



Local Authorities and Energy **Building a Fairer Low Carbon Energy System**

October 2016

Introduction

Local Authorities across the Globe are showing an increasing interest in energy. In June 2016 the Global Covenant of Mayors for Climate & Energy, which represents more than 7,100 cities, and more than 600 million people, agreed to work together in an unprecedented alliance to tackle climate change. Michael Bloomberg, Mayor of New York City, writing in the *Guardian*, said:

“One of the best steps national governments can take to fight climate change is to empower their cities with the tools and autonomy they need to act.” (1)

The Global Covenant Mission Statement says the cities participating in this initiative commit to targets that will eventually be more ambitious than those their respective national governments presented in Paris. (2)

Here in the UK the Association for Public Service Excellence (APSE) is co-ordinating local authority collaboration to maximise the opportunities for local authorities to work together on the green energy agenda. The motivation for local authorities getting involved in energy is wider than just the need to reduce greenhouse gas emissions. As large consumers of energy themselves high energy prices have been having a big impact on council budgets. By generating their own energy or reducing consumption or encouraging community projects to generate energy and reduce consumption, they can bolster the local economy and generate revenue at a time of severe budget constraints. Decentralised energy and energy efficiency projects allow them to bring money into the local economy by making the most of grants and financial support available. And Councils want to assist residents suffering from fuel poverty. If low income families spend less on energy, they will have more money to spend in the local community.

Many local authorities have been developing ambitious projects ranging from energy efficiency schemes and generating their own electricity to setting up heat networks and even setting up their own energy supply companies. These innovative local energy initiatives present a challenge to the existing UK energy framework dominated by the Big Six energy companies and large centralised power stations. They also present us with an opportunity to move to a more democratic, locally-controlled sustainable energy market.

This report hopes to inspire local authorities to learn from each other, prevent wheel re-inventing and speed up progress towards a low carbon local renewable energy revolution. We can learn for instance from Aberdeen's pioneering district heating scheme and Portsmouth City Council's plans to continue installing solar panels on public building despite cuts in feed-in tariffs, or Peterborough's scheme to install solar panels free of charge on homes in the City. Every Authority should know about Wolverhampton's highly efficient new schools which require hardly any energy to heat, about Shetland Island Council's plans to extract heat from the North Sea or Islington's plan to extract heat

from the London Underground and how Nottingham City Council managed to set up its own energy company which can sell electricity more cheaply than any other company in the East Midlands. Surely every councillor will want to hear about Oxford's project to provide low income households with solar electricity and batteries to store any surplus, Edinburgh's work with a local community energy co-operative to install solar panels on schools and leisure centres across the City, and Fife Council's project to fuel council refuse collection vehicles with wind generated hydrogen.

This report looks at a range of these innovative local energy initiatives to show how Britain's towns and cities are transforming efforts to create a cleaner, smarter and more affordable energy system, providing an alternative to the big utilities, and boosting their local economies in the process. (3) We look at a range of different energy initiatives being carried out by local authorities around the country. The list – in alphabetic order – is not meant to be exhaustive, but hopefully it will inspire others to set up projects of their own. If local authorities can learn from each other, rather than starting from scratch, it will avoid common pitfalls and speed up progress towards a low carbon local renewable energy revolution.

To keep up with news about the local energy revolution as it happens see here: <http://www.microgenscotland.org.uk/news/> and subscribe to our weekly news e-mail here: <http://www.microgenscotland.org.uk/maillist/?p=subscribe>

Aberdeen City Council

Municipal Energy Company planned; district heating network already started

Aberdeen City Council has just agreed to set up an arms-length company to manage all of the city's energy-related activity, including investing in community clean energy projects and tackling fuel poverty. A detailed business plan for the new energy company is being developed. The proposed Energy Services Company (ESCo) would be an arms-length external organisation wholly owned by the authority. (4) The ESCo could be involved in the generation, transmission, distribution and supply of energy but also supporting services such as energy efficiency, energy savings, renewable/sustainable energy and/or emission reductions. (5)

The ESCo will help the Council implement its Sustainable Energy Action Plan (SEAP), which was approved in May 2016. (6) The Plan outlines the City's aspirations to reduce CO₂ emissions by 50% by 2030. Some highlights include:

- A promise of support for co-operative and community led projects to ensure that citizens have a greater role in their own environment, finances, health and wellbeing.
- Carrying out a feasibility study on the use of a water source heat pump for Aberdeen's heat network which is currently supplied by a gas combined heat and power plant.
- A plan by the City Council to work closely with neighbouring local authorities including Aberdeenshire, Angus and Moray Council's to develop a joint SEAP for North East Scotland.
- A promise to increase renewable energy power generation and procurement including potential solar farms and offshore wind installations, expanding the district heat network and installing digital infrastructure and virtual networks.
- In March 2015 a Hydrogen Strategy for the Aberdeen City Region 2015-2025 was published. (7) *H2 Aberdeen* is an initiative working to bring about a hydrogen economy in the Aberdeen City Region. This work is helping to reinforce the area's position as an energy city, now and in the future. Hydrogen, as an energy storage medium, offers an opportunity to maximise the capacity of renewable energy. This is a detailed 10 year strategy outlining the key actions

required to ensure Aberdeen remains at the forefront of hydrogen technology. So far the strategy has delivered a state-of-the-art hydrogen production and bus refuelling station and 10 hydrogen fuel cell buses, Europe's largest fleet.

An important element of the business planning process will be to establish the role of the existing arms length company – Aberdeen Heat and Power (AHP) which already exists as an ESCo to manage specific energy services associated with developing heat networks. (8)

Aberdeen Heat and Power (AHP) Ltd has grown substantially since it was set up as a not-for-profit company by the City Council in 2002. The company now supplies 2,361 flats in 33 multi-story blocks and two sheltered housing blocks and 13 public buildings. The Company continues to develop the District Heating network and in 2013 commissioned a £1m extension of underground mains towards the City Centre and has since connected the Council's Town House and four other public buildings en-route.

AHP has recently installed gas-fired communal heating systems in six stand-alone blocks on behalf of Aberdeen City Council, which can later be linked to the wider district heating network.

At the end of 2013 District Energy Aberdeen Ltd (DEAL) was established as a wholly owned subsidiary of AHP to enable commercial customers to be connected into the heat network. This is a profit making company, from which future profits will be transferred back to the parent company to help offset more of the capital costs of developments to achieve affordable heat pricing and further the aims of reducing fuel poverty. (9)

In July 2016 it was announced that AHP's £11 million investment plan was unanimously backed by councillors to expand the heat network into the south of the city. The combined heat and power scheme is expected to deliver low cost, low carbon energy to at least 350 homes in Torry as well as a primary school, swimming pool, community centre and various commercial properties in the East Tullos Industrial estate. (10)

Bristol City Council

One of the UK's first municipal energy supply companies; Council grants for community energy.

Bristol Energy is one of the UK's first new municipal electricity and gas supply companies. It is wholly owned by Bristol City Council. The Company aims to provide an innovative way to support Bristol City Council in its economic, social and environmental goals and make a positive impact on the city, and its customers.

