energy projects to develop. The technical assistance facility will empower local authorities to develop commercial standard business cases, and transform the pace and scale of infrastructure investment in the UK's cities and regions.

Background:
The Growing Consensus

The world faces a big challenge to shift from our current reliance on fossil fuels to clean and renewable sources of energy. Fossil fuels currently satisfy about 80% of our global energy requirement[1] and total world consumption of marketed energy is forecast to grow by nearly 50% between 2012 and 2040[2]. The risks of not making the shift are significant and the costs will end up being paid by the consumer.

But technology is giving us the tools to achieve the shift and the pace of transition is accelerating. The cost of solar PV has fallen by 90% since 2009[3] and, despite the reduction in government incentives, the UK is still leading solar growth in Europe[4]. Batteries have seen a similar trajectory, with costs falling by 65% between 2010 and 2015[5].

> "To make sure that the UK capitalises on its strengths in the energy industries to win a substantial share of global markets. These include in manufacturing and services around clean energy…This requires us to be strategic in how we invest in innovation, and in the design of the regulatory frameworks that can influence investment."
>
> **- Building Our Industrial Strategy**

1 IEA Statistics © OECD/IEA 2014
2 EIA, 11 May 2016, International energy outlook 2016
3 M Liebreich, 23 November 2016, PRASEG guest lecture; G Redi and G Wynn, 2015, The future of solar power in the United Kingdom, Energies, Volume 8, p 7818-7832
4 A Vaughan, 7 March 2017, 'Solar power growth leaps by 50% worldwide thanks to US and China', The Guardian
5 National Grid, 2016, Future Energy Scenarios

There is a growing political consensus that clean energy is not only compatible with economic growth but is a driver of it. The government's recent Green Paper **"Building Our industrial Strategy"** recognises the importance of clean energy to our future economic strategy and is asking industry how we can best capitalise on this[6].

Our ageing energy systems need significant investment to keep pace with consumer demand. Smart technology is providing us with the means to bring about this change in a cost effective manner.

The National Infrastructure Commission, drawing on work from Committee on Climate Change, states that a smart system could provide gross benefits to consumers of £3-£8 billion a year in 2030[7].

A government-commissioned study carried by Imperial College London and the Carbon Trust found broadly similar benefits, with a combination of flexible solutions in a whole systems approach saving UK consumers £17-40 billion cumulative to 2050[8].

This creates the potential to reduce energy costs for consumers. Ofgem estimates that an annual £8 billion saving represents about 25% of UK household energy bills, or roughly £130 per year for each household.

The investment potential of transitioning to clean energy is immense. The Green Investment Bank has estimated that existing and proven low carbon technologies offer a potential investment opportunity of nearly £30 billion by 2020[9].

If we're clever, this new technology can make a big impact on the UK's economic growth, reduce energy costs for both domestic and industrial consumers, and enhance UK exports.

To achieve this we need to do things differently.

6 Dept. for Business, Energy and Industrial Strategy, 23 January 2017, Building our Industrial Strategy
7 National Infrastructure Commission, 4 March 2016, Smart Power
8 Carbon Trust and Imperial College London, November 2016, An analysis of electricity system flexibility for Great Britain
9 Green Investment Bank, Smarter Greener Cities: Ten ways to modernize and improve UK urban infrastructure

Background:
The Challenge

We need to reduce our fossil fuel emissions rapidly. The 5th Carbon Budget requires the UK to achieve a 57% reduction of 1990 CO2 emission levels by 2028-2032. We are becoming increasingly aware of the toxic nature of fossil fuel emissions, especially particulate and NOx emissions from diesel powered vehicles.

Clean energy also gives us the opportunity to increase our energy resilience and security of supply, reducing our dependence on fuel imports from other parts of the world.

The infrastructure transformation for this to become a reality can be at the heart of the UK's industrial strategy.

To make clean energy effective, much of the energy system will need to become more decentralised. It also requires an integrated "whole system" approach in order to more effectively balance demand. Local authorities are well placed to assist in this process but it requires the harnessing of local leadership.

The UK is however a more centralised state than other industrialised countries, where Local Authorities have less discretion or powers over finance, tax etc, than their counterparts in local government across Europe and in the United States. This may change as the devolution agenda progresses, but is an important consideration when assessing the potential for energy systems transformation at local level. City Regions, Combined Authorities, Metro-Mayors and Local Enterprise Partnerships all have a role to play.

The Government recognises the opportunities that clean energy offers and the challenges that currently exist. This year BEIS is due to publish its Clean Growth Plan. DEFRA has recently set out its framework for Clean Air Zones across England.

EU funding from sources such as European Regional Development Funds ('ERDF') and the Horizon 2020 programme has been instrumental in helping the UK address this challenge. Over £1 billion of ERDF funding has been earmarked for the period 2014-2020 for 'supporting the shift towards a low-carbon economy in all sectors'[10]. A number of local authorities are currently applying to the ERDF to support clean energy projects. This will no longer be available after Brexit. Access to European Investment Bank funding is now uncertain. Although the Government has indicated continuing support for the Horizon 2020 programme, it is likely there will be a considerable shortfall in available funding for local authorities that can leverage access to private finance.

Government has reduced its support for renewable energy generation as the cost of distributed solar and wind power, smart demand response systems, electric cars and battery storage is falling. With the costs of many forms of renewable energy tumbling, opportunities are growing for local authorities that want to develop clean energy projects.

- There is no shortage of private finance for investable clean energy projects, but local authorities need technical development and commercial support to bring forward investor-ready projects
- Often the projects are too small scale to attract private investment.
- Even when successful in attracting patient capital/state funding, there is no process for projects to be scaled and replicated.

Some of the trickier challenges of the transformation of the energy system to be fit for a post-fossil-fuel era need local leadership: issues such as demand management, energy efficiency and retrofit.

There is a role for a government committed to an active industrial strategy to bridge this gap, by providing development capital and expertise to enable local, integrated projects to become a reality.

This will enable local leadership to meet some of the biggest challenges of the transition. For example, while we are entering a new era where the consumer really can take control, this risks creating significant inequalities in the new energy economy[11].

Developing greater resilience in local grids will reduce the risks for consumers and support national action to transform the energy system.

10 European Commission, October 2014, Summary of the Partnership Agreement for United Kingdom

11 Green Alliance, April 2017, People power – How consumer choice is changing the UK energy system

Background:
The Benefits

A successful transition to clean energy could deliver significant economic benefits to the UK.

Productivity and Growth:

Lower costs. Smart Power, which harnesses the potential of evolving electricity generation and storage approaches with digital technology, has the potential to reduce significantly the cost of energy to all consumers.

Focussed on place. Clean energy technology enables our different cities and regions to develop solutions that draw upon the nature of their local resources and economic activity, such as solar PV in Cornwall and district heating in areas such as Stoke and the North East which host much of our energy intenxsive industries.

Rebalanced economy. 8% of the UK's GDP is spent on energy and fuels. Local energy generation using wind, solar or industrial heat resources enables the price we pay for our energy to be retained in the local economy and not exported to the producers of fossil fuels. Cornwall's ambitious energy targets for 2030 include increasing the proportion of its energy spend that is retained within the local economy to 30%.

Invest-to-save. Rapid paybacks can be achieved through adopting new energy efficiency technologies such as LED lighting. For example, the Government's Salix finance programme has funded over 14,400 projects with 1,460 public sector bodies valued at nearly £500 million[12]. Most of these investments have a pay back of less than five years.

12 Salix Website, 24 July 2017, www.salixfinance.co.uk

Export Potential:

Energy systems across the world are changing, possibly more significantly than at any time since the early 20th Century. This is driven by two key factors. First, the development of new digital technologies has the potential to transform the way in which energy is consumed. Second, the drive to decarbonise energy production has catalysed the development of decentralised renewable energy sources which generate in line with the availability of natural resources, and the battery storage capacity that we need to provide consumers with energy when they want it.

The UK has long been a leader in developing innovative energy regulation together with the design and delivery of energy systems.

Development of solutions that work in our own mature and complex markets will make us well placed to capitalise on this success to export markets.

Investment Potential:

The Green Investment Bank has estimated that existing and proven low carbon technologies offer a potential investment opportunity in the UK alone of nearly £30 billion by 2020. This includes renewable generation and energy technologies, district heating, and the data and communications infrastructure needed to support this. It equates to 150,000 jobs during construction based on 25% of £30 billion cost spent on salaries and an average mechanical engineer annual salary of £50,000. This figure does not include the potential investment involved in switching to electric vehicles.

