

The background of the entire page is a photograph of a residential roof. In the foreground, several large, dark blue solar panels with a grid of silver lines are mounted on a brown-tiled roof. To the left, a portion of a brick chimney is visible against a clear blue sky. The top of the page features an orange banner containing white text.

Stoke-on-Trent City Council

Housing Revenue Account - Renewable Energy Strategy 2017-2022

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FOREWORD



Councillor Randolph Conteh

Cabinet Member for housing, communities and safer city

This Housing Revenue Account (HRA) Renewable Energy Strategy has been developed to provide the council with a strategic direction on opportunities that exist for our housing stock to make use of renewable energy technology.

Stoke-on-Trent City Council has in the region of 18,500 properties in its housing stock asset base, which include council houses, low, medium and high rise flats, bungalows, and sheltered housing schemes.

As a council, we have already made some progress on the implementation of green technology with approximately 700 solar photovoltaic panels installed on roofs of council properties across the city, helping the city's residents save money on their fuel bills.

The aim of the strategy is to help reduce fuel poverty in council housing in Stoke-on-Trent and to support the council in identifying potential income streams related to generating energy.

The objectives of the strategy are:

- To reduce energy costs for tenants
- To ensure the provision and use of secure, affordable and sustainable energy
- To reduce fuel poverty
- To improve housing quality
- To invest in projects to generate a return
- To reduce carbon emissions

Delivery of these objectives will support:

- A co-ordinated approach to reducing fuel poverty in council housing
- The delivery of renewable energy technology schemes in the council's housing stock
- The council to generate income from its housing stock and renewable energy schemes

This strategy identifies the key technologies, programmes and investment required to enable the council to play its part in meeting the national and local targets on carbon reduction and low or zero carbon energy generation, as well as identifying links with the proposed district heat network.

The Housing Revenue Account Renewable Energy Strategy 2017-2022 provides the framework for the achievement of a range of outcomes that will benefit council property tenants whilst also contributing to the aims of various energy related legislation.

HOUSING REVENUE ACCOUNT - RENEWABLE ENERGY STRATEGY 2017 - 2022



This Renewable Energy Strategy sets out the technically and financially viable renewable energy technologies that can be deployed across the council's housing stock.

The strategy has been developed to support and be integrated with national and local policies and plans.

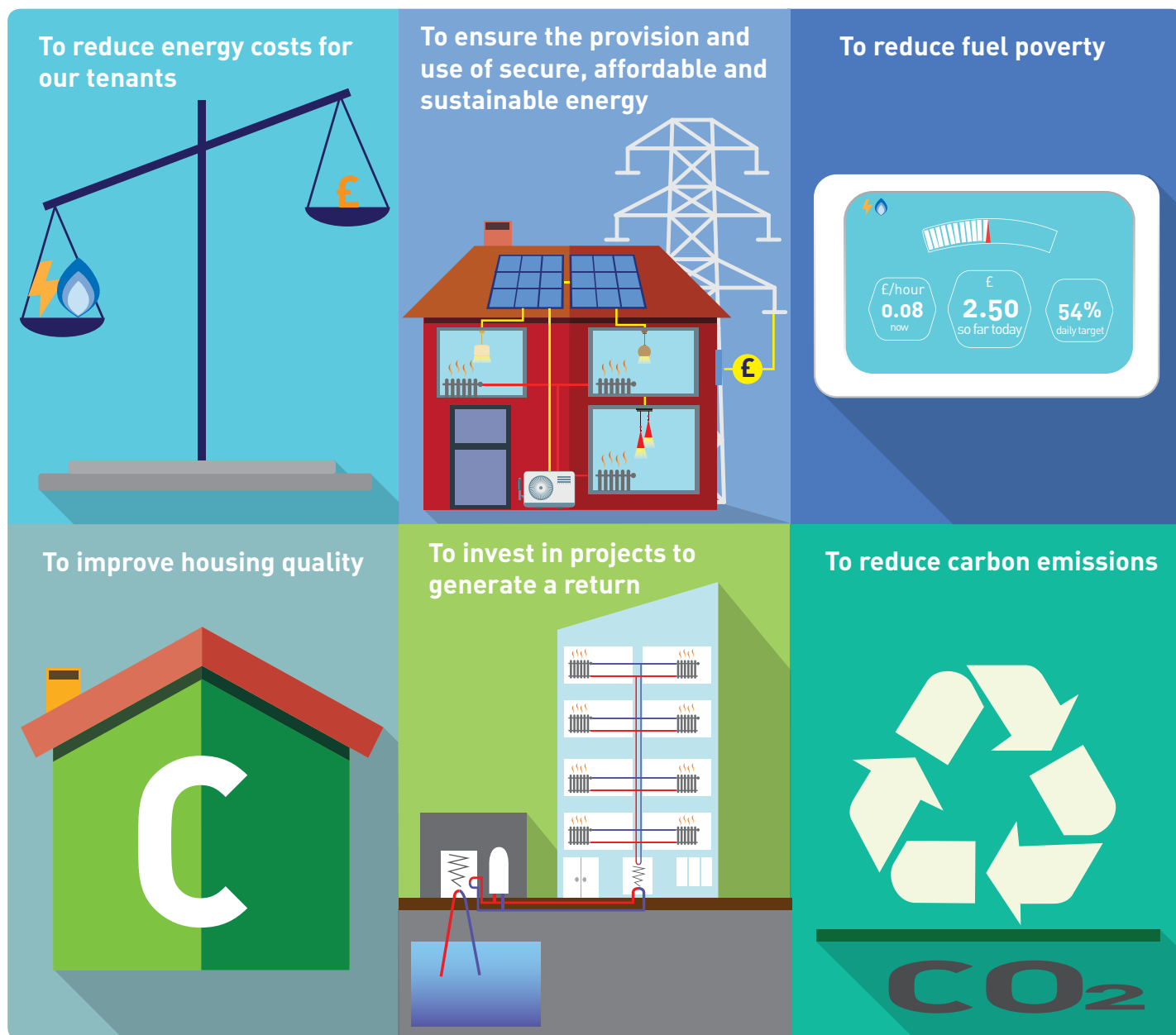


Under the Climate Change Act (2008) the United Kingdom has set a legally-binding target of reducing carbon dioxide emissions by 80% on 1990 levels by 2050. The Act introduced 'carbon budgets', which set a legally-binding target of 34% reduction in carbon emissions on 1990 levels by 2020. The Government has recently set the target for the 5th Carbon Budget (between 2028 and 2032) to be 57% also below 1990 levels. Renewable energy will need to play a key role in helping to deliver this budget.