Fully open since early 2016, the company aims not just to supply energy at competitive prices – it reckons its tariffs can save customers an average of £250 a year – but to invest in community-based renewable generation and ultimately in renewable heat supply as well. Bristol Energy forecasts a 12% return on the council's investment after five years, rising to 35% after 10, with money reinvested for social good. Bristol Energy aims to support locally generated renewables by increasing the amount of renewable energy it can purchase through Power Purchase Agreements (PPAs) (11)

The council's Energy Service carries out a broad range of activities such as Warm Up Bristol - an initiative designed to make the private housing stock in Bristol energy efficient; Infrastructure projects which will improve Bristol's energy security by installing heat and energy networks to supply more efficient and lower carbon heat and power to the city; Investment projects responsible for renewable energy installations and community energy projects which help local people and businesses to invest in clean energy like solar power.

Bristol City Council has established a Community Energy Fund which provides grant funding to community energy projects across the city. Community and equality-led groups can access grant funding of up to £10,000 to support their projects in Bristol. (12)

The Council has its own 1.8MW solar farm in Avonmouth which can generate enough clean energy to power over 4,000 homes. (13)

Bristol City Council has also partnered with Bristol Energy Co-operative (BEC) to deliver some innovative local projects, and supported the Co-operative's local share offers. The Council has been able to offer its own corporate and community roof-space to enable the delivery of solar projects, and it has made a large commercial investment in the co-op's recent project the Lawrence Weston Solar Array – a 4.2MWp solar farm built by solarcentury. (14)

Ceredigion County Council

A plethora of carbon saving projects

Ceredigion County Council's Carbon Management Plan (CMP) contains the Council's strategy for reducing its carbon emissions by at least 15% from 2011/12 to 2016/17 including a register of projects which could be implemented during the five-year period. The plan's second annual review was presented to the Council in December 2015.

The Plascrug Renewable Energy Centre was built in 2009 to supply space heating and domestic hot water to Ceredigion County Council (Canolfan Rheidol) and Welsh Government buildings. The installation of the 1.2MW biomass boiler and pipework for the district heating scheme, together with office rationalisation and Ceredigion County Council's move to the new Canolfan Rheidol building in Aberystwyth has already reduced carbon emissions. (15) Phase 2, which was implemented during 2014/15, extended the district heating system to provide heating for Plascrug Leisure Centre and Ysgol Gyfun Penweddig Secondary School. This installation is expected to attract an annual Renewable Heat Incentive (RHI) income in the region of £95,000. (16)

PV panels were installed on Council offices at Penmorfa (49kW) and Minaeron (26kW) at the end of March 2015. These schemes are expected to provide an annual combined Feed in Tariff income of approximately £7,500 per year. These schemes build on earlier PV installations on several schools in the County.

Ceredigion was one of only two Local Authorities in Wales selected to host a demonstration project supported by the Welsh European Funding Office. A Transpired Solar Collector has been installed on the roof of the Ysgol Bro Pedr school in Lampeter. This heats air before directing it into the building. The system is expected to reduce Gas heating costs at the site by approximately £2,000 per year. (17)

Emissions of carbon dioxide generated by street-lighting have been reduced by 52.63% since 2007/08. This is a significant achievement and has provided significant cost savings to the Authority. This is as a result of a programme of introducing low energy street lights, new photocell controls, electronic control gear and LEDs. Dimming equipment is used in some areas between midnight and 5am. (18)

Cheshire East Council

A bold energy vision including plans for a geothermal heat network

Cheshire East Council's Energy Vision is a bold vision to ensure that three goals are achieved locally – making energy affordable; developing a local energy economy and securing decentralised and locally managed energy services. The Council is developing plans to establish "Fairer Power" as a local energy supply company which can deliver affordable energy and help tackle fuel poverty. The

Authority's Energy Framework recognises that Councils are increasingly becoming involved in low carbon and energy-related projects, delivering savings to help reduce the cost of local government and new income streams to support local investment priorities and stimulate growth and resilience in the local economy. To deliver the Council's energy aspirations, a wholly owned company, Cheshire East Energy Ltd (CEE Ltd) has been established. The company will develop projects and carry out certain functions directly as well as developing a range of separate partnerships and joint ventures. (19)

Crewe, one of the two major towns in Cheshire East (the other being Macclesfield), is one of only six areas in the UK that have been identified by the British Geological Survey as having the potential to exploit deep geothermal energy. This heat in the Cheshire Basin is stored in a hot sedimentary aquifer at depths of up to 5km and offers a potential low carbon heat source. Crewe has been identified as a location with sufficient heat demand to utilise a heat network served by geothermal energy although electricity generation is not thought to be commercially feasible at this stage.

In 2010 the Council put forward a vision of a step change in local production of energy from renewable sources, and began to explore routes that could be taken to deliver innovative and stable renewable energy within the Borough. In May 2013 the Council commissioned Arup to undertake a Review of Geothermal Potential in Cheshire East to inform the business case development. In January 2014 the Council secured £198,000 of grant funding from the Heat Network Delivery Unit (HNDU) within DECC to commission a first phase of feasibility work to explore the potential for deep geothermal in Crewe.

In January 2015 the Council's Energy Framework identified geothermal energy as a significant opportunity to help deliver affordable, sustainable and decentralised energy sources. Heat mapping has identified a potential heat demand of 76 GWh/a in Crewe which could be met by the development of a geothermal heat network in the long term.

As part of its ambitions to deliver deep geothermal in Cheshire East, the Council is also working to identify opportunities for decentralised district heating networks across the Borough. (20)

Comhairle nan Eilean Siar

Establishing Hebrides Energy to tackle the highest levels of fuel poverty in the UK

In January 2015, Western Isles Council appointed consultants MAR (Scotland) Ltd to help set up the Outer Hebrides Energy Supply Company. The project is designed to help lower energy costs in the Outer Hebrides, where households experience the highest levels of fuel poverty in the UK. The Outer Hebrides Energy Supply Company will be a standalone entity.

Initially it is expected that the company will partner with a licensed UK electricity supplier to offer a community tariff to residents in the Outer Hebrides, offering competitive electricity prices to island consumers. But in the longer term it is envisaged that the energy supply company could emerge as a licensed supplier in its own right, particularly should opportunities emerge to invest in and access local renewable generation, either from the commercial or community sectors. The development of the Outer Hebrides Energy Supply Company received funding through the Scottish Government's CARES Infrastructure and Innovation fund. (21)

In March 2016 it was reported that the Council had facilitated the establishment of 'Hebrides Energy', an independent energy supply company comprising representation from Hebrides Housing Partnership, Tighean Innse Gall, The Stornoway Trust, Community Energy Scotland and the Comhairle. The planned bespoke 'Hebrides Energy' electricity tariff is expected to be launched during the second half of 2016. Meanwhile, Hebrides Energy is working with a partner to prioritise the early rollout of Smart Meters in the Western Isles. These devices will allow consumers to view

their real time electricity consumption in pounds and pence and will put an end to estimated bills and associated over charging.