Different types of low carbon investment (GIB analysis)	
Asset Type	**Potential investment opportunity by 2020**
Anaerobic digestion	£500m to £1bn
On-site combined heat and power (CHP)	£500m
District heating	£2bn*
Distributed renewables	£2bn to £4bn
LED street lighting	£2bn
Energy from waste	£5bn
Energy efficiency building ret-rofits	£3bn
Low carbon public transport fleets	£3bn
Electric vehicle charging infra-structure	Not quantified
Data & communications Infra-structure	£10bn
Total potential investment	£28bn to £29.5bn
* BEIS's Heat Network programme is aiming to secure £2bn investment	

Energy Systems Overhaul:

> "If we get this right, we have the opportunity to significantly reduce the amount we need to build, and therefore the cost of this transition, by placing new and alternative sources of flexibility at the heart of our electricity system and making efficient use of our assets."
>
> **- The National Infrastructure Commission**

We have an ageing energy system which requires significant investment if it is to satisfy the demands of consumers in the new energy economy and provide us with the network resilience that we need.

The National Infrastructure Commission has stated that 'If the status quo continues, network reinforcements at the distribution level alone could cost up to £30 billion from now to 2030'.

Despite the long term challenge this represents, it goes on to state that 'if we get this right, we have the opportunity to significantly reduce the amount we need to build, and therefore the cost of this transition, by placing new and alternative sources of flexibility at the heart of our electricity system and making efficient use of our assets.' It estimates that this approach could save consumers up to £8 billion a year by 2030.

Wider Benefits:

Clean energy can deliver wider benefits.

New industries. The clean energy revolution is spawning the creation of new industries in sectors such as:

- Electric vehicle manufacture.
- IT and communications systems.
- Construction and home refurbishment.
- Energy appliance design and manufacture.
- Energy services and product design.

Energy Resilience: local renewable generation, lower electricity demand through LED lighting and other energy efficiency measures, coupled with battery storage have the potential to improve the energy resilience of local and rural communities.

Cleaner Air: the switch from oil fuelled to electric or hydrogen powered vehicles will dramatically improve the air quality in our cities and surrounding countryside.

More Liveable Cities: quieter and cleaner engines will improve the living environments in our cities.

Healthier Citizens: cleaner air and better living environments will help to improve the health and well-being of our citizens, particularly those who live and work in our cities. Active travel options, adopted as part of a modal shift away from car use, also increase public health outcomes[13].Energy efficiency measures can have positive health impacts too by tackling fuel poverty[14].

13 World Health Organisation, 2011, Health co-benefits of climate change mitigation - Transport sector Health in the Green Economy

14 Energy Saving Trust, 2015 Capturing the "multiple benefits" of energy efficiency in practice: the UK example

The Electric Vehicle Transition

- The UK has committed to ban new petrol and diesel vehicles from 2040.
- Volvo has recently announced that every car it launches from 2019 will have an electric motor.
- This year 100,000 electric or hybrid cars will be sold in the UK, but this still represents less than 5% of the market.
- This compares with Norway where electric car sales have already overtaken conventional vehicles.
- Globally current predictions suggest sales of plug-in hybrids and all-electric vehicles will make up 54 percent of new light-duty sales globally by 2040[15].

15 Bloomberg, 6 July 2017, Electric Vehicle Outlook 2017

Why Cities?

Their Role:

Globally cities are playing a major role in helping to bring about the transition to clean energy.

C40 Cities is a network of nearly 100 of the world's largest cities which are committed to addressing climate change. London is a leading member.

UK 100 represents over 70 UK cities and local authorities that are committed to achieve the transition to clean energy by 2050. They recognise how the move to clean energy can help to generate economic growth, reduce energy bills for consumers and create a better environment for those who live and work in their areas.

Global Compact of Mayors is a global coalition of mayors and city officials pledging to reduce local greenhouse gas emissions, enhance resilience to climate change, and to track their progress transparently. 8 local leaders in the UK have signed up to the compact.

The Covenant of Mayors was launched in 2008 in Europe with the ambition to gather local governments voluntarily committed to achieving and exceeding the EU climate and energy targets. 36 UK local authorities are part of the covenant. New signatories pledge to reduce CO2 emissions by at least 40% by 2030 and to adopt an integrated approach to tackling mitigation and adaptation to climate change.

The **Compact of Mayors** and the **Covenant of Mayors** in 2016 announced the **Global Covenant of Mayors for Climate & Energy**, a newly merged initiative to bring these two efforts together.

ICLEI: Local Governments for Sustainability is a global network that promotes local action for global sustainability and supports cities in becoming sustainable, low-carbon, resilient, eco-mobile, bio-diverse, resource-efficient and productive, healthy and happy, with a green economy and smart infrastructure. ICLEI Members are cities, towns and regions of all sizes in more than 86 countries across the world. 5 UK cities and local authorities are currently members.

These networks are built on the principle that local leaders have a particular set of opportunities and characteristics that enable them to shift their local communities and economies to clean energy.

They're Unique:

UK local authorities are uniquely placed to help accelerate the transition to clean energy.

Their democratic accountability requires them to engage with their populations and encourages them to establish political consensus to bring about beneficial change.

They control large budgets and are increasingly reliant on business rates for funding. They work with business to help increase local economic activity, not least through Local Enterprise Partnerships (LEPs) which enable leaders to cooperate with each other and with local business and industry on economic growth at a strategic level beyond their council boundaries

They think across the whole economy and by adopting integrated systems thinking can solve more than one problem at a time, such as saving money for residents, generating income to support public services, designing public space and tackling air quality.

Their Allies:

Local authorities have a wide range of allies who are keen to work with them.

RE100 represents the world's most influential companies who are committed to 100% renewable power. They recognise that as well as delivering on emission reduction goals, renewable power can help manage fluctuating energy costs, improve reputation and provide energy security. Their commitment to the clean energy revolution

represents a smart business decision. Membership includes Marks and Spencer, Jaguar Land Rover, Land Securities and many other international corporates with interests across the UK. It has just recruited its 100th member.

We Mean Business is a coalition of organisations working with thousands of the world's most influential businesses. Leading businesses recognise that while climate change is one of the greatest risks we face, tackling it is one of our biggest economic opportunities.

The Aldersgate Group is an alliance of leaders from business, politics and civil society that drives action for a sustainable economy. Its members include some of the largest businesses in the UK with a collective global turnover of over £400 billion, leading NGOs, professional institutes, public sector bodies, trade bodies and politicians from across the political spectrum.

Local authorities, committed to the transition to clean energy, share objectives with these organisations and others such as the **UK Green Buildings Council**. They can work together to improve planning standards, develop renewable energy generation and create the necessary energy systems to deliver secure and affordable energy for their communities. The Scottish Cities Alliance for example is specifically trying to get standardisation in spatial planning for district heating[16].

Their Potential:

The importance of cities in the UK was highlighted by the **Green Alliance**. 'Cities account for 58 per cent of England's population and 61 per cent of its employment, with those numbers rising to 74 per cent and 78 per cent when wider commuting areas are taken into account.'[17]

The Committee for Climate Change has identified that 'local government has significant scope to influence emissions reduction in the non-traded sector, which represents 60% of UK emissions. Areas such as buildings, transport, waste – where local government have direct relationships - represent over one-third of the abatement potential in the non-traded sector'[18].

In order to pay for the new infrastructure that we need, new business models must be developed that can generate income streams to support the investment required. This may involve the creation of new forms of partnerships between local authorities and business, such as heat networks and car clubs.

The Government's devolution programme recognises the benefits of enabling local and regional government to shape the provision of local service and infrastructure in a way that works best for their localities.

Opportunities and challenges vary according to locality. Solutions need to be tailored to the locality, so that the clean energy approach meets the local needs for jobs, growth, health and wellbeing.

But they must also meet national requirements, such as security of energy supply. Much of the decarbonisation of our economy has come from top-down policy decisions (coal phase-out, offshore wind etc). But there is still further to go. As the energy system develops to one that is more decentralised, it will become both necessary and desirable for local action at scale to meet that gap.

This applies to rural areas as well as cities. Cornwall has set itself ambitious targets for capitalising on the energy assets in its region.

Cornwall's Energy Future Vision for 2030:

- Reduce fuel poverty to 5% (fuel poverty currently stands at just under 15% in Cornwall).
- Meet 100% of Cornwall's electricity demand from renewable and low carbon sources.
- Increase the proportion of Cornwall's energy 'spend' that is retained within the local economy to 30%
- Increase the proportion of Cornwall's energy that is owned locally to 50%
- Reduce fuel bills by 20%
- Create at least 4,000 new jobs.

16 Heat and the City Workshop 28-29 April 2016 http://www.heatandthecity.org.uk/__data/assets/pdf_file/0014/202712/AMY_BROWN_HNP_meeting.pdf

17 Green Alliance, 3 December 2012, Green cities - using city deals to drive low carbon growth

18 Committee on Climate Change , May 2012, How local authorities can reduce emissions and manage climate risk.

The demands of the **Clean Growth Plan** are such that, without greater local action, it will be more of a challenge to meet both legally binding targets and internationally agreed commitments. Local projects need to be aggregated so that they are more easily financed by the private sector. They should also be more easily scaled and replicated. Enabling local leaders to fulfil their ambitions in this regard would mean the national government could find its stretching obligations easier to meet as well as enable a more resilient energy system to develop with public support.