STRATEGY AIMS AND OBJECTIVES

Aim: The aim of the strategy is to help reduce fuel poverty in council housing in Stoke-on-Trent and to support the council to generate an income.

Objectives:



Outcomes:

Delivery of this strategy will support:

- A co-ordinated approach to reducing fuel poverty in council housing in the city
- The delivery of renewable energy technology schemes in the council's housing stock
- The council to generate income from its housing stock and renewable energy schemes



STRONGER TOGETHER

Working together to create a stronger city we can all be proud of



Work with residents to make our towns and communities great places to live



Support vulnerable people in our communities to live their lives well



A commercial council, well governed and fit for purpose, driving efficiency in everything we do

- Deliver a significant improvement in housing quality by investing in homes and driving up housing standards
- Promote security of affordable energy for residents and businesses in the city

- Support residents to manage their money effectively, improving uptake of benefits for those who are eligible

- Invest in projects to generate a return to protect services

Our strategic plan sets out the strategic priorities for 2016-2020 and the objectives looking to be achieved during that time. Driving these priorities is the 'Stronger Together' vision.

Stronger Together is the message that underpins the vision for Stoke-on-Trent – working together to create a stronger city the people of Stoke-on-Trent can all be proud of. The vision will in part be delivered directly by the council but in other areas priorities will be achieved through working in partnership with others to deliver the very best for Stoke-on-Trent.

The plan sets out a four year vision and a process for developing an annual delivery plan for 2016 onwards.

Sitting underneath our vision are five strategic priorities. Aligned to each priority are a number of strategic objectives that the council will endeavour to deliver over the next four years.

DEVELOPMENT OF THE STRATEGY

This Renewable Energy Strategy has been developed through a technical and commercial analysis of renewable energy technologies against the different property types in the council housing stock.

In order to undertake the analysis, the housing stock was categorised into three main housing types:

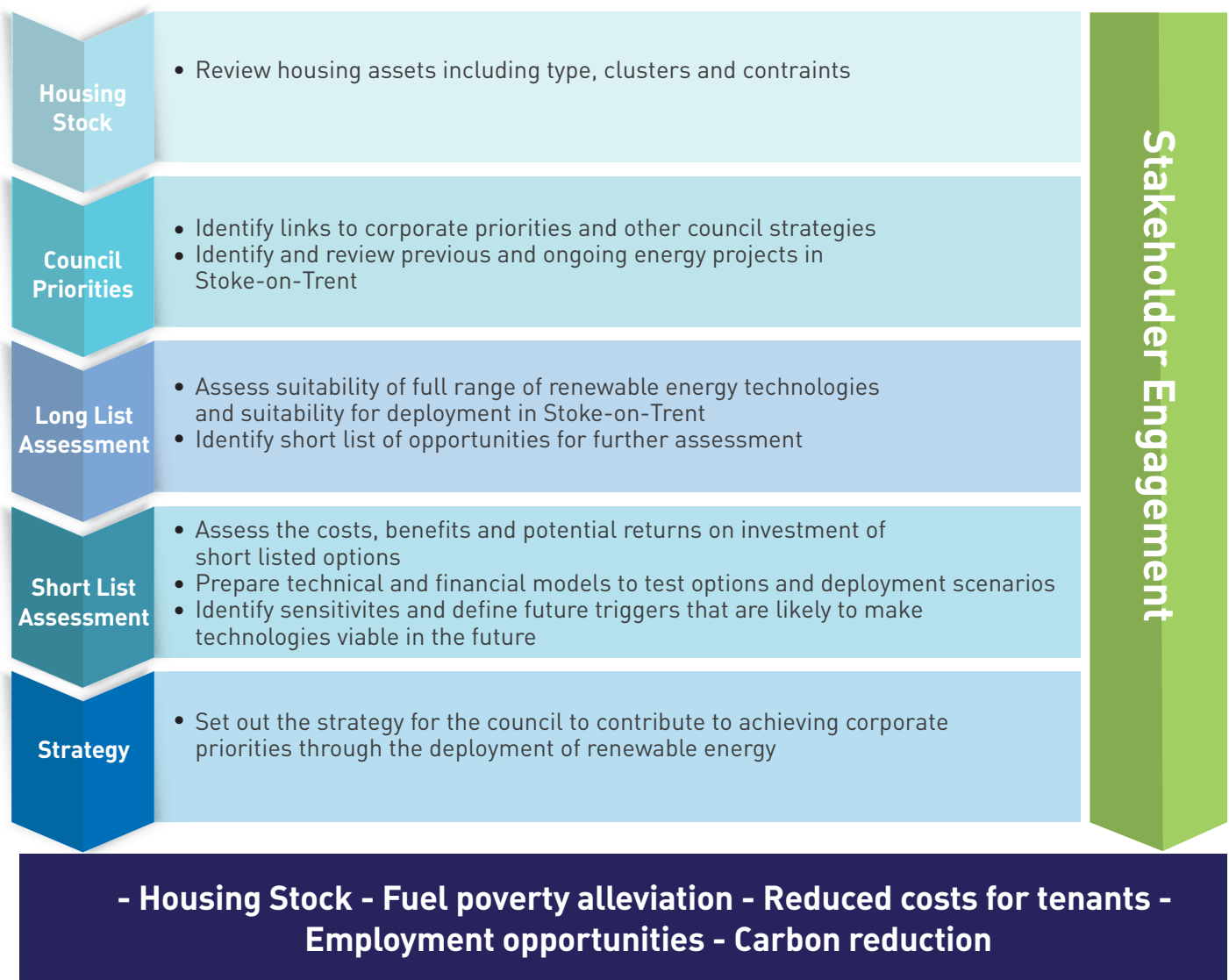
- Houses (including bungalows)
- Low rise flats
- High rise flats

High rise flats were assessed in clusters that can be modified from individually heated flats to a communal heating system (mini-district heating scheme) served

by a central energy centre. This also enables these clusters of properties to be served by an external heat source, such as a district heating scheme in the future, or supply new developments and high energy consumers in the area.

Different housing asset types are suited to different renewable technologies. Where a technology may be technically feasible for a property, the financial assessment may highlight that the technology is not currently viable.

The flow chart below sets out the full assessment methodology



LINKS TO CORPORATE POLICIES

The Stronger Together Strategy provides an overarching vision for our city. Additionally, there are other policies, plans and strategies that also inform this Renewable Energy Strategy.