Alasdair Macleod, Chair of Hebrides Energy, said "... by the time the National Grid Interconnector comes to the Western Isles, Hebrides Energy will have the experience and the track record to start investing in its own, on-island renewable electricity at as near cost as we can, passing on substantial savings to our established island customer base and making a real impact on unacceptable fuel poverty levels". (22)

It had been hoped that the cheaper Island Tariff would have been launched in early 2016 but it has been a complex process and a new type of partnership for both the council and the unnamed electricity supply company, so some elements of working out the relationship are taking longer than anticipated. The "white label" partnership with a commercial operator will allow Hebrides Energy to gain valuable experience of operating in the energy market. It will eventually seek to secure its own licence and look at opportunities to make savings by directly investing in windfarms. In the longer term, the Comhairle intends to negotiate agreements with a raft of community wind turbine operators and the commercial operator of the planned large Stornoway wind farm - to buy and resell electricity generated on local moors to island customers. (23)

Meanwhile, Tighean Innse Gall, the local Housing Agency for the Outer Hebrides, is working with community windfarm charity Point and Sandwick Trust on a five-year project to convert the whole peninsula to energy-efficient lighting. The LED Energy Communities project has been working on replacing the lightbulbs in houses. Each household can receive up to 14 LED bulbs free of charge funded by the Point and Sandwick Trust. At about £6 each, that is a gift of about £84 which should cut yearly bills by around 10%. (24)

Edinburgh City Council

Establishing an Energy Service Company; supporting community energy

The City Edinburgh Council's (CEC's) Sustainable Energy Action Plan (25) envisaged the establishment of an Energy Service Company (ESCO) to be called Energy for Edinburgh (EfE) as the main delivery vehicle for a number of major projects. Councillors have now approved the setting up of a Board of Directors. EfE will be a strategic structure wholly owned by the Council which will oversee energy initiatives across the city. It will be key to driving forward energy projects and in particular focusing on developing the scale of projects necessary to achieve considerable carbon reduction. It is expected to be delivering on a number of major initiatives by 2020. (26)

EfE will have five key objectives:

- reduce carbon emissions;
- deliver affordable energy (with a particular focus on alleviating fuel poverty);
- generate income;
- encourage wider community benefits; and
- access and leverage the use of private sector finance where appropriate and where its use meets the above objectives.

Officials from CEC gave a progress report to councillors on 6th March 2016 on plans to set up EfE. Draft legal documents and a draft Business Plan were presented.

The report said work has been underway to identify projects across three areas: energy efficiency, district heating and renewables. A number of these are currently at the Investment Grade stage with

others about to be progressed past feasibility. A project manager will be recruited who will oversee day to day operations for the new company.

The projects are summarised as follows:

Solar Photovoltaic (PV): A feasibility study currently underway focusing on the large scale application of PV canopies at Park and Ride sites across the city, as well as developing solar farms on unused Council land or former landfill sites. The aim is to maximise value from CEC owned assets and generate income and green electricity for CEC. This will allow the above options to be fully appraised within a business case and determine which approach would be best for EfE to adopt.



Solar Car Port Sydney Market, New South Wales.

District Heating: Two investment grade business cases are underway exploring the feasibility of district heating schemes at the Edinburgh BioQuarter (Gas CHP generation) and Saughton Park (ground source heat pumps). Liaison has also taken place with EDI (the Council's Property Development Company) on their plans to deliver a district heating scheme at Fountainbridge and what role the Council ESCo might play.

Non Domestic Energy Efficiency: EfE will develop a major energy retrofit programme for non domestic buildings to be rolled out city wide; working with the largest employers to set targets for energy reduction; working with Commercial Property owners to reduce carbon.

Community Energy: CEC has already supported the establishment of Edinburgh Community Solar Co-operative which has almost completed the installation of around 1.5MW of solar panels on 24 council-owned schools and leisure centres. (27)

Exeter City Council

An early adopter of the Passivhaus standard for energy efficient buildings

Exeter City Council has been an early adopter of what is known as the Passivhaus standard for energy efficient buildings. Passivhaus or 'Passive House' is the fastest growing energy performance standard in the world with 30,000 buildings constructed so far, mostly since the turn of the century. The Passivhaus standard is basically a relatively simple approach which involves excellent thermal performance, exceptional air tightness and mechanical ventilation with heat recovery. (For a 90 second video explaining the Passivhaus see here: <http://www.passipedia.org>)

These three elements allow the designer to minimise heating demand, so that, for instance and in some residential buildings all that is required is a heated towel rail to keep the building warm. This

heat can then be recovered and circulated by a Mechanical Ventilation and Heat Recovery (MVHR) unit. The low heating demand of Passivhaus Buildings of less than 15kWh per square metre per year means that annual fuel costs are reduced by a factor of 5-10. For example a household living in a 70m² Passivhaus with gas heating could spend as little as £25 per year on space heating. (28)

Exeter City Council pioneered building to the standard in 2009. Since then the Council has delivered five different housing developments across the City – all council stock. Currently a 27 Passivhaus development is being built. In September the Council will start on its first development for older people with care needs of 53 homes and a Passivhaus standard leisure centre and bus station is in the design stage.

Fife Council

Pioneering renewable-derived Hydrogen-powered council vehicles; and generating income from wind.

Fife Council's Energy Programme consists of four clusters of work which are: energy efficiency; wind; other renewables and district heat.

Projects include a district heat network which is already operational in Dunfermline. An average of 75% of the heat consumed annually by the properties connected to the network comes from the low-carbon waste heat recovered from landfill gas, and an anaerobic digestion plant. In 2013/14 staff worked closely with Scottish Futures Trust and NHS Fife on the technical, financial and legal feasibility to extend the existing network to Queen Margaret Hospital. (29)

The Levenmouth Community Energy Project

Based at the Hydrogen Office in Methil's Fife Energy Park and run by Bright Green Hydrogen, the Levenmouth Community Energy Project includes Fife Council, Toshiba, Leven Valley Development Trust, Fife College, BOC, Green Business Fife, Community Energy Scotland and the Scottish Hydrogen and Fuel Cell Association.

The project has received a £4 million funding package from the Scottish Government's Local Energy Challenge Fund. It is a pioneering industry development aimed at shaping the future prosperity of Levenmouth communities through a number of green hydrogen projects which aim to be the world's foremost demonstrator of innovative applications of hydrogen derived from renewable sources.

This includes Levenmouth becoming the home of Europe's largest fleet of hydrogen dual-fuel vehicles (25) including Ford Transits (10), Renault Kangoo vans (10), and refuse collection vehicles (2). Hydrogen refuelling is to be installed at both the Hydrogen Office and at the Fife Council vehicle depot at Bankhead in Glenrothes.

Hydrogen will be stored at the Methil site and reconverted to electricity at times when onsite wind and solar generation is low. This will help offset the intermittency of renewable generation and as a result, improve the business park's ability to be energy self-sufficient. Such an approach will also demonstrate how more renewable energy can be connected to the grid nationally by alleviating the network export constraints that are becoming all too common in areas such as Scotland in times of peak renewable generation.

The visionary project, which would position Levenmouth at the heart of the next generation of clean energy evolution, may also power part of the heating of Leven swimming pool by hydrogen produced at the Hydrogen Office. This would not only bring economic benefits to the area but is widely considered as a valuable demonstration of how hydrogen can decarbonise heating applications in Scotland and help secure future energy supplies for generations to come. (30)

Council Turbine

In July 2016 Fife Council switched on its first commercial-scale wind turbine which it hopes will generate £100,000 a year. The £1.3 million turbine at the council's recycling and resource recovery facility near Ladybank is the latest in a series of renewable energy generation projects that Fife Council has undertaken. It also generates electricity from garden and food waste using an anaerobic digester and from landfill gas as well as solar photovoltaic panels at a number of locations. (31)

Forest Heath District Council

Buying ready-made solar farm to generate income

Forest Heath District Council has bought a 12.5MW solar farm for £14.5 million. The council says the solar farm, which began generating power in June, will bring in £300,000 in the first year from renewables subsidies, even after the capital outlay has been recouped. This is expected to rise to just over £700,000 per year after a decade, bringing in millions for the council over the 25 year project. Cllr Stephen Edwards, Forest Heath's cabinet member for resources and performance, said: "*The way councils are financed is changing – our main government grant will be scrapped by around 2020 and council tax doesn't cover as much as people think. This means we have to look at new ways of investing to make money to pay for services.*" (32)

Glasgow City Council

An Energy Service Company with a vision of a transformed energy economy to low carbon decentralised energy; pioneering the use of geothermal heat from underground mine workings.