Clean energy projects can also create a competitive edge for the UK in innovation. The recent report, **'Who will power the powerhouse?'** identifies how the North is leading the way in the transition to a renewable power supply. It 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. It also has pockets of innovation in leading areas such as energy storage and demand management. It argues for a Northern energy strategy that pulls together national energy policy, a place-based industrial strategy and the strategic economic plans of the relevant LEPs[19].

Devolution could enable these goals and ambitions to be met in a strategic way, especially if localities manage their own investment to meet local needs and ambition.

The Stern Review on the Economics of Climate Change, published in 2006, concluded that the benefits of strong, early action on climate change far outweigh the costs of not acting. A number of cities have conducted their own mini-Stern reviews which have identified the strong economic benefits that could be gained from the switch to clean energy.

A mini-Stern review for the Leeds City Region identified that 10% of city scale GDP (£5.4 billion in 2011) leaves the local economy each year through payment of the energy bill. Exploiting cost effective low carbon options would bring £4.9 billion of investment into the Leeds City Region's economy. Such investments would pay for themselves in 4 years, cutting Leeds City Region's energy bills by £1.2 billion a year. They would also create 4,400 jobs and an extra £200 million in wider economic benefits to the Leeds City Region's every year.

19 IPPR North, February 2017, Who Will Power The Powerhouse? The Challenges And Opportunities Facing The Energy Sector In The North

Our Research Findings

Evidence Gathering:

In order to understand what cities and regions are actually doing and the constraints they face in achieving their transition to a clean energy economy we:

- Sent out a questionnaire to a number of UK100 members and either received written responses from or carried out structured interviews with local authority officers from 10 cities and regions across the UK.
- Conducted two challenge sessions with leading industry participants across the public and private sectors which considered our emerging findings and provided valuable feedback.
- Carried out structured interviews with elected councillors from a number of cities: Bristol, Leeds, Leicester, Newcastle, Nottingham, Peterborough and Stoke. These cities were chosen as they varied on a number of measures: size of community, ambition and record on clean energy, different party administrations.
- Carried out desktop reviews of and interviews with people involved in some of the leading low carbon support programmes.

A list of the parties we engaged with, together with summaries of their responses and the challenge session findings, is set out in Appendices 2, 3 and 4.

Strong Political Support:

All 10 cities and regions who responded to our questionnaire confirmed strong political support, usually cross-party, for their transition to clean energy. All had climate change action plans on which they were actively seeking to deliver.

The most important drivers for this support were:

- Their desire to alleviate fuel poverty and reduce energy costs for their residents.
- The investment opportunities that clean energy offers for their local communities together with its impact on jobs and growth in their areas
- The opportunity to generate additional income for the local authority
- The need to address climate change and air quality

There was also a strong desire to develop approaches that were tailored to their own local needs and opportunities and which reduced their communities' dependence on the 'Big Six' energy companies for their energy. The transition to clean energy is part of a wider vision of their communities' future, addressing issues such as energy resilience, future proofing and aspiration.

Cities Are Innovating But Would Like To Do More:

A recent assessment of local authority action on clean energy indicates a large appetite to accelerate the transition: more than 80% of UK local authorities have ambitions for action on sustainable energy. But fewer than 10% have implemented plans on emissions reduction and energy. Few have mobilised investment for more than three energy projects[20]. A further fifth of local authorities have implemented plans and have mobilised investment for at least one project.

The responses to our questionnaire highlighted the broad range of clean energy investment that the UK's most ambitious local authorities have supported to date and this represents only a sample of local authority supported investment across the UK.

Cities and their innovations

Peterborough: Free residential solar PV with Empower

The Council entered into a strategic partnership with social enterprise Empower Community Management starting an installation programme from March 2015 in a designated Green Deal Community fund area and rolling out across the city from October 2015.

The scheme offers free solar PV to all private residents within the city. The benefits from the scheme are split between Peterborough City Council and a Local Community Fund. The income to the council protects front line services while the community fund delivers new projects as directed by city residents.

The main benefits of the scheme:

- Average £200 saving per year on electricity for the owner/occupier from free access to the daytime electricity generated.
- The owner receives a cheque of £100 every 5 years (on the original scheme, now continuing under reduced feed-in Tariff without the cash incentive).
- No costs to the property owner/occupier.
- The profits from the scheme will be split between PCC and a Local Community Fund: over £1 million to each party.
- A further 396 installations have been completed to date and are on-going.

The scheme has also made 5,758 social housing installations for Gentoo, Axiom, Stockport, Boston Mayflower, Ongo, Corby and Northampton.

20 M Tingey, J Webb, and D Hawkey. 2017. Local Authority Engagement in UK Energy Systems: Highlights from Early Findings. UKERC, London and The ETI, Loughborough. Available at: http://www.ukerc.ac.uk/publications/local-authority-engagemnet-in-uk-energy-systems-highlights-from-early-findings-.html

Leeds Hydrogen Project

BEIS recently announced £25 million funding to support the Northern Gas Networks H21 project.

This proposes that Leeds will be the first city in the UK to run on hydrogen instead of natural gas. Northern Gas Networks have partnered with Leeds City Council, establishing its H21 Project Office in the council buildings while assembling a £15 million Network Innovation Competition bid to provide the compelling safety evidence for gas grid conversion to hydrogen.

This type of collaboration has required Leeds City Council to dedicate officer time to help to create the correct city environment for effective innovative partnerships. The Council has provided practical support measures for the project such as identifying land for field trials of hydrogen technologies, not easy in a time of austerity and reduced budgets.

The long-term prize is an estimated £7 million per year in economic value of the jobs created or supported directly, together with an 11% reduction in regional carbon emissions are worth pursuing.

Clean Energy Support For Local Authorities:

Local authorities have been assisted in this investment by a wide range of UK Government, Devolved Administration and EU programmes. These are summarised in Appendix 5.

The most valued features of these programmes have been:

- Technical assistance (expertise and financial support) to provide development capacity and the capability to take projects from concept through business case to procurement.
- Development of standardised documentation available to everyone
- Critical friend support to help guide local authorities through the development process.
- Patient capital which can work alongside private capital to improve the financial viability of projects.

"HNDU is a great model. The mixture of feasibility funding, strategic, technical and business case support from the HNDU team (including a range of training / events for local authorities), which is designed to create a pipeline and generate sufficient scale to catalyse the markets, is a great model from the point of view of local authorities. Subject to the final details such as investment products and hurdle rates, the HNIP also offers an important investment fund which should help to create sufficient capacity to begin to drive down costs and deliver social as well as economic outcomes."

- Cornwall response

"Some of the models developed by UK and Scottish Governments have been very helpful, for example HNDU, Heat Network Partnership. The best models are those that can provide free assistance to local authorities where the organisations can be seen as "neutral" or critical friends with no agenda."

- Edinburgh response

Heat Network Delivery Unit (HNDU)

HNDU was set up to provide development support to local authorities who wanted to develop district heating schemes. Since its inception in September 2013 it has deployed over £14 million in grant funding to 131 local authorities for over 200 projects. The unit employs former local authority district heating developers, industry practitioners including engineers and BEIS policy staff. It has managed about four funding rounds per year.

Development support starts with early stage heat mapping, and continues through to commercialisation support to help make projects investor ready. Local authorities are able to apply for support at any stage. Support is contingent upon successful completion of relevant stages and proven potential of the project. Support includes expert assistance from the HNDU team and funding for third party project development costs. HNDU acts as a project mentor as a project evolves through its development stage. It helps guide local authority teams through the relevant procurement processes at each stage.

HNDU has gained a great deal of knowledge about the practical issues of developing heat networks. It has created standardised approaches to developing schemes effectively. This is greatly valued by local authorities that are keen to support the development of heat networks in their area.

As the HNDU pilot programme evolved it became clear that some level of public capital financial support would generally be required to support the investment case for new district heating projects. This resulted in a Heat Network investment Programme (HNIP) - £320 million to be deployed through investment and grant to projects that have reached the end of their development phase. This capital investment programme is expected to support up to 200 projects by 2021 through a combination of grants and loans and lever up to £2 billion of wider investment. Following a bidding competition, the pilot phase of £24 million was awarded in April 2017. This is supporting 9 schemes with a total capital value of £74 million.

The HNDU initiative has a number of key characteristics that have made it extremely effective including:

- Development support to take a project from concept through to construction over several years.
- Specialist staff with industry/public sector experience.
- Mentoring support as well as funding.
- Feedback to increase the efficiency and effectiveness of the process.
- Programme continuity that has encouraged local authorities to persist with their heat network development ambitions.