Local Development Framework

The Newcastle-under-Lyme and Stoke-on-Trent Core Spatial Strategy covers the period from 2006-2026 and sets out a template against which planning applications and regeneration programmes are tested.

The Core Spatial Strategy outlines that renewable energy generation and the increased energy efficiency of new developments have an important role to play in reducing CO₂ emissions and addressing global warming.

Strategic aim 17 (SA17) of this document sets out “to minimise the adverse impacts of climate change in the move towards zero carbon growth through energy efficiency, promoting the use of renewable energy sources and green construction methods in accordance with best practice.”

Policy CSP3 of the Core Spatial Strategy covers sustainability and climate change development. This policy outlines developments which positively address the impacts of climate change and deliver a sustainable approach which will be encouraged.

Local Plan: Sustainability and Climate Change Supplementary Planning Guidance (2012)

The Sustainability and Climate Change Supplementary Planning Guidance provides additional considerations to support sustainable development of new buildings and infrastructure. This guidance provides an assessment checklist for developers to demonstrate that they have taken due consideration of local and national planning policy with regards to climate change and sustainability. The checklist includes criteria for developers to outline their plans to reduce carbon emissions and include renewable technologies and/or low carbon energy generation within their development.

The Council Housing Revenue Account Asset Management Strategy

A Council Housing Revenue Account Asset Management Strategy has been produced to inform the maintenance, development and management of the council housing stock into the future.

The council’s housing stock comprises the council’s highest value assets. The overall housing stock is valued at £1.15bn in terms of open market value and £367m in terms of existing use (social housing value).

One of the objectives of the Asset Management Strategy is to develop renewable energy technology opportunities. The composition of the current housing stock¹ is shown below. This information is important for the Renewable Energy Strategy as some types of property will be more suited to a particular technology than another.

The Council Housing Stock (September 2016)	
House Type	Number of Properties
House	11,929
Bungalow	3,580
Flat	3,036
Non-Self Contained Flat	19
Total	18,564

Stoke-on-Trent Energy Efficiency Action Plan 2016-2020 (Draft)

The council is a partner of the European Union Planning for Energy Efficient Cities (PLEEC) project funded under the European Framework Programme.

The overall aim of the PLEEC is to empower the city to deliver energy efficiency improvements working together with people, businesses and partners.

One of the areas for action within the PLEEC is residential properties. The PLEEC highlights improving energy efficiency, behaviour change, smart metering, and consideration of using planning to drive district heating and the installation of renewable energy technologies as measures to reduce energy consumption.

¹ Definitive Stock Report_residential 180915

Fuel Poverty Strategy

Fuel poverty is a major social problem, causing considerable hardship and negative health impacts. Households living in or on the brink of fuel poverty often face very difficult trade-offs between meeting their fuel bills, spending on other essentials such as food and falling into debt, all of which can exacerbate physical and mental health problems.

The Fuel Poverty Strategy highlights that improving the energy efficiency of the housing stock and providing affordable heat is the most cost-effective, sustainable and long-term solution to tackling fuel poverty.

The aim of the Fuel Poverty Strategy is to reduce the rate and risk of fuel poverty in Stoke-on-Trent. One of the key actions and links to this Renewable Energy Strategy is to achieve these aims through the installation of renewable technologies.

Energy Policy

The council is also developing an Energy Policy and city-wide Renewable Energy Strategy in order to provide detailed commitments and direction to achieve the objectives of the strategic plan. It has been recognised that by developing an over-arching energy and renewable energy policy, the council would address the need for greater clarity of purpose around energy efficiency, generation and supply. Adopting a clear, cohesive and local approach also has the potential to influence the wider city and to encourage collaboration.

Conversely, not developing and adopting these overarching policies carries the potential risk that service areas, partners and other stakeholders will adopt disjointed, ad hoc or short-term approaches to energy-related issues which fail to capitalise on innovative developments. This includes examples such as the district heating network project which do not create the critical mass needed to drive positive change and shape consensus around the shared goals and benefits of a long-term strategic vision for the city's energy needs.

City-Wide Air Quality Action Plan 2014

There are other policies and strategies that will impact on the applicability of renewable technologies for the council housing stock. For example air quality policies may have an implication for the combustion of biomass fuels.

The whole of the city of Stoke-on-Trent has been designated an Air Quality Management Area (AQMA) for nitrogen dioxide (NO₂), measured as an annual mean and as a one-hour mean. The predominant source of NO₂ is road transport. Renewable technologies, such as biomass combustion can have a relatively higher impact on local air quality than more conventional gas boilers, as well as increased emissions from fuel deliveries. It is important to find a balance between these issues as part of the council's integrated policies and plans.



GOVERNMENT FINANCIAL INCENTIVES

A key driver for the uptake and installation of renewable energy technologies are financial incentives provided by the Government. These have sought to provide parity with fossil fuel sources of energy by providing long term financial support for renewable energy generation and to drive down technology costs. Incentives are, and will continue to be regularly reviewed and form a key element in the financial viability of different technologies.

The Renewables Obligation was introduced by the UK government in 2002. It was seen as the main mechanism for encouraging the uptake of large scale electricity generation from renewable technologies as it encourages licensed electricity suppliers to source a specific and annually increasing percentage of their electricity from renewable sources.