Glasgow City Council is in the process of setting up an Energy Service Company which will oversee the creation of renewables and low carbon projects in the city. The Council has been mapping derelict and vacant land to determine which sites would be best suited for use as mini-solar farms – either by the council or for community-owned projects. The ESCO would be able to reinvest profits from power generation on improving building insulation and reducing fuel poverty. The proposal is to design either a community-owned company or social enterprise based in the city, which would take on land, often gifted, and then collectively raise finance to build power installation to generate power.

Glasgow's Energy and Carbon Masterplan (ECM) (33) sets out a vision of a transformed energy economy based on low carbon and increasingly de-centralised energy sources better able to meet Glasgow's energy needs and help tackle climate change. In order to meet this vision the City needs to use energy more efficiently, generate more of the electricity consumed locally from low and zero carbon sources, and look at other ways of heating homes - which accounts for over half of the energy consumed.

This can be facilitated through the expansion of wind energy, solar photovoltaic, geothermal energy, and energy recovery from waste. Some of the main proposals set out in the Plan are:

-
- Development of a number of co-ordinated district heating schemes in the city –expanding out from installed schemes and covering a mixture of commercial and residential premises within specified zones identified in the Local Development Plan.
 - Phasing out coal, oil and older inefficient electric heating in Glasgow City Council buildings and housing across the city.

- Seeking to facilitate improved energy efficiency and energy management systems across all sectors but particularly in residential housing.
- Roll out of LED lighting across the city.
- Further expansion of waste to energy schemes including greater use of food waste and anaerobic digestion.
- Further promotion of the use of electric vehicles and cycling as a key mode of transport, replacing the use of petrol and diesel vehicles.
- Lowering the carbon intensity of electricity consumed in Glasgow by promoting further expansion of low and zero carbon energy generation

District Heating

The council is keen to facilitate and encourage combined heat and power and district heating systems and to work towards improving the energy efficiency of, and reducing fuel costs for homes in the city. District heating is one of the key ways to tackle fuel poverty. Targeting those homes that are in more deprived communities, heated using inefficient electrical resistance heating, or solid fuels, and which are therefore more likely to suffer from fuel poverty is a priority for this plan. Replacement of electrical resistance heating is seen as a key action to address this issue.

This plan presents proposals for more extensive district heating networks in key areas of the city and is supported by the proposed City Development Plan (CDP) which outlines the areas that district heating is expected to be deployed by the new Energy Services Company (ESCo). The CDP has supportive policies for district heating including a rule that all proposed new developments in an operational district heating zone must obtain their heat from the district heating system or be capable of easy future connection to the district heating system when district heating is available.

District heating can be fuelled from a number of different low carbon and renewable sources. In an optimised scenario, a district heating network should make use of any, and all, sources of heat that are available and can be feasibly connected to the network. For example, a network could make use of heat from gas fired CHP heat derived from waste disposal, through anaerobic digestion, at a waste to energy plant such as Polmadie; or through heat captured from trapped water in flooded mine workings via heat pumps; or heat captured from industrial processes within the vicinity of the network.

There are a number of schemes currently in operation in the city and further schemes currently at different stages of development. The Glasgow 2014 Commonwealth Games Athletes Village is heated by a district heating network providing heat to over 700 homes, a 120 bed care home and the Emirates Arena and Velodrome.

A proposed North Glasgow and City Centre North district heating strategy could take 4,500 homes out of fuel poverty. Work has also begun on the University of Strathclyde (UoS) district heating network which could also supply heat to the Glasgow Housing Association (GHA) owned housing in the Townhead area of the city and perhaps the Glasgow City Chambers complex. District heating has replaced electric heating in one of the blocks (98 homes) at Ibroxholm Oval. The Wyndford housing estate, owned by Cube Housing Association, has the largest (1700 homes connected) existing district heating network in Glasgow. The University of Glasgow is proceeding with a campus development programme. In addition Glasgow City Council is looking at two schemes in Polmadie and Ballater Street which would together provide heat to 1000 homes and 30 businesses.

Geological studies are helping to identify which parts of the city would offer the best prospects of supplying geothermal energy, perhaps in conjunction with heat pumps, and looking at the potential heat within minewaters. One small housing estate – Glenalmond Street in the East End – already uses geothermal energy from underground mine workings and residents have heating bills of around £160 per year, as compared to £660 for an average Scottish family. British Geological Survey estimate that potentially up to 40% of the city’s heat could be provided in this way either from abandoned mines or bedrock aquifers.

The proposed ESCo would support the roll out of district heating schemes in the city.

Greater London Authority

The first local authority to hold a special ‘licence lite’ to supply electricity

Ofgem, has confirmed that the London Mayor, Sadiq Khan can formally advertise his application for a new type of junior electricity supply licence called ‘licence lite’, with the aim of the licence being granted soon. City Hall will then become the first local authority in the UK to hold a special ‘licence lite’ that will allow it to buy energy from small, low and zero carbon energy generators, and sell it directly to the public sector to help meet the sector’s electricity needs.

The ‘Licence Lite’ will allow the Greater London Authority (GLA) to buy clean electricity from a generator panel including five London boroughs, social housing provider Peabody and energy companies Scottish & Southern Energy and Vital Energy. The Mayor will then aim to supply it, also at a competitive rate, to help power escalators and ventilation systems in tube stations, offices and other facilities. By providing energy generators with a better price for their electricity this new scheme could help London generate more of its own energy in a much cleaner way, creating £300m of additional investment by 2021, 1,650 short term construction jobs and 160 permanent jobs in operating the low carbon centres and networks. The Mayor’s Energy for Londoners scheme will also expand the use of solar power across the city, and support communities who want to set up their own green energy generation schemes. (34)

During the Mayoral election campaign Sadiq Khan pledged to establish a municipal energy company, Energy for Londoners, similar to the not-for-profit companies already established in Nottingham and Bristol – but much larger, and more ambitious. He said:

“It will expand the use of solar across the city, and support communities who want to set up their own green energy generation schemes. And it will roll out schemes like the Bunhill Energy Centre [See Islington] that take waste heat from the tube and make the most of buildings across the city to generate energy from solar.” (35)

Havering London Borough Council

Building solar farms to generate income

Havering London Borough Council has put forward plans to build two solar projects – a 6MW farm at a former landfill site at Gerpins Lane and a 9.5MW project on scrub land at Dagnam Park. The council intends to fund the proposed solar parks using its own capital budget reserves. However, it is also looking at the potential to release a portion of the capital cost to the public to allow residents to invest directly in the solar parks alongside the council. Some of the income could be used to fund local community projects. In total nine of the council’s buildings now have solar panels, generating more than 450kW of energy and saving the council over £2 million over the next 25 years through smaller energy bills and income from generating electricity. (36)

Islington London Borough Council

A leader in district heating; capturing waste heat from the London Underground

Bunhill Energy Centre is connected to a district wide heat network in Islington, London, which provides cheaper, greener heat to homes on several estates and buildings in the borough. In the same way that we use heat from a car engine to keep us warm when driving, the energy centre uses the heat created from producing electricity to help heat buildings and provide hot water. Unlike normal electricity production that wastes up to two thirds of the fuel used to make it, Bunhill Heat and Power uses the otherwise wasted heat to heat 700 homes, Ironmonger Row Baths and Finsbury Leisure Centre and therefore it is more efficient, cheaper and greener. (37)

Phase 2 of the Bunhill Heat and Power network now has planning permission to build a new energy centre. The Council, Bunhill Ward and the EU CELSIUS research project (managed by the GLA in London) agreed to fund an extension of the heat network, and provide additional heat production capacity for connected buildings. The extension will connect a further 454 homes in the area, with the potential to supply a further 1,000 homes. The existing heating pipe network will be extended so that it can capture waste heat from the tube network. (38)

The Bunhill Energy Centre is part of Islington Council's Decentralised Energy Programme which aims to cut carbon emissions and fuel bills across the borough. The programme is part of the council's efforts to meet its ambitious target of a 40% reduction in carbon emissions in the borough by 2020 and help alleviate fuel poverty. The Bunhill Energy centre and heat network will be fully owned and managed by the Council, and was funded by grants sourced from the London Development Agency and the Homes and Community Agency.

