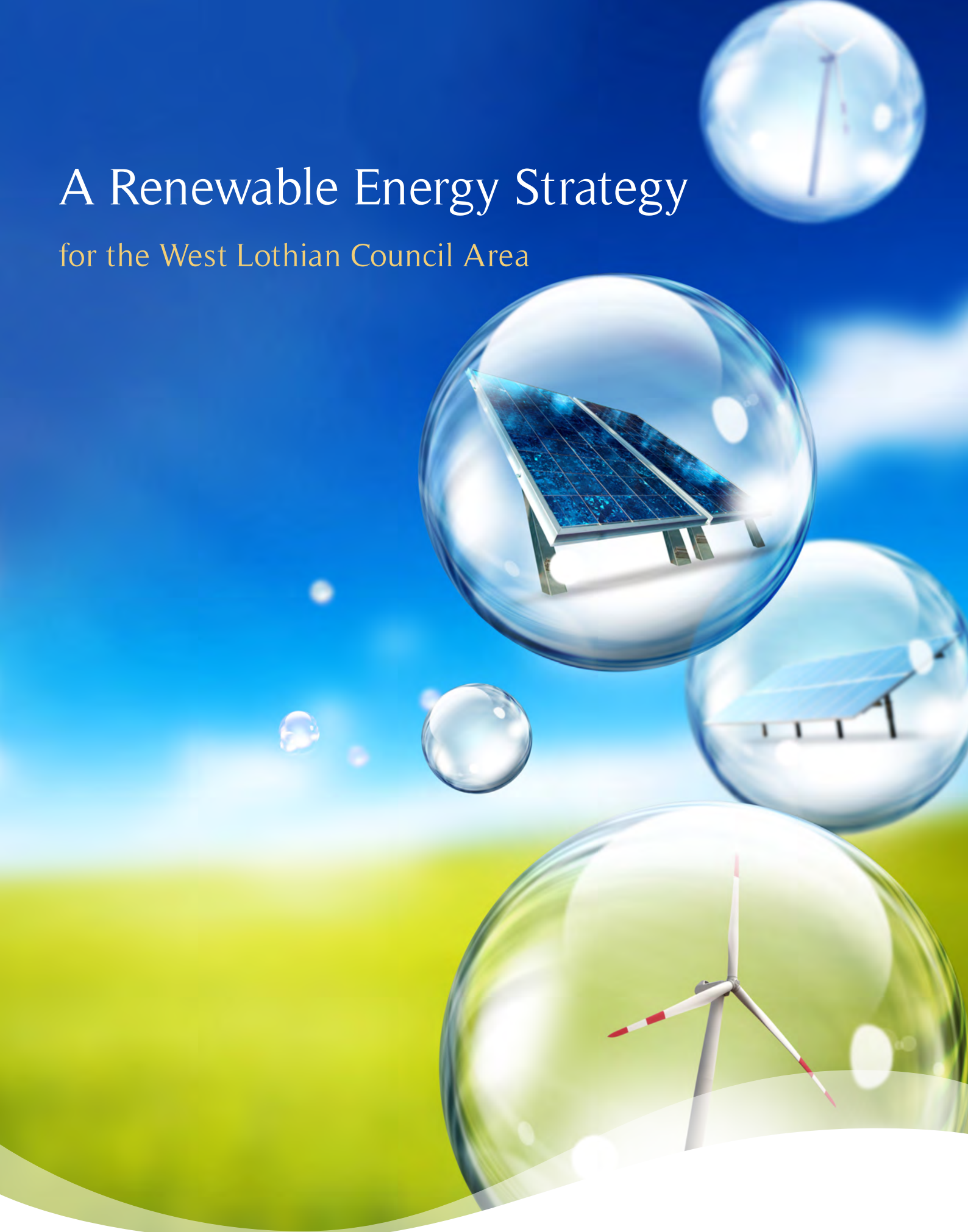


A Renewable Energy Strategy

for the West Lothian Council Area



EXECUTIVE SUMMARY



The council recognises the need to be part of the positive climate change agenda and this strategy is the outcome of an evidence based study to understand where renewable technologies may be implemented across the council's assets.

The study was undertaken by ENVIRON (UK) Ltd on behalf of the council with the support of the Carbon Trust Scotland. The study focussed on the renewable and low carbon technology opportunities for the council's assets including:

- ▢ Buildings - domestic and non-domestic,
- ▢ Land*,
- ▢ Street lighting; and
- ▢ An initial review of the potential for heat networks to the public and private sector across the council area.