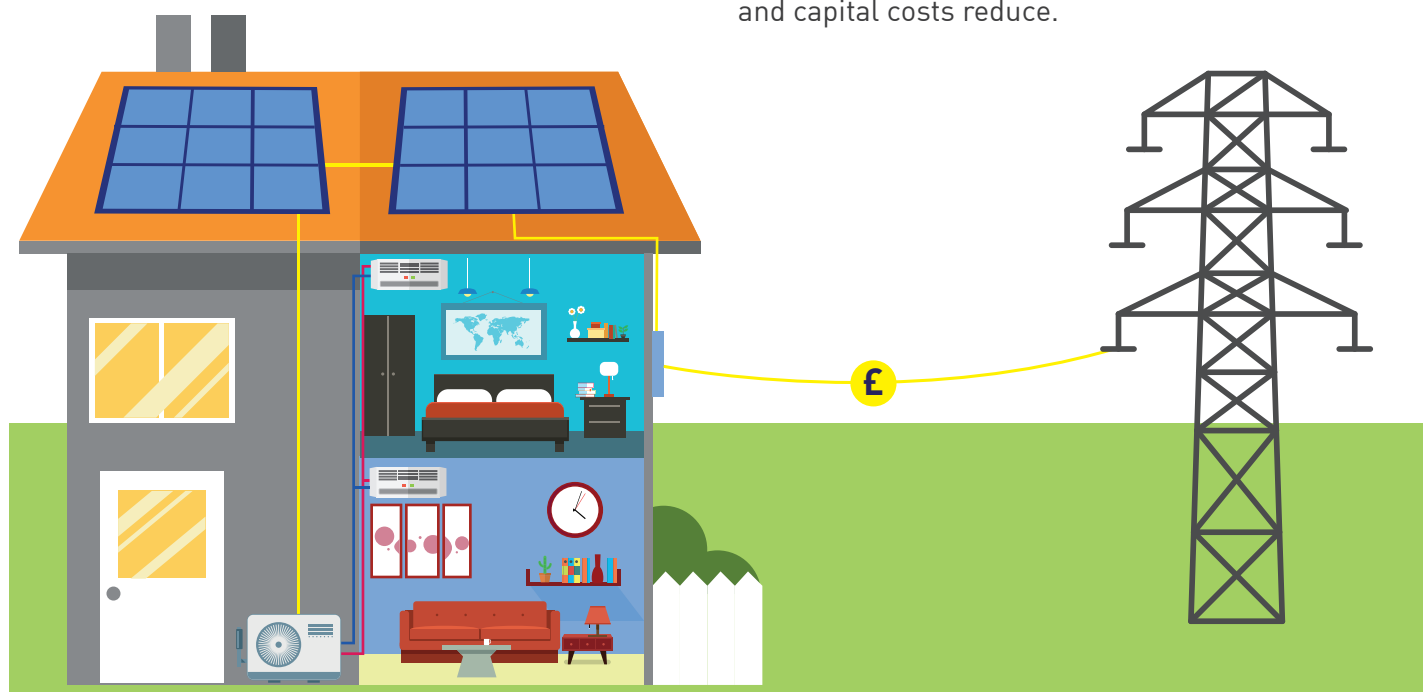
Under the Energy Act 2013, the Renewables Obligation is being replaced from April 2017 with Contracts for Difference (CfDs). Under this new support system for larger renewable energy developments, renewable generators will be guaranteed an agreed 'strike price'² for the energy they produce. Each technology will have its own strike price.

As part of the Energy Act 2008, the Government set out to stimulate smaller scale renewables growth with the introduction of Feed-in Tariffs (FITs) for renewable energy installations of up to 5 megawatts. Feed-in Tariffs oblige electricity suppliers to buy electricity generated from renewable sources at above market rates, which are set by the government, and were introduced in April 2010.

The Renewable Heat Incentive is a Government scheme set up to encourage uptake of renewable heat technologies amongst householders, communities and businesses through financial incentives. It is the first of its kind in the world and the Government expects the Renewable Heat Incentive to contribute towards the 2020 ambition of 12% of heating coming from renewable sources.

In 2012 phase one of the Renewable Heat Incentive launched to support the UK's non-domestic sector. The domestic Renewable Heat Incentive was launched on 9 April 2014 and provides financial support to the owner of the renewable heating system for seven years. Details of the Renewable Heat Incentive are provided in this report.

Government support for both the Renewable Heat Incentive and the Feed-in Tariff reduces as technologies are further employed across the sectors and capital costs reduce.



²The Government agrees to pay the difference between the electricity market price and a fixed price level for 15 years known as the 'strike price'. This reduces exposure to volatile and rising fossil fuel prices. The strike price also means that renewable energy generators must pay back the difference when the price of electricity goes above the strike price.

RENEWABLE ENERGY SCHEMES IN STOKE-ON-TRENT

Stoke-on-Trent City Council has a recent history of developing and installing renewable energy technologies in the city. A key consideration for this strategy has been how the council can build on this success whilst also incorporating lessons learnt.

What the council has done - Solar Photovoltaic Schemes

Over the 2010-2012 period, 694 Solar Photovoltaic (PV) systems were installed on council properties across four projects. The council funded three of these projects covering 127 PV systems and we are responsible for their maintenance and repair.

In 2011 EON was selected to supply, fit and maintain the installation of solar PV systems on up to 1,000 council properties. The programme was affected by the changes to the Feed-in Tariff, which led to the council completing 567 installations of the planned programme.

The following table provides a summary of the council's portfolio of existing PV projects.

Stoke-on-Trent City Council Portfolio of PV Projects

Project	Location	Install	Year	Funder	Installer	Maintenance
Pilot programme	Chell Heath	57	2010	Council	Kier Stoke	Council
EON scheme	City Wide	567	2011	EON	Kier Stoke	EON
Middleport CESP	Middleport	53	2011	Council	Various	Council
Warren Road bungalows	Chell Heath	17	2012	Council	Seddons	Council

Total

694

Annual revenue gained from the council's PV projects in 2015

Revenue Stream	Revenue
FIT generation payment	£98,160
FIT export payment	£3,404
VAT	£10,048
Roof rental	£46,755
Total	£158,367

The EON scheme was delivered utilising a 'Rent a Roof' scheme. In this arrangement;

- EON funded the installations and takes the full income from the FIT
- The council receives a set income from the rental of the roof space (£60 per roof per year)
- Council tenants benefit from reduced electricity bills – as they do not pay for the electricity generated from the PV panels
- EON has responsibility to repair and maintain the PV systems it has installed

What the council is doing now - Low Carbon City-Wide District Heat Network

District heating is the use of a centralised heat source(s) used to heat (or cool) a network of buildings through district heating pipework. The council is developing a Low Carbon District Heat Network (DHN) with a potential deep geothermal heat source.

The council has accessed funding as part of the City Deal where central government initially provided £0.4m support to produce an outline business case which was used to secure an additional £19.7m of capital funding to help deliver the network infrastructure. It is estimated that a total £52.4m investment is required for the delivery of the district heating network scheme through public sources and the private sector.