The Council's ownership and management of the scheme will help to maximise benefits for the local community and energy bill savings for residents. Islington has won praise for being one of the most pioneering authorities in the country on combating climate change and addressing fuel poverty.

Kirklees Council

Building houses to the Passivhaus standard

Kirklees Council, which had the first ever universally free insulation scheme which insulated over 50,000 homes with cavity wall and loft insulation has approved a budget of £1.1m for the additional cost of taking a project to build around 30 houses up to Passivhaus standard (See Exeter City Council) The Council has also established a Passivhaus task group to look at the standard to see what can be done. The Council is currently going through the production of its local plan which envisages 20,000 new homes by 2031. If each home saved £1,000 on fuel bills – that is £20m per year which stays in the local economy that wouldn't otherwise have done so. (39)

Leeds City Council

Setting up a 'White Label' energy company in partnership with Robin Hood Energy

Leeds City Council has set up White Rose Energy in partnership with Robin Hood Energy, a not-for-profit energy company that the council has elected to endorse, through a competitive process. It is driven by the same social motive, which is to provide low cost energy to all households, with pricing that's fair and transparent. (40)

Luton Borough Council

Biomass boilers to power council buildings

E7 Building services installed all the heating and plumbing services throughout the Stockwood Discovery Centre, a museum and period garden run by Luton Borough Council. This included a biomass boiler with gas boiler back up. The project also involved a number of other forms of modern technologies, including passive ventilation systems, solar panels for hot water recovery and biomass wood pellet boilers, to produce the heat load to underfloor heating throughout. (41)

Manchester (Greater Manchester Combined Authority)

Energy service company opportunities and developing district heating networks

The Greater Manchester Combined Authority has a target to deliver a 48% reduction in Greater Manchester's carbon emissions by 2020 from a 1990 baseline. This will be achieved by cutting back on fossil fuels and achieving a paradigm shift in the way Greater Manchester works, lives, travels and plays. In 2011 a partnership-led GM Low Carbon Hub was established, charged with leading work to retrofit homes and workplaces, develop low-carbon skills, build renewable energy capacity and energy efficiency and help the low carbon business sector flourish and grow.

The Greater Manchester Combined Authority is investigating the potential to establish an Energy Service Company (ESCO) under the working title 'Greater Manchester Energy Company'.

In 2014, a Low Carbon Project Delivery Unit (PDU) was set up, using funding from the European Investment Bank's ELENA fund, to provide specialist support to the 10 local authorities to deliver low carbon projects across the city region. (42)

The PDU supports local authorities and key stakeholders to ensure that investable schemes are taken from feasibility through to strategic business case, project procurement, final business case, and delivery. As part of this, a number of heat network opportunities across the city region are at various stages of development. The first project for which the business case and procurement milestones have been reached is the Manchester Civic Quarter Heat (Energy) Network (CQHN).

The CQHN proposal involves, as its base scheme, a cluster of primarily Manchester City Council-owned or controlled buildings (including the Town Hall and Central Library) supplied with heat from a new central plant room at Manchester Central. The scheme will also include private wire electricity supply, and potential for significant expansion to other heat off-takers.

Detailed techno-economic feasibility studies have recently been completed for six further opportunities:

- A network at the Co-op/Hermes mixed-use NOMA development at the northern edge of Manchester City Centre;
- Development of a series of network opportunities within the Corridor area of Manchester City Centre;
- An extension of the existing tri-generation (supplying heating, cooling and power) network at MediaCity UK;
- A network in Ashton under Lyne town centre supplying heat and power to civic and commercial buildings;
- A network in Bury town centre supplying heat and power to civic and commercial buildings;
- A network in Bolton town centre supplying heat and power to civic and commercial buildings, and including assessment of the potential for supplying low carbon heat from the nearby existing Raikes Lane Energy from Waste plant.

A masterplanning study is also underway around Piccadilly Station in Manchester City Centre. Subject to the findings of the masterplanning, it is envisaged that this project will build on the precedent set by the recent Birmingham New Street redevelopment and could take the form of central heat generation plant located within Piccadilly Station generating electricity for on-site consumption at the station, with heat exported into a local heat network of high heat demand buildings.

Further masterplanning studies are also underway to identify network opportunities for Salford Central (based upon significant planned commercial and residential development in the city centre) and Trafford Park Industrial Estate (based upon existing high-energy-volume users, and large scale primary and secondary heat generation opportunities).

Additional funding has also been secured to support a masterplanning and detailed project development study for the Greater Manchester (GM) Regional Centre. The study will enable strategic planning and co-ordinated development of the portfolio of active heat network projects across Manchester, Trafford and Salford. The study will also investigate legal structures, commercial structures, governance options and funding options for a Regional-level network, and build on the work carried out to date by all of the GMCA Local Authorities.

Manchester City Council, through the PDU, is also working to support the set-up of a municipally-owned not-for-profit joint purchasing vehicle, established to provide skilled procurement services to its members. Known as the District Energy Procurement Agency (DEPA), the vehicle will support Local Authorities to procure good quality and competitively priced goods and services in the district energy market within the UK, and is based on an established model operating in Sweden (adapted to UK market conditions). The overarching aim will be to facilitate the development of the district energy market in the UK for the benefit of its members, and support the cost-effective development of the UK-wide pipeline of district energy projects.

Other achievements include:

- 160,000 boilers have been replaced in social housing developments across the city-region.
- LED street lighting conversion schemes have commenced in 7 of the 10 Councils and the other 3 Councils are developing their business cases for similar schemes.

There has been a long established culture of co-operation between the 10 local authorities in Greater Manchester on energy efficiency and low carbon projects. It is hoped that this will be enhanced by the election of a Mayor for Greater Manchester in 2017.

Merthyr Tydfil Council

Generating income via a no-cost solar PV roof-renting type scheme

Due to budget constraints options for installing renewable energy in Merthyr Tydfil were limited. The Council had looked at nine suitable Council owned buildings for larger roof mounted solar installations. In October 2012, the Estates Department met with Egnida, a Welsh renewable energy company. Egnida offered to fully fund the installation costs of a Solar PV project and carry out the maintenance of the system over the 20 year period when Feed-in Tariffs were available. Through this arrangement the council also benefits from a share of FiTs payments, export revenue and reduction in electricity costs.

Solar PV has been installed at nine different sites, a mixture of Schools, Leisure Centre, Civic Halls & Care Homes which will accrue over £300,000 of income for Merthyr Council throughout the lifetime of the installations.”