European Local ENergy Assistance (ELENA)

ELENA is a joint initiative by the EIB and the European Commission. It provides grants for technical assistance focused on the implementation of energy efficiency, distributed renewable energy and urban transport projects and programmes.

The grant can be used to finance costs related to feasibility and market studies, programme structuring, business plans, energy audits and financial structuring, as well as to the preparation of tendering procedures, contractual arrangements and project implementation units.

The ELENA facility is led by a team of experts consisting of engineers and economists with extensive experience in the transport and energy sector. The ELENA facility has awarded around EUR 100 million of EU support triggering an estimated investment of around EUR 4 billion on the ground.

Typically, ELENA supports programmes above EUR 30 million over a period of around 2-4 years, and can cover up to 90% of technical assistance/project development costs. Smaller projects can be supported when they are integrated into larger investment programmes.

The annual grant budget is currently around EUR 20 million. Projects are evaluated and grants allocated on a first-come-first-served basis. ELENA may co-finance investment programmes in the following fields:

Energy efficiency and distributed renewable energy.

- Public and private buildings (including social housing), commercial and logistic properties and sites, and street and traffic lighting to support increased energy efficiency.
- Integration of renewable energy sources into the built environment – e.g. solar photovoltaic on roof tops, solar thermal collectors and biomass.
- Investments into renovating, extending or building new district heating/cooling networks, including networks based on CHP, decentralised CHP systems.
- Local infrastructure including smart grids, information and communication technology.
- Infrastructure for energy efficiency, energy-efficient urban equipment and link with transport.

Energy efficiency and distributed renewable energy

- Investments to support the use and integration of innovative solutions for alternative fuels in urban mobility.
- Investments to introduce on a large-scale new, more energy-efficient transport and mobility measures in urban areas including passenger transport, freight transport, etc.

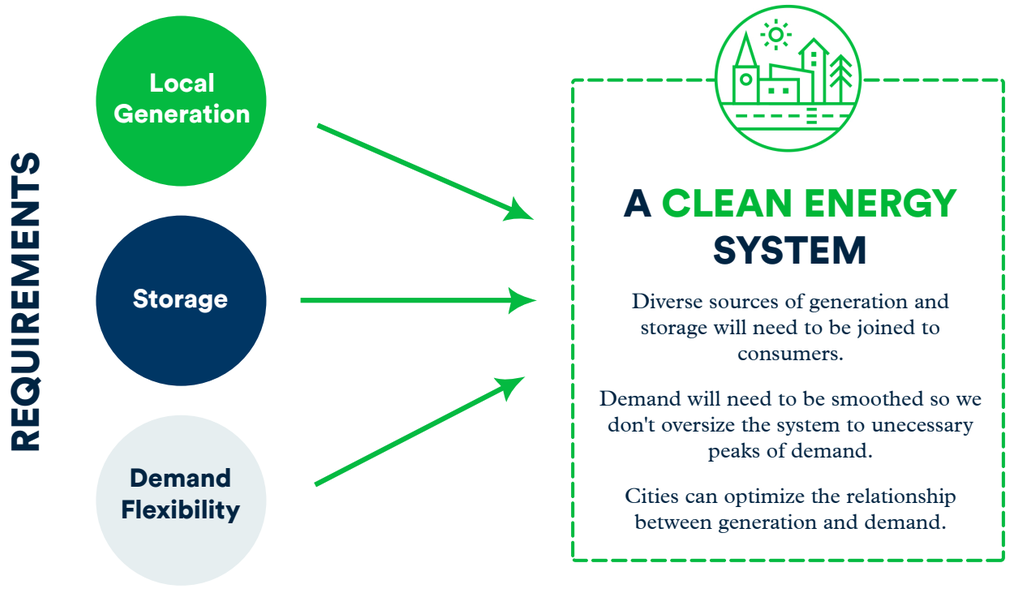
The Need For Integration – Local Authorities Can Help:

Most local authority clean energy investment to date has focused on individual technologies in response to the government support designed to encourage the deployment of those technologies.

Our successful and cost effective transition to clean energy through Smart Power requires the integration of:

- **Interconnection,** joining consumers with increasingly diverse and decentralised sources of electricity generation.
- **Storage,** where technology is accelerating at a remarkable speed.
- **Demand flexibility,** so we can save money by not creating a system which is sized to peaks of demand, but instead can be smoothed by changing the way in which users consume energy.

Smart Power requires integrated thinking

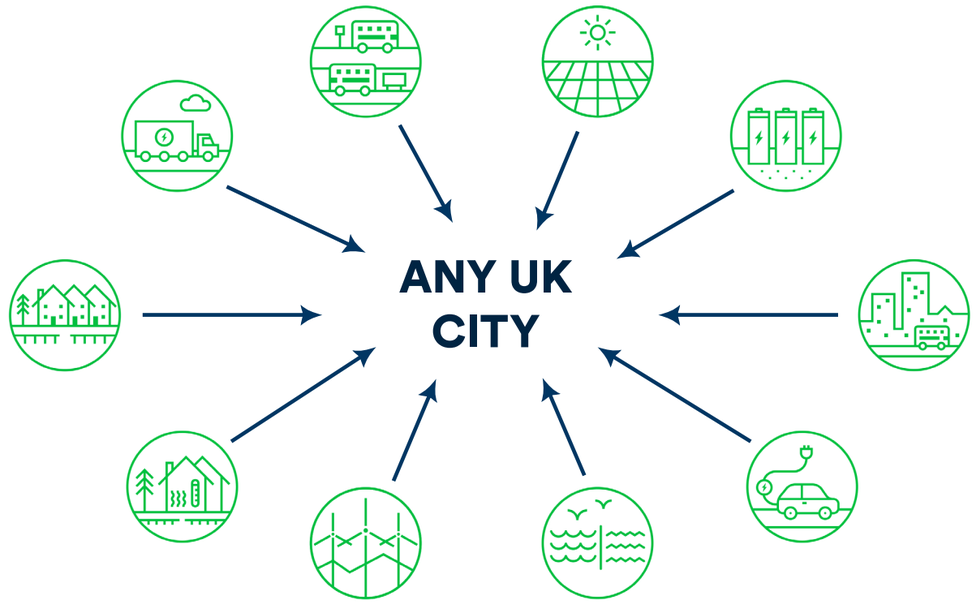


Local authorities can play a valuable role in helping to develop our new integrated energy system. For example, they can use their influence by using:

- Their powers such as planning.
- Convening local parties to work together and create new partnerships.
- Raising standards through collaboration.
- Encouraging the use of new methods of construction for housing and buildings.

Local authorities want to move away from subsidy-driven investment in specific technologies towards more sustainable delivery models which take advantage of the integration of emerging new technologies.

Cities can make sense of investment opportunities in an ingrated manner



"…It is rather about moving away from the current approach of securing grant funding for energy infrastructure on an ad hoc basis towards a more sustainable delivery model of energy infrastructure at the local level. The changing nature of the current energy systems towards more digitalised services that are provided locally also requires local authorities to take on more responsibility in this area of work in the future."

- Bristol response

They also want to develop solutions that can operate at scale in order to have a positive impact across all of their communities.

"Scale is the challenge. We are trying to do this quickly because particular funding pots are time-limited. Also scale adds complexity – there aren't a huge number of companies that have skills that can do that."

- Cllr Lucinda Yeadon, Deputy Leader, Leeds

What Is Constraining Them:

Deficit reduction has made it more difficult for local authorities to develop and finance clean energy. Our findings show that:

- **They lack the technical capacity to take projects forward.** This includes both engineering and commercial resource needed to develop the business case in order to secure the necessary investment approvals. It also means even successful pilots are not scaled or replicated.
- **Some Local Enterprise Partnerships have the potential to lead** on energy system transformation at a regional scale, working with local authorities, local businesses and local research institutions, but they lack the resource to do this.
- **Cheap money is available but mostly for business as usual.** Low cost Public Works Loan Board (PWLB) finance raised through prudential borrowing often funds local projects. Finance officers tend to avoid innovative projects in favour of the tried and tested.
- **There is a need for patient capital working alongside commercially available private capital** to support the development process and capital investment requirements. Clean energy projects have to compete with other calls on capital. The reduction of financial support for renewable energy has made the economics of clean energy projects more challenging.
- **The timescale to develop projects cuts across political cycles.** City leaders are keen to establish certainty by creating political consensus so that projects are more resilient to electoral dynamics. They need equal levels of commitment to certainty at national level and an agreed national vision for UK energy infrastructure. Without strong and consistent signals indicating national support local authorities are reluctant to invest in this sector.
- **Local authorities tend to be risk-averse adopters of new technology.** Their willingness to take projects forward would be greatly enhanced with the right champions at a national and local level. The rapid evolution of clean energy technology can exacerbate local authorities' cautious response to these opportunities.

Nottingham:
A Case Study

Nottingham has a wide range of clean energy projects underway. Whilst these are all at a community or individual scale, the aggregation of a hundred or so similar scale schemes across the city would be sufficient to address the significant electricity grid constraints that the city currently faces and which will become more challenging with economic growth in the area and the switch to electric vehicles.