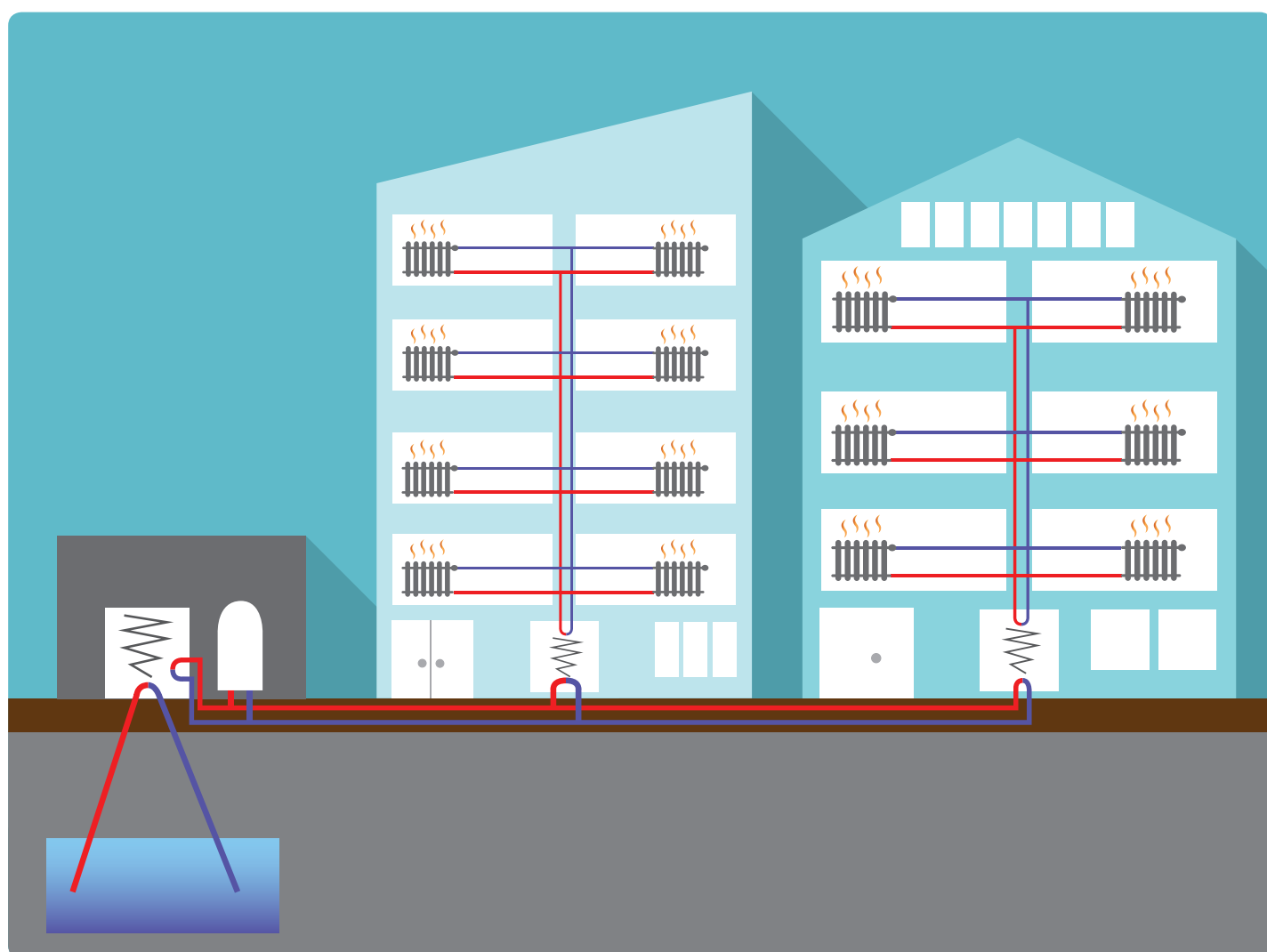
Housing, in particular high density housing such as high and low rise flat clusters, can provide heat loads suitable for a connection to a district heating network or the delivery of stand-alone networks that are able to connect to larger networks in the future.

The council DHN team have identified customers and routes for the infrastructure, and have targeted in collaboration with the HRA the following buildings:

- Southern Court
- Honeywall House
- Dibden House
- Penkhull Court
- Bucknall New Road Flats - Lindop Court
- Bucknall New Road Flats - St Lukes Court
- Bucknall New Road Flats - Wellington Court
- Bucknall New Road Flats - Westwood Court
- Bucknall New Road Flats - Seddon Court
- Union Street Flats - Boundary Court
- Union Street Flats - Brookfield Court
- Union Street Flats - Forest
- Union Court

The DHN team commissioned a study funded by the Department of Energy and Climate Change to investigate the retrofit requirements of communal heating systems in blocks of flats to ensure full compatibility with DHN connection.

The DHN scheme is due to start construction in late 2017 and be completed in 2019.



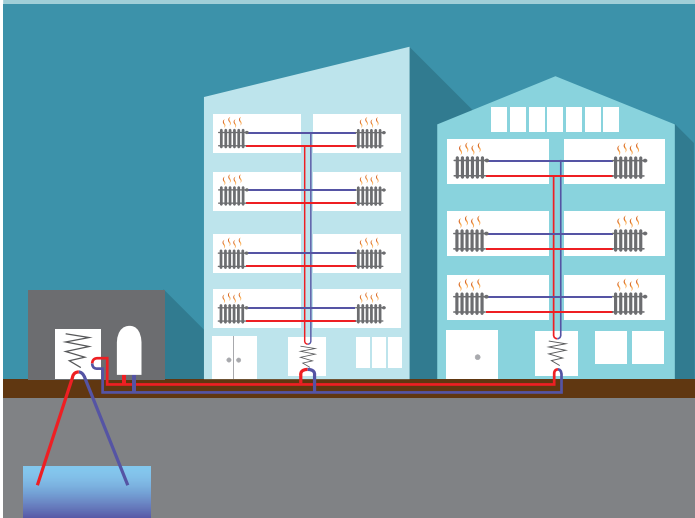
WHAT THE COUNCIL CAN DO IN THE FUTURE

Renewable Energy Technology Schemes

Detailed analysis has been undertaken on the financial viability of technology types, the potential for deployment opportunities for individual properties (houses, bungalows and low rise flats) and high rise flats in the city, and how each technology links to our strategic objectives.

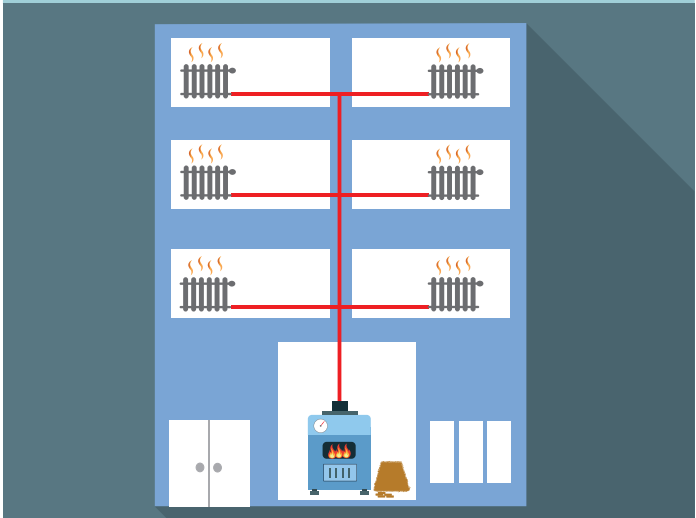
This analysis is summarised below for each technology type.