The Council has managed to create a source of income to allocate to whatever projects it chooses and in the process has the satisfaction that it is doing its bit for the low carbon economy.” (43)

Norwich City Council

Ambitious Passivhaus standard house building scheme

An ambitious house building programme by Norwich City Council is putting the Council at the forefront of the development of energy efficient homes. In January the council’s cabinet awarded the building contract for a development of ten flats built to Passivhaus standard (See Exeter City Council) This is one of the first projects to use the council’s new ‘Fabric First Framework’. Due to the specialist nature of Passivhaus construction and design, the framework brings together a group of small, medium and large contractors with the expertise necessary to carry out this type of work and assist the development of a number of Passivhaus projects. A newly-formed Regeneration Company, which is wholly owned by the council, is planning a development of 172 houses, of which 112 will be built to Passivhaus standard making it one of the largest Passivhaus schemes in the UK. A further 105 Passivhaus properties are already being planned. The three Norwich schemes together will virtually double the total number of certified Passivhaus dwellings built in the UK to date. (44)

Nottingham City Council

Leader in establishing a municipal energy company

Nottingham City Council has set up Robin Hood Energy (RHE) - the first local authority-owned electricity and gas company since the electricity industry was nationalised in 1948. It is a not-for-profit company which is fully licensed for commercial supply. Its key social objective is to tackle fuel poverty, so it is predominantly aimed at domestic customers. RHE signed up its first customer in September 2015. It is installing smart meters prioritising customers who have traditionally used prepayment meters. Since Robin Hood Energy was launched by Nottingham city council in September 2015, it has become one of the cheapest suppliers in the East Midlands. RHE is also creating local and high quality new jobs. (45)

In addition other objectives include:

- Enabling local ownership of renewable generation
- Supporting community energy projects.
- Matching local generation to local demand by using Power Purchase Agreements.
- Acting as a vehicle to assist local authorities develop municipal energy models including Energy Service Companies.

Setting up the company has been a huge and complicated process with over 146 contracts having to be signed.

Nottingham is now sharing this experience with other Local Authorities. Robin Hood Energy (RHE) is also working with a number of Councils to allow them to become a ‘white label’ supplier which means they won’t hold a supply licence, but instead will work in partnership with a licensed ‘partner supplier’ to offer tariffs under their own brand. (46) The first to take up this offer and launch is Leeds City Council, which has launched White Rose Energy – a partnership between the Council and RHE. (47) Other Councils are likely to follow such as Islington.

The Association for Public Service Excellence (APSE) has agreed to provide capacity to deal with the inquiries being received by RHE and to support those local authorities that are taking the idea

forward. They will also have a role in ensuring the RHE message gets out to all local authorities, housing associations and other public sector providers. (48)

Our Power - Scotland

An energy company run by social housing providers

Our Power is a new energy supply company established by Scottish social housing providers who want to make the energy industry work better for the residents and communities they serve. Our Power aims to reduce heat and fuel costs by passing benefits from the energy sector to communities. This is done by not paying dividends to shareholders, by finding the most efficient ways to operate, by generating our own power and by reinvesting any profits to benefit customers and communities. Our Power seeks to buy a minimum of 30% of its energy from renewable sources. (49)

Our Power entered the market at the end of 2015 as an Ofgem licenced supplier of gas and electricity. It plans to be selling heat and power to tenants in 200,000 homes across Scotland by 2020. It expects to save its members up to ten per cent on their household utility bills compared to standard commercial tariffs. Over the next five years, this could see up to £11 million of savings for households in some of the most disadvantaged communities across the country. In the future, Our Power hopes to develop renewable energy projects as part of its business for the benefit of local communities. (50) Our Power is backed by £2.5m from the Scottish government and another £1m from Social Investment Scotland. (51)

Oxford City Council

Project ERIC – a pilot energy storage scheme for low income households

Project ERIC is a pilot involving nearly 100 low-income homes and community buildings. It's a partnership led by Moixa Technology and Bioregional with Oxford Brookes University, Re-Energise, SSE PD and British Gas in partnership with Oxford City Council and social housing group Green Square.

The basic idea is simple. Deploy as many photovoltaic (PV) panels as possible on rooftops. Whenever surplus solar electricity is generated - more than the household below can use - store the surplus in compact battery pack within the home, rather than exporting it into the local electricity network. Then use it later in the day, instead of importing electricity from the grid.

Local battery storage of PV electricity reduces the requirement for nationwide fossil fuel back-up; reduces the strain on local electricity grids, which were not designed to cope with large quantities of solar-power generated on rooftops travelling 'the wrong way' up the grid; reduces peak household power exports, and curtails the need to spend money enabling the grid to cope.

It also allows local solar generators to trade their solar power locally, using a web-based platform to keep track on local supply and demand and electricity trades. So a household with a big rooftop PV array could choose to sell some surplus power to their neighbours, as well as storing the remainder. This opens up a future in which millions of households both demand and supply electricity, trading with their neighbours and consumers more widely through the national grid. These trades would be automated, and organised to ensure electricity was generated and consumed as cheaply, as efficiently and often as locally as possible - with high resilience and a minimum of greenhouse gas emissions. (52)

Oxford City Council (OCC) has provided extensive support to ERIC in the form of on-site project management, resident engagement and a capital investment which has enabled the installation of solar PV and batteries in 59 council properties and a new community centre in Rose Hill. Eight of these

homes also have state-of-the-art direct current (DC) LED lighting powered by the battery, so that even in the event of a power cut the lights will stay on. (53)

Peterborough City Council

Offering homeowners free solar panels

Empower Peterborough CIC, is a partnership between the council and Empower Community, a social enterprise. Empower Peterborough runs a scheme which offers homeowners in Peterborough the chance to have solar panels installed for free. The scheme has now reopened after recent changes to the Feed-in Tariff and is being offered to all areas of the city. The house occupant would be expected to save roughly £200 every year and will own the operating PV system at the end of the 20-year term. The wider Peterborough Community also benefits, as a percentage of the money generated will be shared equally between a Local Community Fund and Peterborough City Council. (54)

Plymouth City Council

Supporting community energy with council loans

Plymouth Energy Community (PEC) coop as an example of the kind of project that councils up and down the country should be pursuing, according to councillor Tudor Evans, leader of the Labour opposition in Plymouth "*Plymouth Energy Community is a fantastic example of what can be achieved when you put residents at the heart of the action and the vision. It's a three year old co-operative... born from one of our early manifesto pledges, and it's gone from strength to strength. Over the last three years [it] has attracted inward investment in excess of £6.5 million to Plymouth – not bad for a little neighbourhood co-op. This has led to solar installations which will save over 70,000 tonnes of CO2 over their lifetime.*" (55)

In February 2014 PEC launched its first solar share offer to fund solar installations. Plymouth City Council showed support by providing a loan of £500,000 from their Investment Fund. A further £500,000 was sought from the community. The money was used to install a combined total of 0.8MW of solar PV on 21 schools and community buildings in Plymouth.

PEC launched a second solar share offer in February 2015. Plymouth City Council again supplemented the funds raised from this Share Offer with a £500,000 loan facility. The money was used to install solar PV on more schools community buildings and businesses in Plymouth.