Project SCeNE In The Trent Basin:

This community energy demonstrator scheme is being rolled out on a 400 home regeneration project in Nottingham's Trent Basin being developed by Blueprint, a joint venture between Nottingham City Council (NCC) and Igloo.

The scheme involves the installation of a community scale battery storage facility that will work in conjunction with on-site solar photovoltaic (PV) installations and will showcase innovative energy efficient solutions for sustainable homes and communities. The scheme is also seeking to deliver the charging infrastructure for electric vehicles. It aims to develop a 'subsidy-free' commercial model for community energy. Results will be disseminated as business model templates that can be used by any developer or energy supply company (ESCO) in the UK.

They are working with Nottingham and Loughborough Universities and a range of private sector partners including Siemens, SmartKlub (who are developing a community ESCO business model) and AT Kearney, who are acting as project manager for the Innovate UK funded Project SCENe (Sustainable Community Energy Networks) which is delivering the project. This is an example of how the research work on community energy undertaken by the University of Nottingham (UoN) is directly informing a real world development. The scheme has been supported with £6.3 million funding from the Energy Research Accelerator (ERA) and Innovate UK.

SENSIBLE On The Meadows Social Housing Estate:

This is a UoN led scheme. It is part of Project SENSIBLE, an EU funded Horizon 2020 project, which has other demonstrators in Portugal and Germany.

Its main objective is to demonstrate that the deployment and use of energy storage within a community can reduce the energy costs for consumers who adopt energy storage.

Other objectives are:

- To demonstrate that control of energy storage for a community rather than for the individual consumer, can help to increase the amount of PV generation that can be installed within a localised area.
- To show that energy storage can be used to improve the quality of the electrical power within an area.
- To provide evidence to change potentially restricting policy and attitudes towards the use of energy storage at distribution level.

This project is being carried out in an existing residential community that has a tight community structure and high level of community cohesion.

REMOURBAN:

Nottingham City Homes, Nottingham Trent University (NTU), and a local SME called Sasie.

Whilst the main activity involves looking at different approaches to retrofitting energy efficiency measures in 450 homes, it is also involved with clean energy transport initiatives such as electric buses, a city car club, and electric last mile deliveries.

The retrofit programme is taking three different approaches to the challenge.

- Bronze standard: this involves standard external wall insulation and LED lighting.
- Silver Standard: this is working with four low rise blocks of flats installing external wall insulation, battery storage, solar PV, LED lighting, low temperature district heating and developing an ESCO model.
- Gold standard: this is the most exciting approach which is seeking to develop a subsidy-free model which delivers very low carbon living with a maximum annual energy bill of around £300 per home. The approach is being developed under the Dutch Energiesprong model which aims to recover the investment cost over 30 years, using innovative procurement and a contractor guarantee of performance to drive high quality and low cost. One of the aims of the project is to develop cost effective off-site manufacture solutions for retrofit insulation panels.

Horizon 2020 funding is supporting innovation funding for the initial nine gold standard homes. NCC is currently seeking ERDF funding for the next wave of 230 homes to cover the reducing commercial gap.

City Solar PV And Storage:

NCC has invested in over 50 commercial solar PV schemes across the city. Despite current low levels of Feed in Tariff (FiT), it continues to invest in such schemes thanks to its ability to fund such investment with low cost borrowing available to local authorities, decreasing component costs and the utilization of the energy on site (offsetting energy costs).

The council has recently made its first investment in battery storage with an installation in a leisure centre and is working with APSE to develop the commercial model for larger scale batteries. NCC is now using the expertise that it has developed to help other local authorities in the region, and across the UK, to develop similar schemes.

Energy From Waste And District Heating:

Nottingham has a waste incinerator that was built in the 1970s, which feeds energy into a CHP, running a private wire and district heating network that has developed organically since.

This represents an important energy resource for the city, but its ageing infrastructure presents a challenge.

Social Housing:

NCC owns 26,000 housing units in the city, run by an Arms Length Management Organisation, Nottingham City Homes (NCH). Over 4,000 were fitted with PV whilst FITs were low. Around 5,000 were fitted with external wall insulation through area-by-area schemes (plus over 1,000 privately owned in the same areas, paid for by grant and/or homeowner contribution), and tens of thousands of lower cost energy efficiency measures, using a combination of funding sources including ECO, Green Deal Communities Fund, and NCH's own funding. The external wall insulation schemes have been named as

good quality examples in the Bonfield Review[21].

An environment strategy for NCH has been published exploring options for the remaining properties to meet anticipated 2050 standards. The Energiesprong demonstrators described above are a way of developing affordable methodologies which could be used to do so, with the commitment to having a solution ready by 2020.

A significant reduction in the energy demands of these homes would make a major contribution to Nottingham clean energy ambitions, and it would have a major impact on the size of the energy system needed to deliver this.

Energy Supply:

NCC owns Robin Hood Energy, the first 'not for profit' energy company, owned by a local authority. It was set up to tackle fuel poverty and to help give people a cheaper, more helpful alternative to the Big Six. It started operating nationally in September 2016 and already supplies over 140,000 homes and electricity meter points across the country, with a strong presence in the Nottingham area.

Developing The Electricity Grid:

Nottingham's electricity grid capacity is constrained. For example, there have been issues with fulfilling some renewable energy ambitions at both of Nottingham's Universities, and citing issues for NCC, for this reason. The combination of the initiatives listed above, and a replication of successful models across the city could help to address these issues.

Lessons Learned:

The foundation for Nottingham's energy success is infrastructure and skills, developed through conventional technologies already known to work and pay back: thousands of domestic, and tens of non-domestic, solar PV installations supported by FITs and low cost public sector financing; over 6,000 external wall insulation installations using ECO, grant funding, rental income or homeowner contribution; over 40 years of running a district heat network with energy from waste; two established universities with ambitious estates teams installing CHP and renewable energy across their estates. This has built skills and understanding across the city which, blended with local research expertise, is a foundation for energy innovation.

The innovative work that is being carried out in Nottingham has required financial support for:

- Project development and management.
- Research and data gathering.
- Capital investment which is not supported by a proven business model.

This support has come from a range of sources such as:

- EU funding such as Horizon 2020 and ERDF.
- Grants from UK research funding bodies such as Innovate UK.
- NCC access to low cost public borrowing, to match fund the grants, covering commercially viable aspects of projects.

Whilst demonstrator projects require public funding, the overall approach to all of the projects in Nottingham is to develop subsidy-free business models that will enable the right investment to be made at scale across the city.

The development of successful projects has required the right mix of parties including:

- Ambitious clients with energy skills (NCC, UoN, NTU).
- Patient developer to work with (e.g. Blueprint).
- Research capability (e.g. Nottingham and Loughborough Universities)

21 BEIS and DCLG, Peter Bonfield, December 2016, Each Home Counts - An Independent Review of Consumer Advice, Protection, Standards and Enforcement for Energy Efficiency and Renewable Energy, p.46

- Funder of innovative technology (e.g. ERA/Innovate UK).
- Systems integration and business model development (e.g. SmartKlub).
- Project design and management (e.g. AT Kearney and NCC).
- Private sector technology partners (e.g. Siemens).

Investment activity should look for scaleable locations.

- A supportive local authority with strong clean energy ambitions: Nottingham has an in-house Energy Team that is justified because it generates income, making it more resilient in a tight fiscal climate. This has taken years to develop and puts Nottingham ahead of most local authorities in this field.
- Scale of opportunity across the city: There are different resource constraints depending on geography, demographics etc, but even with no tidal or wind options, Nottingham is exploring generation as well as demand reduction. Their energy offer has to meet the needs of a wide range of residents.

Nottingham is not unique in its ambition. Local authorities recognise the potential benefits of switching to clean energy but are hampered in what they can do.

The Proposal:
Clean Energy Action Partnerships

Challenge to local authorities: How can your area create a financeable approach to switching to clean energy and generate economic growth as quickly as possible?

From the research that we have carried out UK100 believes that local authorities should:

- Do all they can at the local level.
- Focus on scale.
- Move on from pilots.
- Make sure they have picked the low hanging fruit (e.g. LED street lighting).
- Be clear on what they want to achieve:
  - Income generation (for the local authority).
  - Local economic growth (job creation, enterprise, innovation).
  - Social purpose (health & well being, cost of living).
- Build on what they are doing.
- Develop open source solutions that can work across localities.
- Develop methods of sharing best practice amongst local authorities.

What Support Do They Want:

Our research has identified the potential of what could be achieved through an integrated city-led approach to developing new clean energy solutions.