Low Carbon City-Wide District Heat Network (DHN)



Current Risks	<ul style="list-style-type: none">Insufficient heatCustomers contracted
Suitability	
Individual properties	Not suitable
High rise flats	Suitable and being carried out by the council
Strategic objective	
Ensure the provision and use of secure, affordable and sustainable energy	✓
Reduce fuel poverty	✓
Reduce energy costs for our tenants	✓
Reduce carbon emissions	✓
Generate income from renewable energy schemes	✓
Improve housing quality	✓

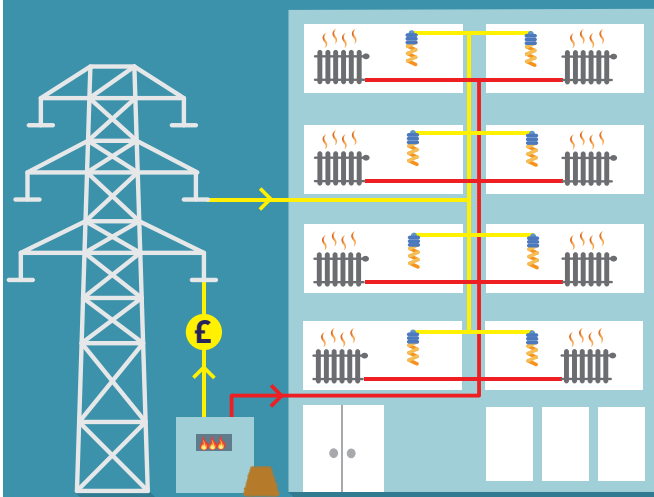
Biomass Boilers



Current Risks	<ul style="list-style-type: none">Space requirementsRHI reduction at small scale
Suitability	
Individual properties	Not suitable
High rise flats	Suitable for further assessment
Strategic objective	
Ensure the provision and use of secure, affordable and sustainable energy	✓
Reduce fuel poverty	✓
Reduce energy costs for our tenants	✓
Reduce carbon emissions	✓
Improve housing quality	✓



Biomass Combined Heat and Power (CHP)



Current Risks

- Technology maturity
- Access to CFD
- RHI Revenue

Suitability

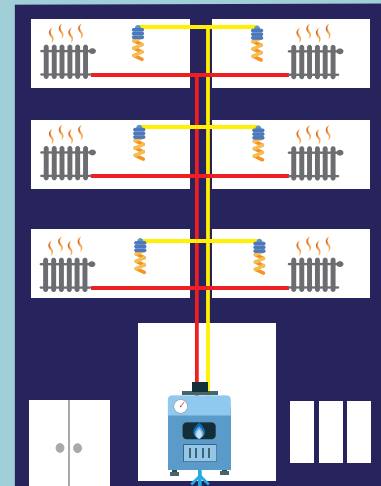
Individual properties Not viable at this scale

High rise flats Suitable for further assessment

Strategic objective

Ensure the provision and use of secure, affordable and sustainable energy	✓
Reduce fuel poverty	✓
Reduce energy costs for our tenants	✓
Reduce carbon emissions	✓
Improve housing quality	✓
Generate income from renewable energy schemes	✓

Micro Combined Heat and Power (CHP)



Current Risks

- Technology still not mature in UK
- Providers require users to use specific energy suppliers

Suitability

Individual properties Not suitable
Watching brief;
Future Trigger – could be suitable with increased market activity.
Pilot programme recommended.

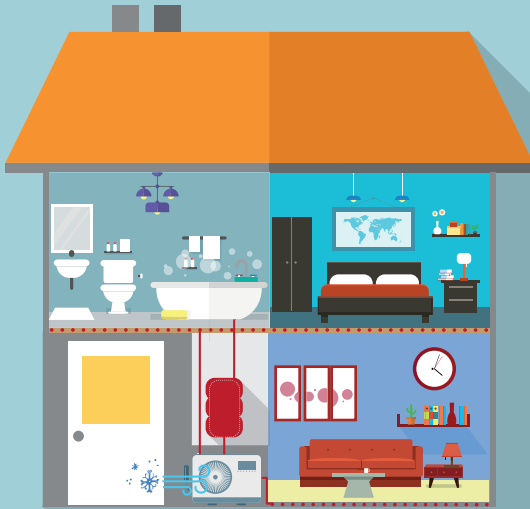
High rise flats Not suitable

Strategic objective

Ensure the provision and use of secure, affordable and sustainable energy	✓
Reduce fuel poverty	✓
Reduce energy costs for our tenants	✓
Reduce carbon emissions	✓
Improve housing quality	✓



Air Source Heat Pump



Current Risks

- Capital costs covered by RHI income with 11% IRR return over 7 years.
- Most efficient with lower flow and return temperatures (requires underfloor heating or larger radiators)

Suitability

Individual properties

Suitable
Future Trigger:
Refurbishment for low temperature heating
Increase in RHI support

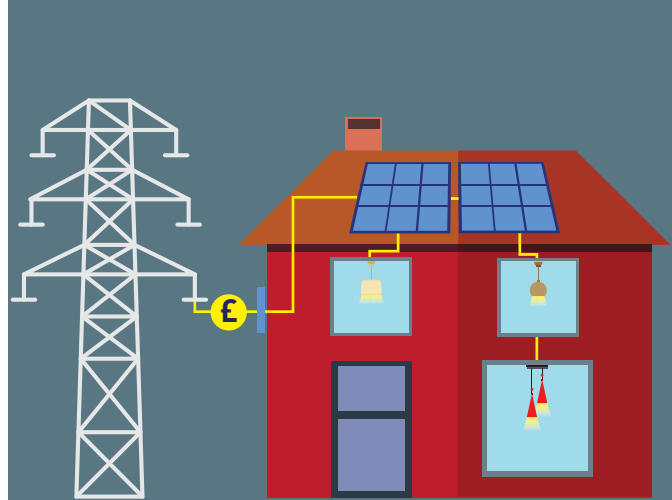
High rise flats

Not suitable
Future Trigger:
Refurbishment for low temperature heating
Increase in RHI support