A third share offer was run in 2016 to raise £1,230,000 to help finance a completed 4.1MW solar array with Plymouth City Council providing 70% of the long-term finance required. (56)

Portsmouth City Council

Pioneering the use of Power Purchase Agreements to continue installing solar PV

Portsmouth City Council already has fitted 2MW of roof based solar panels which will have benefitted from higher feed-in tariffs. PV panels have been fitted at over 200 sites ranging in size from 4kW to 175kW and including several high energy using sheltered blocks, large multi-use buildings, libraries, and large and small blocks of residential flats. But Portsmouth is now proposing to carry on installing, where many other authorities have called a halt to such work, due to the FiT rates plummeting. This is far sighted and the sort of longer term thinking that is required to achieve success in the roll out of renewable energy in the public sector. Despite the business cases losing a large chunk of government subsidy, the Council has realised that a good financial return can still be achieved by taking a different route. Power purchase agreements (PPAs) with commercial tenants of

local authority owned buildings, or indeed the council simply using the electricity in the buildings it occupies itself is the answer. (57)

The Council announced in June 2016 that it was preparing to begin a substantial solar roll-out scheme worth up to £10 million which will see hopefully 2MW of PV panels installed each year on council owned buildings across the city over the next four years. (58)

The Council has already funded and project managed a 50kWp scheme on the passenger terminal at Portsmouth International Port using the latest and most efficient panels on the market. The building is already one of the most eco-friendly in Britain. The impressive glass and steel structure is heated by thermal energy from the sea, and cooled by natural coastal breezes that are captured by wind catchers on the roof. Energy efficient LED lighting helps cut power demand. Toilets are flushed with salt water, a measure that reduces the amount of ‘clean’ water supplies used. This further reducing the amount of energy used for pumping and processing. (59)

Reading Borough Council

Investigating a ‘White Label’ energy supply company

Reading Borough Council is in talks about establishing itself as a local energy supplier to tackle fuel poverty. Reading was one of the founding councils of APSE Energy, a collaboration of local authorities that seeks to bring about the municipalisation of energy. Working with APSE Energy, Reading has been in conversation with a number of other southern local authorities to consider the possibility of working together to establish a joint arrangement to supply energy locally. The Council is looking at a “white label” arrangement where several councils join up with an energy supplier to secure a certain tariff and create a locally branded supply. (60)

Shetland Islands Council

Expanding district heating network; pioneering large-scale heat pumps

Shetland Heat Energy and Power Limited (SHEAP), is a wholly owned subsidiary of the Shetland Charitable Trust, set up to operate the Lerwick District Heating Scheme. It is overseen by a Board of three Directors. Shetland Charitable Trust started life as Shetland Islands Council Charitable Trust (SICCT) in 1976 when the Sullom Voe Oil Terminal began operating. (61)

As at August 2013 1,200 properties in Shetland were connected to the District Heating network. (62) The heat used in the scheme is generated at a Waste to Energy Incinerator located on the outskirts of Lerwick. The incinerator at the Energy Recovery Plant burns domestic and commercial waste from Shetland, Orkney and from the offshore oil industry, reducing the amount of waste going to landfill.

A 200KW biomass plant operated by Northfish is now supplying heat to the network when required, and 500KW wind turbine will shortly be able to supply heat to the network too. Shetland Heat and Power has received a £1.6 million loan from the Scottish Government for a large scale sea-water source heat pump scheme in Lerwick, to allow 225 more households to join the existing heat network. (63) This could help the district heating scheme meet the urgent need for new capacity, which at peakloads exceeds the 6.3 megawatt output of the energy recovery plant run by Shetland Islands Council. The plan is to extract sea water and cool it down from around eight to four degrees, harnessing enough energy to add a further 2MW in capacity. (64)

Swindon Borough Council

First local authority to launch a solar bond; now launches a second; Council approaches 200MW renewable capacity goal

Swindon Borough Council has launched a second solar bond following the success of its first local authority led investment offer earlier this year, which closed a month early after raising almost £2 million. Approved at a council meeting on 19 October, Swindon's second solar bond will fund a new 5MW solar farm on a council-owned former landfill site at Chapel Farm in Blunsdon. The offer will be the first in the UK to allow investors to use the new Innovative Finance ISA (IFISA) to give them a tax-free return. The council is committing £3 million to the project while seeking to raise £2.4 million from the community. Investors are expected to gain a return of 6% from the offer, with revenues from the solar farm also due to make a contribution towards community initiatives. As well as providing additional funds to both the council and local residents, the Chapel Farm project will help Swindon move closer to its goal to install 200MW of renewable capacity by 2020, enough to meet the equivalent electricity requirements of every home in the Borough. Completion of the latest solar development, which is expected in spring 2017, would take the present total to 167MW, over 80% of the target. (65)

Warwickshire County Council

Biomass and solar PV installed

Warwickshire County Council has a policy of enabling the growth of renewable energy generation on its corporate estate. The Council has encountered various difficulties whilst trying to deliver renewable energy projects. Two or three biomass boilers have been installed but low gas prices make the economics difficult.

Solar PV has been easiest to install. The council has installed solar PV on 12 council properties, and it is now investigating the feasibility of a larger-scale ground-mounted system. (66)

Wolverhampton City Council

Pioneer of Passivhaus standard school construction

Wolverhampton City Council has built three schools to Passivhaus standard. (See Exeter City Council). (67)

Pete Roche October 2016

- (1) Guardian 22nd June 2016 <https://www.theguardian.com/sustainable-business/2016/jun/22/michael-bloomberg-global-covenant-links-600m-people-and-7000-cities-fight-against-climate-change>
- (2) Climate Progress 23rd June 2016 <https://thinkprogress.org/thousands-of-cities-from-six-continents-just-agreed-to-work-on-climate-change-e68e919774ae>
- (3) Reg Platt, Will Straw, Jimmy Aldridge and Jack Williams, City Energy, IPPR, July 2014, http://www.ippr.org/files/publications/pdf/city-energy_Jul2014.pdf
- (4) Business Green 19th August 2016 <http://www.businessgreen.com/bg/news/2468322/aberdeen-city-council-agrees-plans-for-new-energy-company>
- (5) Aberdeen City Council 17th August 2016 <http://news.aberdeencity.gov.uk/energy-services-company-to-be-set-up>
- (6) Powering Aberdeen, Aberdeen City Council May 2016 <http://www.aberdeencity.gov.uk/nmsruntime/saveasdialog.aspx?IID=71150&sID=25580>
- (7) Hydrogen Strategy for the Aberdeen City Region 2015-2025, March 2015 <http://www.aberdeeninvestlivevisit.co.uk/nmsruntime/saveasdialog.aspx?IID=924&sID=231>