It also considers the role of the council in supporting renewable energy in the wider community.

The strategy sets a vision for renewables across the West Lothian Council area and recommends that the council implements a phased adoption of renewable energy with the following key steps.

- ▢ Develop and install solar photovoltaic (PV) and solar thermal
- ▢ Develop Biomass
- ▢ Develop renewable energy and low carbon energy networks
- ▢ Continue a leadership role promoting renewable technology within the wider community.

*Note: This does not include land held for sale or development by the Council (housing and economic development) or properties identified as surplus or part of the office rationalisation strategy and tenanted non-residential properties.

DRIVERS AND OUTCOMES

Local authorities have a wide role, including that of leadership, in tackling climate change by reducing carbon and increasing renewable energy generation. At a time of intense pressure on resources the expanding green economy presents an opportunity to set a positive agenda. Implementing renewable technologies can create an income to the council alongside reducing energy and carbon emissions to meet national and European Union (EU) targets.

The key driver for renewable energy policy is the legally binding EU 2020 target which states that 20% of the EU's energy consumption must be from renewable sources by 2020.

In Scotland, current energy policy is framed by the Scottish Government's plans to move towards a low carbon economy through progressively increasing the generation of renewable energy in Scotland, and supporting an increase in sustainable economic growth. Scotland is committed to achieving the EU 2020 target as follows:

- ➡ Renewable sources to generate the equivalent of 100 per cent of Scotland's gross annual electricity consumption by 2020.
- ➡ Renewable sources to provide the equivalent of 11 per cent of Scotland's heat demand by 2020.

The Climate Change (Scotland) Act 2009 also sets ambitious targets for carbon reduction: 42% reduction in carbon emissions to be achieved by 2020, and 80% reduction in carbon emissions by 2050.

To encourage the implementation of renewable energy the UK Government has introduced financial incentives. Some of these financial incentives, such as the current Feed-in Tariff (FiT) rate for technologies such as wind turbines and solar photovoltaics, and the Renewable Heat Incentive (RHI) for biomass, heat pumps, and solar thermal, provide payments for each unit of renewable energy generated over a period of up to 25 years.



To meet its statutory responsibilities the council needs to be part of the positive climate change agenda. As the largest land and property owner in the district there are a number of opportunities that exist for the council to utilise its assets to generate renewable energy and provide significant benefits, including:

- ▢▶ Reduction of energy costs.
- ▢▶ Generation of income.
- ▢▶ Reduction in carbon impact.

Alongside installing renewable technology within its own assets the council recognises its role in supporting individuals, businesses, community groups and partners to install renewable technology as society moves towards a low carbon economy. Investing in renewable technology can support positive outcomes for the wider community, including job creation. Further to this, financial savings for individuals and organisations in the community through investment in renewables can link to fuel security and reducing fuel poverty.

This strategy builds upon the positive carbon reduction measures already taking place within the council and is the next vital step towards ensuring that energy costs are reduced, national targets are met and that the council is leading the development of a sustainable community. This strategy links to the council's existing plans and policies including the Corporate Plan, Single Outcome Agreement and delivery of actions to meet the duties for public sector bodies within the Climate Change (Scotland) Act 2009.



RENEWABLE ENERGY TECHNOLOGY IN THE COUNCIL AND WIDER COMMUNITY

Renewable energy technology uses natural resources such as sunlight and wind to generate energy for heating and lighting. The appendix contains descriptions of some of the renewable energy technology considered in the development of this strategy.

The council recognises that technology is constantly advancing and aims to be at the forefront of such changes. In 2011 the council trialled public litter bins with solar panels which increase the capacity of the bin to accept public waste by regularly compacting it. We continue to explore innovative opportunities for renewable technology across our services.

The council's Advice Shop and Business Gateway are important services providing individuals and businesses with information on reducing energy costs. Partnership working with organisations such as the Energy Saving Trust, and community groups is also key to engaging successfully with the wider community on renewables.

There are examples of renewable energy technology working across the council area, from solar photovoltaic (PV) panels on individual houses, to large arrays of solar PV on college buildings.