Strategic objective

Ensure the provision and use of secure, affordable and sustainable energy	✓
Reduce fuel poverty	✓
Reduce energy costs for our tenants	✓
Reduce carbon emissions	✓
Generate income from renewable energy schemes	✓
Improve housing quality	✓

Photovoltaics



Current Risks

- Moderate capital cost
- Recent significant reduction in FIT tariff

Suitability

Individual properties

Suitable for further analysis

High rise flats

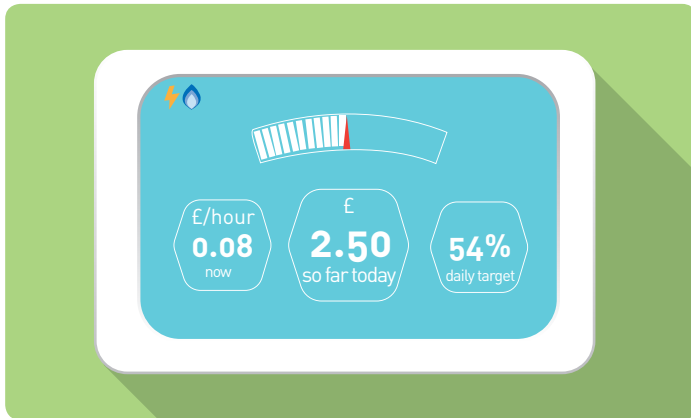
Not suitable at this scale due to roof to floor space ratio

Strategic objective

Ensure the provision and use of secure, affordable and sustainable energy	✓
Reduce fuel poverty	✓
Reduce energy costs for our tenants	✓
Reduce carbon emissions	✓
Generate income from renewable energy schemes	✓
Improve housing quality	✓



Smart Meter Installation Programme



The Government has set a policy for all homes to have smart meters installed by 2020. Energy suppliers will be required to install smart meters and take all reasonable steps to install them for all residential customers.

Consumers with smart meters will be offered an in-home display that lets them see how much energy they are using and what it will cost. This will let them have more control over their energy use and help them save energy and money.

Between now and 2020 energy suppliers will be responsible for replacing over 53 million gas and electricity meters. This will involve visits to 30 million homes and small businesses.

This target will require significant resources from the utility providers. An opportunity exists for the council to benefit from this roll out programme by undertaking and managing the roll out across the council housing stock.

For example, we could take a role in the funding of smart meters in Stoke-on-Trent as a Meter Asset Provider, either providing the service itself or in partnership with another Meter Asset Provider, or through providing funding for an energy company. The funding could be generated from financing smart meters in both Stoke-on-Trent's council housing whilst promoting the funding of smart meters across the private residential sector.

The council is in a good position to manage the roll out as they already have a relationship with the tenants to organise site visits and access to local labour.

A smart meter installation programme will support the council to achieve the following strategic objectives:

- reduce energy costs for our tenants
- generate income from renewable energy schemes

Bulk Energy Purchasing

An opportunity exists for the council to act as an intermediary for energy suppliers and bulk purchase energy on behalf of its tenants. We could then be in a position to sell the energy at an improved market rate for the tenants, whilst generating a revenue income from the energy sales. This could be to social tenants or private dwellings across the city increasing the scope of the opportunity.

This opportunity would require the council setting up as an Energy Service Provider, which would be one of the services that could be operated by the Energy Company developed by the council.

An example of this type of supplier is Nottingham City Council who has developed Robin Hood Energy which is a not for profit company. The aim of the supplier is to help reduce fuel poverty and provide energy at as low a tariff as possible.

Robin Hood Energy competes with private sector energy companies but with an aim to provide low cost tariffs. This is a model that Stoke-on-Trent could follow in the future.

A further option for consideration is a partnership with an existing energy supplier where the council markets the energy tariff to existing tenants and takes a fee for each tenant that switches. This is similar to the model that Peterborough City Council have developed with OVO Energy.



HOW CAN WE DELIVER RENEWABLE ENERGY SCHEMES?

In this section potential, ownership, funding and delivery mechanisms will be reviewed with reference to the benefit of revenue generation but also on reduced tenant bills and measures to address fuel poverty. We will also look to deliver these projects taking account of other energy projects and plans and delivery options being undertaken across the council.

Project Ownership Options

The choice of ownership options for renewable energy projects is important as it will define the future risk and reward parameters for the council. One of the ownership options is that projects are owned or part owned by a third party Energy Service Company. An Energy Service Company is a catch all term for a company that provides an element of energy services which could include piece meal services such as energy billing or energy supply. It can also refer to an organisation providing a holistic energy service offering - covering the energy infrastructure investment and construction, operation and maintenance, life cycle replacement, energy supply, customer relations and metering and billing of a project.

The other ownership options are that the council fully owns the projects or that we set up a joint venture with a third party where benefits and risks are shared depending on the percentage of stake owned.

If the delivery vehicle is owned by the council, the council would receive the full benefits of the investment, however, the project risks are higher.

Individual Property Projects

There are a number of potential projects that have been identified as viable for our housing properties. There could be significant savings and additional revenue generated by grouping these technologies in a single installation contract.

As well as grouping the technologies within a property, clustering properties where there are high concentrations of council housing estates will also lead to reduced procurement and installation costs.

Additionally, the council will look to include these installs within planned refurbishment works and/or void refurbishments.

For the delivery of the energy projects for housing properties, there are three main delivery options that are being considered;

- The council include energy upgrades and installation in existing repairs and maintenance contracts – in this option the council could negotiate with existing repairs, maintenance and refurbishment contractors to include energy installation. The council would retain ownership of the assets
- The council directly finance the capital and installation costs and procure an installation contractor – in this option the council would retain ownership of the assets and could either manage the operations and maintenance internally or procure an operations and maintenance contractor
- The council could procure or set up a specialist Energy Service Company to deliver all aspects of the installation and management – in this option the council could be either a joint venture partner in the Energy Service Company or could provide the finance for an Energy Service Company partner to deliver all aspects of the project. The installation, operations and maintenance could be included within existing repairs and maintenance contracts

High Rise Flat Cluster Projects

For the delivery of the mini district heating schemes there are two main delivery options that we are considering;

- The council directly finance the capital and installation costs and procure a construction contractor – in this option the council would retain ownership of the assets and could either manage the operations and maintenance internally (including billing) or procure an operations and maintenance contractor
- The council could procure or set up an Energy Service Company to deliver all aspects of the installation and management – in this option the council could be either a joint venture partner in the Energy Service Company or could provide the finance for an Energy Service Company partner to deliver all aspects of the project

RISKS AND CONSIDERATIONS

A number of risks and considerations have been identified. These are explored below with proposed mitigation actions.