- (8) Aberdeen City Council 17th August 2016
<http://committees.aberdeencity.gov.uk/documents/s59648/ESCo.pdf>
- (9) See <http://www.aberdeenheatandpower.co.uk/>
- (10) Scottish Energy News 4th July 2016 <http://www.scottishenergynews.com/scotlands-leading-housing-heat-network-set-to-grow-with-11-million-investment-plan/>
- (11) See <https://bristol-energy.co.uk/>
- (12) See <http://www.bristolcommunityenergy.co.uk/funding/>
- (13) See <https://www.bristol.gov.uk/policies-plans-strategies/the-energy-service>
- (14) Bristol energy Co-operative 2nd August 2016 <http://www.bristolenergy.coop/blog/clean-energy-to-make-bristol-proud-our-partners-at-bristol-city-councils-energy-service>
- (15) Ceredigion County Council Carbon Management Plan 2012/13 – 2016/17
<http://www.ceredigion.gov.uk/SiteCollectionDocuments/Your%20Council/Strategies,%20Plans%20and%20Performance/policies/carbonmanagement.pdf>
- (16) Ceredigion County Council Carbon Management Plan 2nd Annual Review December 2015
[http://www.ceredigion.gov.uk/cpl/Democratic_Services_Meetings_Public/D.%20Sustainable%20Communities%20\(Saes\).pdf](http://www.ceredigion.gov.uk/cpl/Democratic_Services_Meetings_Public/D.%20Sustainable%20Communities%20(Saes).pdf)
- (17) Ceredigion County Council 3rd March 2015
[http://www.ceredigion.gov.uk/English/Resident/News/Pages/Sustainable-Building-Envelope-Demonstration-\(SBED\)-Project.aspx](http://www.ceredigion.gov.uk/English/Resident/News/Pages/Sustainable-Building-Envelope-Demonstration-(SBED)-Project.aspx)
- (18) Ceredigion County Council Carbon Management Plan 2012/13 – 2016/17
<http://www.ceredigion.gov.uk/SiteCollectionDocuments/Your%20Council/Strategies,%20Plans%20and%20Performance/policies/carbonmanagement.pdf>
- (19) Cheshire East Energy Framework, January 2015
<http://www.cheshireeast.gov.uk/pdf/majorregenerationproject/cec-energy-framework.pdf>
- (20) See http://www.cheshireeast.gov.uk/business/major_regeneration_projects/geothermal_energy.aspx
- (21) Scottish Energy News 14th January 2015 <http://www.scottishenergynews.com/western-isles-council-to-set-up-outer-hebrides-energy-company-to-help-combat-fuel-poverty/>
- (22) Island News and Advertiser 29th March 2016 <http://www.islandnewsandadvertiser.co.uk/local-energy-company-bring-lower-tariffs-western-isles/>
- (23) Hebrides News 30th March 2016 <http://www.hebrides-news.com/western-isles-electricity-tariff-30316.html>
- (24) Scotsman 18th Oct 2016 <http://www.scotsman.com/news/western-isles-energy-project-lighting-up-the-future-1-4261423>
- (25) See http://www.edinburgh.gov.uk/info/20220/economic_development/544/sustainable_economy/2
- (26) The National 21st Sept 2016 <http://www.thenational.scot/news/edinburgh-poised-to-make-history-with-councils-sustainable-energy-company-plan.22649>
- (27) See <http://www.edinburghsolar.coop/>
- (28) See <http://www.howtopassivhaus.org.uk/videos-la-ha-procurement>
- (29) Fife Council Energy Programme Annual Report 2013-14
http://publications.fife.org.uk/uploadfiles/publications/c64_EnergyProgAnnualReport2013-14v1.7FINAL.pdf
- (30) See <http://brightgreenhydrogen.org.uk/>
- (31) Courier 16th July 2016 <https://www.thecourier.co.uk/fp/news/local/fife/223809/fife-councils-first-commercial-wind-turbine-powers-up/>
- (32) Solar Power Portal 22nd August 2015
http://www.solarpowerportal.co.uk/news/local_authority_buys_up_12.5mw_solar_farm_with_capital_reserves
- (33) Energy and Carbon Masterplan, Sustainable Glasgow,
<http://www.glasgow.gov.uk/CHttpHandler.ashx?id=28750&p=0>
- (34) My Green pod 10th August 2016 <http://www.mygreenpod.com/articles/a-greener-tube/>
- (35) Sadiq Khan for London 5th February 2016
http://www.sadiq.london/sadiq_khan_unveils_plan_for_london_clean_energy_revolution
- (36) Solar Power Portal 11th October 2016
http://www.solarpowerportal.co.uk/news/havering_london_borough_council_puts_forward_plans_to_build_15.5mw_of_solar
- (37) Islington Council 11th Dec 2012 <https://www.youtube.com/watch?v=SuBa9qYQ9VM>
- (38) Islington Council 7th Jan 2016 <https://www.islington.gov.uk/environment/energy-services/bunhill-heat-power>
- (39) See <http://www.howtopassivhaus.org.uk/videos-la-ha-procurement>
- (40) See <https://www.whiteroseenergy.co.uk/about-us>

- (41) E7 Building Services Case Studies <http://www.e7buildingservices.co.uk/casestudies/#/public/>
- (42) See <http://gmlch.onthepatform.org.uk/>
- (43) See Egnida website <http://www.egnida.co.uk/casestudy/merthyr-tydfil-county-borough-council/>
- (44) Norwich City Council 15th Jan 2016
https://www.norwich.gov.uk/news/article/19/city_council_leading_the_way
- (45) Guardian 7th September 2015 <https://www.theguardian.com/environment/2015/sep/07/robin-hood-energy-nottingham-council-launches-not-for-profit-energy-company>
- (46) See <https://www.robinhoodenergy.co.uk/>
- (47) See <https://www.whiteroseenergy.co.uk/>
- (48) APSE 13th October 2016 <http://www.apse.org.uk/apse/index.cfm/news/2016/apse-energy-partners-with-robin-hood-energy/>
- (49) See <https://our-power.co.uk/>
- (50) Scottish Housing News 16th July 2015 <http://www.scottishhousingnews.com/4510/social-landlords-launch-non-profit-energy-company/>
- (51) BBC 16th July 2016 <http://www.bbc.co.uk/news/uk-scotland-scotland-business-33528729>
- (52) Business Green 16th September 2016 <http://www.businessgreen.com/bg/opinion/2470965/a-sunny-alternative-to-hinkley-point-c>
- (53) See <https://localisedenergyeric.wordpress.com/>
- (54) See <https://www.peterborough.gov.uk/council/campaigns/free-solar-for-your-home/>
- (55) Plymouth Herald 27th September 2016 <http://www.plymouthherald.co.uk/watch-tudor-evans-tells-labour-conference-how-plymouth-is-paving-the-way-to-a-green-future/story-29754439-detail/story.html>
- (56) See <http://www.plymouthenergycommunity.com/>
- (57) Clean Energy 6th July 2016 <http://www.cleanenergynews.co.uk/blogs/solar/local-authorities-should-be-stepping-up-solar-deployment>
- (58) Solar Power Portal 24th June 2016
http://www.solarpowerportal.co.uk/news/portsmouth_city_council_to_spend_millions_on_rooftop_solar_roll_out
- (59) Portsmouth Port 1st Sept 2016 <http://www.portsmouth-port.co.uk/news/solar-boost-to-portsmouth-international-ports-eco-credentials>
- (60) Get Reading 15th June 2016 <http://www.getreading.co.uk/news/reading-berkshire-news/reading-council-talks-become-energy-11472349>
- (61) See <http://www.shetlandcharitabletrust.co.uk/our-investments>
- (62) See <http://www.sheap-ltd.co.uk/>
- (63) Scottish Government Press Release 2nd March 2016 <http://news.scotland.gov.uk/News/Funding-for-low-carbon-heating-2349.aspx>
- (64) Shetland News 30th October 2014 <http://www.shetnews.co.uk/news/9590-taking-the-heat-out-of-the-sea>
- (65) Solar Power Portal 14th October 2016
http://www.solarpowerportal.co.uk/news/swindon_borough_council_to_launch_second_community_solar_bond_offer
- (66) Warwickshire County Council's Approach to Renewable Energy & Solar PV
<http://www.apse.org.uk/apse/assets/File/Day%20%20strategic%20forums%20A%20-%20Dr%20Jacky%20Lawrence.pdf>
- (67) See <http://www.elementalsolutions.co.uk/passivhaus-schools/>