> "For us as an authority income generation is really important; having our own District Heating Network offers local businesses a sustainable energy supply with the chance of an income stream that we can then use to maintain our services. There has never been a better time for local authorities to invest in capital projects. This programme emerged from our City Deal, and we have been more proactive since about income generation because it benefits residents directly and indirectly."
>
> **- Cllr Abi Brown, Deputy Leader, Stoke-on-Trent**

But most of these are still at an early stage. If we are to accelerate progress we need to create a number of real-world sandboxes which:

- Encourage R&D and innovation.
- Help to develop commercial standard business cases.
- Help to commercialise the new technology.
- Demonstrate how it can be integrated to best effect.
- Create solutions which can be scaled and replicated.
- Enable private finance to be confident about the rate of return from the project.
- Facilitate a project pipeline.

Successful projects will create viable solutions that can accelerate the transition by combining:

Financial Innovation

- Developing new business models that can generate the revenue needed to support the necessary underlying investment.
- Identifying how to access the finance to support this.
- Creating new partnerships with business that can deliver the solutions.

Local Authority Powers

- Identifying how they can best use planning powers to achieve the desired outcomes.
- Freedom to capitalise on devolution and foster local solutions that meet the needs of their local communities.
- Create a carbon reduction metric that measures and evidences their transition to clean energy.

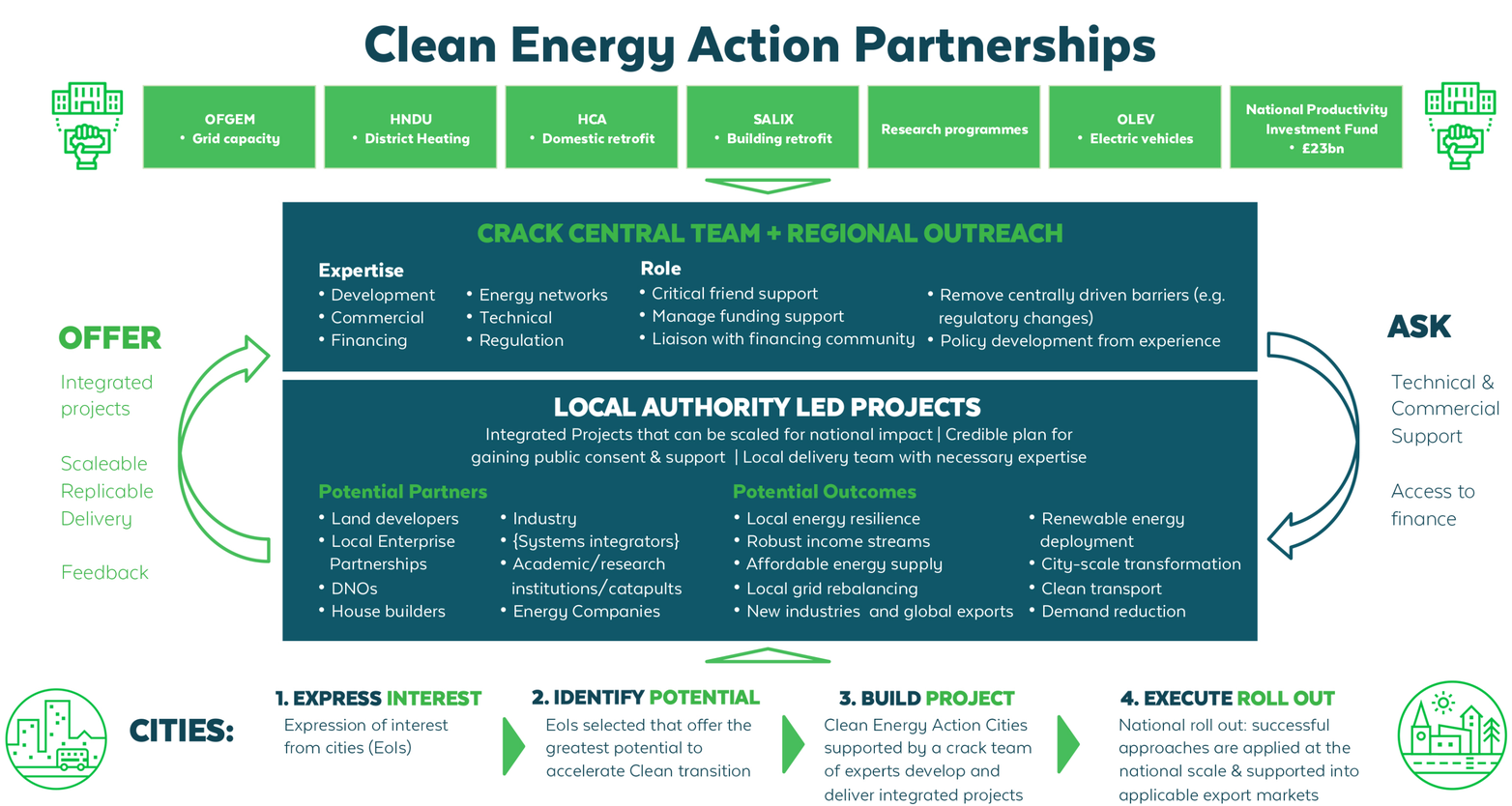
Other Freedoms

- Better building standards that reduce energy consumption but make sense for developers and building owners.
- Procurement innovation such as modern methods of construction that represent best practice.
- Ofgem permissions that support the creation of a more flexible energy market whilst protecting the interests of all consumers.

"Project development unit would be most helpful in terms of building a robust business case and we have found the account management and Huddle facility of HNDU to be excellent.

Recent increased dialogue with Government has been of great use and we have had welcome opportunity to feed back in terms of enabling policy, e.g. encouraging DNOs to cooperate with each other/act in a cohesive manner in terms of grid connections, fees and time planning"

- Swindon response



Clean Energy Action Partnerships: An Offer And An Ask

Building on the experience of successful programmes, such as HNDU and ELENA, we propose that central Government runs a competitive programme to create Clean Energy Action Partnerships to develop and deliver scaleable projects which:

- Develop integrated holistic approaches to capitalise on new clean energy technologies and approaches.
- Contribute to local economic activity (jobs & growth).
- Reduce energy costs for residents and businesses.
- Create new and economically sustainable solutions to address the low carbon challenge (meets climate change targets, financeable by the market with minimal pump priming from central government).
- Help to create higher quality living environments (fuel poverty, air quality, healthier living environments).
- Contribute to the UK developing market leadership and therefore exportable expertise (jobs & growth).

We envisage that this programme would have the following stages:

Stage 1: Invitation for Expressions of Interest (EoI) – local authorities, individually or grouped on a regional basis, would submit outline proposals for Clean Energy Action Partnerships in their areas setting out.

- The range of potential clean energy projects that they believe could be delivered in their area over the next 5 years.
- The partners they propose to work with to deliver this potential.
- The resources that they and their partners would be willing to offer to achieve this.
- What assistance they would seek from Government to realise their vision.

Stage 2: Development of Detailed Proposals - Government would select the EoIs that offer the greatest potential to accelerate the transition to a Clean Energy economy and would provide assistance to the selected local authorities to work up detailed proposals for their Clean Energy Action Partnerships.

Stage 3: Delivery of Clean Energy Action Partnerships - Government would create a crack team of experts to support the successful local authorities, and their partners, in the development and delivery of their projects, with funding closely tied to the delivery of agreed outcomes. Government support could include technical assistance funding, review of potential local powers and regulatory constraints which are seen to be impeding investment, and provision of 'patient' capital to support capital investment.

Stage 4: National roll out: Government will work to ensure that successful approaches are applied at the national scale and supported into export markets where applicable.

This would build on the recent successful experience of BEIS's Heat Network Delivery Unit, and the Heat Network Investment Programme.

The Benefits Of This Approach:

The benefits of such a programme would include:

- Efficient use of expertise across cities, facilitating the growth of local capacity over time.
- Area-based 'whole systems' approach to developing the solutions we need, harnessing local leadership.
- Focus on local delivery with knowledge being fed back to the centre.
- Government support will be contingent on delivering agreed outputs.
- Funding and critical friend support for local project development teams.
- Central expertise will be cross-functional to support local teams wanting to work across silos.
- Encouraging development of financially self-sustaining business models.

Government Criteria:

An important evaluation criterion of EoIs will be the progress that applicants have made to date in delivering local clean energy projects (e.g. energy efficiency, LED street lighting, heat networks).

Other criteria that could be used are:

Capacitiy of Consortia partners which could include:

- Local Enterprise Partnerships.
- Universities and research institutions (including Energy Technology Institute, Innovate UK & Energy Systems Catapult).
- Local DNOs.
- Other private sector partners (emphasis on principals, not consultants e.g. car manufacturers, contractors & developers).

Sound business sense

- Capacity to generate revenue streams that would support private finance.
- Potential to become a financially self-sustaining business model.

Projects that can be scaled

- Ability to standardise approach and generate significant investment.

International best practice

- Incorporates good ideas from abroad that have the potential to be applied effectively in the UK.