Financial Risks

Government financial incentives (Feed-in Tariff, Renewable Heat Incentive, and Contracts for Difference) for renewable technologies are uncertain policy instruments. For example, reductions to the Feed-in Tariff in 2011 led to the early conclusion of the Council's PV scheme and further significant reductions took place in February 2016, putting further stress on this market.

Developing financial returns within this policy landscape makes it difficult to provide long term certainty. To mitigate this, the council will look to large scale deployment to maximise the financial benefits. Additionally fluctuations in fuel prices can impact on the projected financial return of a project. Long term fuel supply agreements can help mitigate this issue.

On the other hand current technologies that are not financially viable today may become more attractive in the future as a result of decreasing capital costs. To keep abreast of these future financial changes, the council will keep the financial models underpinning this Renewable Energy Strategy under review and updated on a regular basis.

Photovoltaic Considerations

Some risks have been identified with the existing PV schemes that would need to be considered in the development of any future PV programme on council stock:

- **Roof Maintenance/Replacement:** This issue needs to be clarified under any future PV scheme contract. A number of roofs included in the existing scheme have needed maintenance or replacement since the PV panels have been installed. The existing scheme does not sufficiently address the financial responsibility in situations where roofs need to be maintained or replaced during the PV life. This has led to an increase in expenditure by the council.
- **Right to Buy:** The existing schemes do not have sufficient clarity on the arrangement if a tenant wishes to buy the property under the Right to Buy scheme. According to the Council Solar PV annual report in 2015 there have been four properties purchased through Right to Buy, three of which have retained the PVs through a lease.

Grid Connection

In the UK, the traditional arrangement of the electricity supply infrastructure begins with electricity being generated by a large power plant (e.g. coal, nuclear, gas or renewables). This is transmitted at a high voltage to distribution points. A local distribution network then carries electricity to homes and businesses. There are 14 geographically distinct distribution networks which are managed by different Distribution Network Operators (DNO). Stoke-on-Trent's DNO is Western Power Distribution (WPD). DNO's do not sell electricity to consumers. This is done by the electricity suppliers.

Some technologies such as heat pumps do not export electricity to the grid but still need an import connection and can need a lot of power at times. Network modifications to allow for increased generation capacity are likely to introduce additional costs or timescales for new connection.

In order to connect a renewable installation and export electricity to the grid requires consultation and agreement with the local DNO. The level and type of interaction with the DNO depends on a number of factors including the size of electricity generator, location of the installation and the capacity and quality of the grid in the local area. Western Power Distribution has outlined that on some of its networks, it is not possible to connect further amounts of generation without making changes to their assets. These changes are due to the network reaching the physical limit of power able to be transferred through it, usually due to thermal, voltage, protection or fault level issues.

To mitigate against this capacity problem;

- Options to integrate energy storage solutions with solar PV
- Engagement with DNO will be continued
- For new larger generation connections (11kV or 6.6kV) networks, WPD has developed a generation capacity map to give customers and early indication of the potential capacity available. WPD also provides a budget estimate service to give an early indication of the likely capacity and costs of a generation connection at a specific location

Air Quality

The whole of the city of Stoke-on-Trent has been designated an Air Quality Management Area (AQMA) for nitrogen dioxide (NO_2), measured as an annual mean and as a one-hour mean. The predominant source of NO_2 is road transport.

Some renewable fuels such as biomass have high levels of NO_2 and particulates (PM_{10} and $\text{PM}_{2.5}$) when combusted which means that any proposed

installations will need to be reviewed to ensure that the plant meets any air quality requirements set by the council.

To mitigate the potential air quality problem, air quality dispersion models will be undertaken for heat production systems.



GLOSSARY OF TERMS

Air source heat pumps

An air source heat pump (ASHP) is a refrigerant based system, like your refrigerator at home. The system can absorb low grade heat from the air, and raise its temperature efficiently to be suitable for space heating and/or hot water.

Some ASHPs can provide water temperatures of up to 60°C (without backup electric heater) in ambient temperatures as low as -25°C.

There are air source heat pumps available on the market which are suitable for everything from small domestic to large applications.

Biomass Boilers

Biomass for burning or as a fuel for gasification includes wood, energy crops, agricultural crop residues, wood manufacturing by-products and farm animal litter. Although burning biomass releases carbon dioxide (CO₂) to the atmosphere, this is principally offset by the CO₂ absorbed in the original growth of the biomass, or captured in the growth of new biomass which replaces the materials used when it is sustainably sourced. Using biomass for heating therefore results in very low net 'lifecycle' carbon emissions relative to conventional sources of heating, such as gas, heating oil or electricity.

Biomass Gasification CHP

Biomass gasification is a process whereby the fuel undergoes partial oxidation under high temperature and limited oxygen supply to generate a 'producer or product gas'.

The conversion of solid fuel into a gaseous fuel allows gaseous products with greater flexibility and control. This can improve the efficiency as it maximises the chemical energy contained in biomass.

Additionally, the conversion of biomass allows for the cleaning of gas prior to use and in the case of combustion produces a cleaner fuel that is more suitable in urban areas as stack heights for exhaust systems do not need to be as high.

District Heat Network

A District Heat Network is a system of underground pipes that deliver heat via hot water between an energy centre and buildings connected to the network.

The heat network consists of two parallel insulated pipes, one carrying hot water to buildings and the other returning the cooler water back to the energy centre.

Natural Gas CHP

Combined heat and power (CHP) is the simultaneous production of electricity with the recovery and utilisation of heat. Using a CHP locally to where the electricity and heat is required can lead to primary energy savings compared to the separate purchase of electricity from the national electricity grid and a gas boiler for onsite heating.

Natural gas CHP is available at the small scale to the domestic market. These units replace the boiler and provides energy in the ratio of about 6 units of heat for every 1 unit of power.

Solar PV

Solar Photovoltaic (PV) technology is a mature technology. PV technology converts the sun's radiation directly into electricity. The solar cells are made of semiconducting materials similar to those used in computer chips. The process of converting light (photons) to electricity (voltage) is called the photovoltaic effect.

Building mounted PV can be placed on flat or suitably orientated pitched roofs. Rooftop installations have also been installed in great numbers across the UK, on a mixture of domestic, public and commercial buildings.



City of
Stoke-on-Trent