Integrated "place-based" approach

- Considers heat, light, transport, power, liveability, wellbeing.
- Integration of technologies which makes a place-based approach economically viable.
- Is it smart (i.e. use of data to maximise impact)?

Climate change/environmental impact

- CO2 emissions reduction.
- Air quality.

Energy resilience and security of supply

- Demand reduction and smoothing.
- Grid transformation.
- Energy generation.

Jobs & growth impact

- Local investment.
- Export potential.
- National economy.

Social impact

- Fuel poverty.
- More effective market for consumers.
- Health and wellbeing.

Where will the money come from:

Technical and financial assistance doesn't come for free.

And the loss of EU funding following Brexit increases the challenge of providing the funding support that is needed.

BUT there are existing pots of government funding that could be deployed to facilitate local-authority-led clean energy projects.

- **SCIENCE, INNOVATION DIGITAL TECH & SMART** funds that could be deployed for clean energy transformation such as Innovate UK, Energy Entrepreneurs Strategy Fund, Catalyst Fund.
- **NATIONAL PRODUCTIVITY INVESTMENT FUND** £23 billion for housing, R&D and economic infrastructure.
- **SECTOR SPECIFIC POTS OLEV**, Salix, Heat Network Delivery Unit, Ofgem's LCNF/ENIC.
- **REGIONAL INITIATIVES** such as Northern Powerhouse, Midlands Engine/Energy Capital, Cheshire Hub and devolved funding for Northern Ireland, Scotland and Wales.
- **BUSINESS RATES** An opportunity for revenue generation and rewarding businesses for adopting clean energy technologies and practice.

These could be used to leverage private and public capital. Local leaders need help to understand how to access them and pull them and private finance together in a way that enables integrated projects of scale.

Appendices

Appendix 1: Documents Reviewed

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Vaughan, Adam, 7 March 2017, "Solar power growth leaps by 50% worldwide thanks to US and China" The Guardian

Appendix 2: Summary Responses of Call for Evidence Questionnaire

City/Region	What has local authority done to date?	What low carbon infrastructure would the LA like to support?	What models of support are best in class and what sort of support would you like to see?
Bristol	• £50m of investment delivered ELENA programme 2012-2016: ELENA support enabled Council to create an Energy Service team to deliver energy efficiency and renewable energy projects to the city and to set up Bristol Energy • Salix: revolving £1.8m fund • Green Deal Communities: £7.3m DECC funding • HNDU: secured over £13.4m of grant funding • Bristol Energy: Council owned energy supply company • Wessex Loan Fund: supports energy efficiency investment in private housing	• Wide range of technologies that are financially viable • Energy efficiency measures on private housing but these are difficult to deliver in the absence of an Energy Strategy and grant funding at the national level. • Current funding support encourages focus on ad hoc projects which attract grant funding. Need to bundle projects in a more holistic manner to upscale and secure private finance	• Want shift from current focus on grant funding for energy infrastructure on an ad hoc basis to support for developing a sustainable delivery model of energy infrastructure at a local level • Programme focused on building capacity and capability that works similarly to ELENA. • Funding to support supply chain development in the retrofitting sector. • Capital for Wessex Loan Fund or similar initiative.
Cornwall	• HNDU: 3 successful grant applications • Exploring scope to develop funding from Cornwall and Isle of Scilly European Structural Funding programme • LA considering options to enter electricity and gas supply markets • 8MW of LA owned solar PV projects. • Glow Cornwall ECO concession contract: 1,700 homes treated, together with other retrofit investment • Green Deal pilot retrofit project • Community energy revolving loan fund which has supported 1.3MW of community owned generation • Largest rural network of electric vehicle charging infrastructure in UK (OLEV funding in partnership with SSE)	• Electricity distribution network capacity – either traditional or smart: to unlock constrained generation capacity in Cornwall, and build on the ERDF-funded smart innovation projects that are happening in Cornwall. • Community-owned renewable energy generation, supply and efficiency projects: • Energy storage: release capacity within the distribution network to accommodate more low carbon generation. • Deep Geothermal: potential to generate more heat and power than Cornwall needs and create new high quality jobs that build on Cornwall's mining heritage. • Marine energy. Cornwall Council owns Wave Hub – the world's leading test bed for commercial-scale marine energy generation installations. • Heat networks: Cornwall Devolution Deal commits the Council and Government to work together to develop new models to community-owned heat projects in off-gas locations. • Energy efficiency: 80% of homes in Cornwall are energy performance 'Band D' of worse. Nearly half of residents are not connected to the gas network. • Local supply: Council is also keen to help develop models that enable community energy schemes to supply themselves. The Cornwall Devolution Deal commits the Council and Government to work together to develop new models for community energy supply.	• HNDU: The mixture of feasibility funding, strategic, technical and business case support from the HNDU team (including a range of training / events for local authorities), which is designed to create a pipeline and generate sufficient scale to catalyse the markets, is a great model from the point of view of local authorities

City/Region	What has local authority done to date?	What low carbon infrastructure would the LA like to support?	What models of support are best in class and what sort of support would you like to see?
Edinburgh	• Salix: has used funding • Refit • LCITP: feasibility work for heat pumps and solar PV • Horizon 2020: funding bid • Charge Place Scotland: funding for electric vehicle charging points • Scottish Energy Efficiency Programme: funding for a range of energy projects • Switched on Fleets: funding for electric vehicles • Council owned ESCO created with a brief to work across all areas of energy including energy efficiency, renewables and district heating.	• Over 100 projects which make up the city's Sustainable Energy Action Plan	• Projects require technical, legal, financial and procurement expertise. • Larger scale projects such as district heating require a great deal of coordination between public sector and private organisations, are influenced by the planning system and require the right incentives for investors and protection for users. Would welcome support to address these challenges • HNDU and HNIP regarded as very good models. • The best models are those that can provide free assistance to local authorities where the organsiations can be seen as "neutral" or critical friends with no agenda.

Leeds	• Development of city wide heat network which will take heat from city's newly opened recycling and energy recovery facility
	  • £7m grant/loan package from LEP to support development
	  • Agreement for £5.8m of ERDF funding for connection to domestic users
	  • £10.3m of HRA funding for housing
	• Council backed solar PV projects: 3 solar PV schemes
	• White Rose Energy: Council sponsored energy supply company.
		• Vision to create interlinked series of district heating networks covering much of the city
		• Exploring with local universities scope to combine solar PV with battery storage following reduction in FiTs which makes stand alone solar PV projects unviable
		• Affordable Warmth strategy: ambitious plan to improve energy efficiency in homes over period 2017-30
			• Cross council and cross partner approach requires development support

Nottingham	• Salix: invested over £2m in own estate since 2009 • HNDU: various feasibility and mapping funds used • EU Horizon2020: REMOURBAN programme of smart cities measures including deep retrofits (energy efficiency, generation, and storage) of 366 homes worth £5.5m (about 50% matched by HRA Money), ESCO model for pay-as-you-save model on some of the homes. • ECO: has enabled around 6,000 homes with external wall insulation (about 4,000 social houses and 2,000 private). Funding match was HRA for social and private or Green Deal Communities for private.	• £3m current pipeline of designed renewable energy projects was about £3m, with scope for a further £6m • Energy efficiency investment potential is much greater. The HRA alone includes over £35m energy efficiency measures on council owned housing run by Nottingham City Homes over the next 5 years. Seeking additional funding to top up – ECO, ERDF etc. – to deliver greater improvements than it would otherwise fund. • Solar PV expansion with battery storage • Roll out of deep retrofits onto private housing - at least 35,000 homes need some kind of external wall insulation if they are to meet 2050 standards.	• Constrained by lack of grid capacity • Would welcome support for resource to develop project business cases and appropriate funding to help improve project economics
Oxford	• Salix: £600k revolving loan fund for energy efficiency in buildings supplemented by £800k of own funds for renewables generation and longer payments investment opportunities • Ox Futures, supported by £1.2m EU IEE funding which has delivered over £14m of renewable and energy efficiency projects • HDNU: support for district heating project development	• ERDF: funding bid to support decentralised grid strategy development and low carbon business support, awaiting confirmation of funding • Decarbonisation of heat across Oxford City Council estate with opportunity to connect other users. This requires:	• HNDU: well designed and resourced in central government • Project Development Assistance: best experience where funding is available to Council to develop its own capacity to liaise with other institutions. Access to a Project Development Unit would be good if that unit's resourcing costs are covered either directly or through funding to the Council

City/Region	What has local authority done to date?	What low carbon infrastructure would the LA like to support?	What models of support are best in class and what sort of support would you like to see?
		• Maximum 10-15 year payback. • facilitation/long term interest role and to tie in with strategic development of city – hence local authority ideally positioned to co-ordinate. • Going beyond 40% carbon target for 2020 will require deep renovation or change to energy systems • Decentralised energy building on Project ERIC. • Development of a business model for electricity suppliers to get involved would accelerate investment • Funding required for further piloting • May require regulatory support/ changes • New ways of working with the DNO which is not very supportive of innovation when working on a project by project basis • Heritage investment: major challenge for Oxford in achieving net zero carbon by 2050	
Peterborough	• Salix: used funding from 2010-12 but later adopted alternative approach to energy efficiency investment because it was viewed as being too cumbersome • Participated in EU funded Interreg IVb project ZECOS which explored how rural communities could become carbon neutral • Set up Council sponsored ESCO, Blue Sky Peterborough, but this has not traded to date • Have considered a number of ground mounted solar PV and wind turbine projects which ultimately failed due to local and national pressure.	• All projects are based on an invest to save model funded by PWLB.	• Development of projects hindered by reduction in FiT and ROCs • Due to budget pressure, lack spare funds for the evaluation on would enable LA to consider more projects.
Plymouth	• Salix: used to fund energy efficiency (including LED lighting) investment. • £9m of street lighting and boiler replacement on own estate • DECC: Green Deal Communities: 3m investment completed • HNDU: funding to review heat network potential for hospital • Plymouth Community Energy: LA has supported solar PV investment on schools, community buildings and derelict land.	• Interested in improving electricity grid storage capacity but relationship with DNO is not good.	• HNDU performs well in providing support and guidance, as well as funding. • Need development capacity in form of funding and personnel.

City/Region	What has local authority done to date?	What low carbon infrastructure would the LA like to support?	What models of support are best in class and what sort of support would you like to see?
Swansea	• New homes scheme to Passivhaus standard • Local partnerships • Community energy scheme • Wider solar PV installations on new build and retrofit • All street lighting shifted to LED • Other opportunities being considered as part of strategy including REFIT • Partner in EU funded FINERPOL project which aims to increase the rate of energy efficiency refurbishment in buildingst	• Considering setting up an ESCO	

Swindon	• HNDU: funding to produce heat mapping/master planning studies on two large urban extensions and a technical/economic feasibility study for a heat network on a leisure complex
	• Have funded (part-Council, part community) two 5MW solar farms.
	• A third solar farm will supply power by private wire to a local business. Have applied for ERDF funding for battery storage and a smart grid system to this facility.
	• Used Abundance investment platform to raise £4.2m for solar PV investment
		• With Swindon and Wiltshire LEP has signed up to the EC partnered Fuel Cell Hydrogen Joint Undertaking
		• Council has committed to a target of 200MW of renewable energy generated by 2020
		• Considering setting up an ESCO
		• Will consider investing in
		  • Heat networks
		  • Rooftop and ground mounted solar PV
		  • Support for hydrogen technologies
			• HNDU: have found account management and support very helpful
			• Project development unit would help build robust business cases
			• Recent increased dialogue with Government has been of great use and we have had welcome opportunity to feed back in terms of enabling policy, e.g. encouraging DNOs to cooperate with each other/act in a cohesive manner in terms of grid connections, fees and time planning

Appendix 3: Challenge Session Participants

Challenge sessions held on the 27th February and 27th March 2017

Energy Technologies Institute

E3G

Stoke City Council

Edinburgh University

Suffolk county Council

Ameresco

Engie

UK100

Energy 4 London

IPPR

Green Investment Bank

PWC

Your Homes Newcastle

Sustainable Development Capital Limited

C40

Scottish Futures Trust

Stephen Cirell

Imperial College Grantham Institute

Note: One or two representatives were not able to attend both sessions or were part time.

Appendix 4: Challenge Session Findings

What do cities need to accelerate progress?

Long-term commitment and certainty.

- Waiting for next round of government funding holds back investment (confidence and attitudes towards risk in LAs)
- Start/stop programmes damage industry & investor confidence.

Desire for consistency across electoral cycles (establish political consensus)

Currently fighting subsidies with subsidies.

We can achieve much more if we can create integrated systems.

- The more clean energy actions are linked together, the more benefits are visible (including savings/returns)
- E.g. waste and energy industries' infrastructure (Peterborough)
- Government support for specific technology solutions has undermined ability of LAs to produce integrated (holistic) plans.

Local Authority culture constrains investment.

- Strategy and vision documents but less strong on delivery plans.
- Need for better understanding of risk and technology.
- Regulation can encourage delivery action (building standards)

We can learn from the US experience.

- Federal funding only available for states which prove they've exhausted all other possibilities.
- Standardised contracting has accelerated investment.

Effective knowledge sharing can help accelerate investment.

- Open sourced learning to reduce supply chain costs.
- NHS collaboration programme is an interesting precedent.

Investment at scale needs revenue streams to attract private capital

- Need to create new business models to generate this.
- LAs have access to a range of funding sources to support investment: need to be creative in pulling them together.
- High quality pipelines will attract private capital interest.
- Keep it simple.

Observations

- Programmes have been designed to cover individual market failures (e.g. development capacity, or capital cost finance) but
- Do they address the range of market failures which prevent good concepts from becoming real projects?
- Involve different combinations of public and private capabilities.
- Public sector is constrained by:
  - Competing priorities.
  - Not core business (currently).
  - Public accountability.
  - Cumbersome/politicised decision making process can reduce ability to make things happen fast.
  - In times of substantial budget constraint there may be more focus on securing the money, not the outcomes.
  - Local public sector governance is patchy.
  - Central government may perceive risk in giving localities too much money/autonomy.

Further insights from this process are:

Local leaders should only ask for support when all the easiest actions have been completed.

- Local authorities are able to make some advances without the need for central government support or interference.

Successful authorities are clear about the purpose of their investment.

- Local leaders have a wide range of demands on their resources, so focus is essential. Clean energy projects can meet a range of needs: keeping bills down, creating jobs, and/or tackling social needs like poor health or fuel poverty. Being clear about how the projects will meet their purpose ensures investments are more likely to be successful:
- Any ask should come after the strategy and plan is agreed.

With technical assistance, especially development expertise, cities and local authorities would be able to meet local and national ambition. Dedicated resource in each local authority is difficult if not impossible with current constrained budgets. They need:

- Capability to take a project from concept through business case to procurement.
- Support to pull together complex and not easily monetisable propositions.
- Access to expert advice at reasonable cost.
- A critical friend to address confidence to proceed.

Cities would benefit from devolved powers to encourage optimal local energy infrastructure investment.

- Cities and local authorities have not been allowed to master plan energy, unlike health and social care.
- The Scottish Government is considering whether to require local authorities to develop heat and energy efficiency strategies.
- An increase in energy-related statutory powers of local authorities would enable greater action, such as being able to require developers to connect to district heating networks.

Government has the potential to be an ally in transforming our energy infrastructure. The current policy framework has strengths and weaknesses.

- The focus on power is welcome, as is the acknowledgement that heat requires more action.
- The policy framework needs to link transport with energy.
- There are opportunities for DNOs and local authorities to work better together to overcome the energy challenges in local areas.

Appendix 5: Examples of Clean Energy Support Programmes Targeted at Local Authorities

Initiatives	Key Features
EU • ELENA, IEE, Horizon 2020 • ERDF and JESSICA funds • EIB	• Support for project/programme development based on competition • Funding (subject to 3rd party match) for capital development • EIB funding for £50m+ programmes based on LA covenant
BEIS • Heat Network Development Unit • Heat Network Investment Programme.	• Supports development of DH projects in England and Wales • Dissemination of best practice • £300m allocation to provide mix of grant and 'patient' loan finance
Green Investment Bank	• Loan capital priced at a slight premium to PWLB, focus on street lighting
The Carbon & Energy Fund	• UK procurement framework for CHP focus on public sector building retrofit
Salix	• 0% interest 5-8 year loans to public bodies for building retrofit energy efficiency • programme funded by BEIS
Local Partnerships: Re:Fit programme	• Support for Energy Performance contract based public sector building retrofit
Scotland Low Carbon Infrastructure Transition Programme	• Supports development of business cases to help Secure public & private finance. • • Collates evidence on recurring barriers and challenges to projects • Shares this intelligence with investment communities
Scottish Futures Trust	• Street lighting toolkit for local authorities • District heating programme
Green Growth Wales	• Street lighting toolkit for local authorities • District heating programme • ELENA funded support programme to help develop low carbon projects • Circa £14m Salix equivalent fund
London • Project Development Unit • London Energy Efficiency Fund/ MEEF	• ELENA funded project development unit for district heating and energy efficiency retrofit • ERDF JESSICA fund providing competitively priced loan capital for public sector energy efficiency retrofit & district heating (LEEF) • Mayor's Energy Efficiency Fund (LEEF successor) has specific technical assistance facility
GM Low Carbon PDU	• Originated as JV with GIB to develop low carbon projects in GM area • Now funded by ELENA, with heavy focus on district heating
Oxford Low Carbon Hub	• Used Abundance investment platform to raise £4.2m for solar PV investment