West Lothian has wind farms which help power communities across Scotland, and smaller turbines supplying energy to individual properties. The council's dedicated website for community funding from windfarms distributes financial contributions from the windfarms to local communities: **www.westlothian.gov.uk/windfarms**



The council works alongside community organisations to support work on carbon reduction projects. Transition Linlithgow and Fauldhouse Community Development Trust are two community organisations actively promoting and installing renewable technology. Examples of successful renewables projects include Transition Linlithgow's solar discount scheme which has resulted in over 150 installations of both solar PV and solar thermal across the council area. The council will continue to support these projects as we work towards creating a sustainable community for all.

In addition, the council is working in partnership with other local authorities, looking at the potential of renewable technologies. The aim of these collaborations is to identify strategic sites for renewables and maximise the supply chain benefits to existing and new local companies.

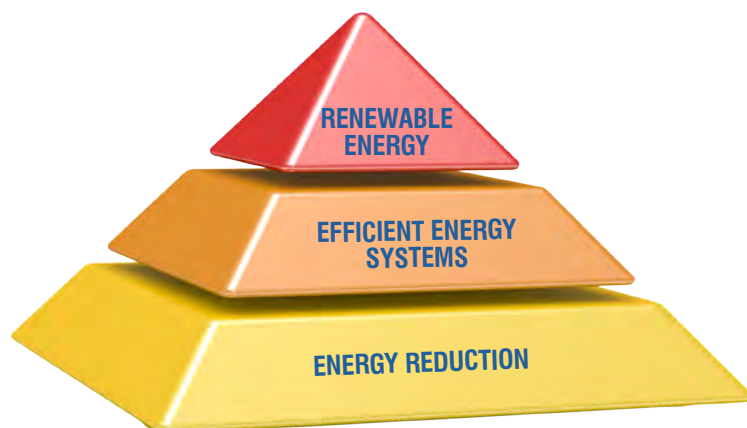
Experience from working with these groups, organisations and partners has allowed the council to develop a unique insight into the wider benefits of renewable energy. The recommendations of this strategy aim to build upon existing experience and success.



INCORPORATING RENEWABLES IN THE FUTURE

The addition of renewable energy is the third stage of the carbon reduction hierarchy.

The hierarchy is often described as **“Be Lean - Be Clean - Be Green”**.



Over the next ten years the council will continue to adopt renewable energy, where appropriate, by:

- ➡ Developing and installing solar PV and solar thermal
- ➡ Developing and installing Biomass
- ➡ Developing renewable energy and low carbon energy networks.
- ➡ Developing data to inform future decisions on renewable technology installations.

The council will also continue its leadership role to encourage and support the wider community to introduce renewable energy where this is possible.

In doing so the council will:

- ➡ Support the Scottish Government in meeting national renewable and carbon reduction targets.
- ➡ Prioritise energy efficiency where appropriate.
- ➡ Reduce energy costs.
- ➡ Stimulate the local economy and generate financial income.
- ➡ Take part in pilot projects with new technology where appropriate.

THE COUNCIL WILL SEEK TO IMPLEMENT THE STRATEGY THROUGH THE FOLLOWING KEY STEPS:

ACTION
Where appropriate, new build projects should include appropriate renewable capacity and be designed for the future addition of renewables.
Identify and prioritise sites for implementation phases of solar PV and solar thermal.
Establish solar PV and thermal installation capability of in-house staff.
Evaluate options for bio-mass supply capability.
Follow on phases of renewable installation focused on bio-mass in additional properties linked with bio-mass supply chain developments.
Identify existing and planned suitable character areas for effective local heat networks in conjunction with wider public sector.
Recognise potential for future heat networks in future planning guidance and development plans.
Where appropriate, establish active co-operation with other public sector bodies, community planning partners, third sector organisations and community groups in West Lothian.
Enhance GIS information to enable the identification of Council owned land that could potentially support renewable technologies, and undertake feasibility studies for specific renewable technologies.
Develop Economic Development role by working in collaboration with other local authorities to develop the potential of renewable technologies, both through identification of sites and maximising supply chain benefits to existing and new local companies.
Work with partners to develop the best means through which the wider community may install appropriate renewable technology.
Develop the policy framework for renewables in the wider local authority area alongside the Local Development Plan process.
Actively encourage and support householders and the community in the implementation of appropriate renewable energy installations.
Include a renewable energy evaluation for all projects as part of the Strategic Outline Business Case.
Set up a 'Green fund' where income from renewable is reinvested in further carbon reduction projects.
Establish procedures to regularly monitor technological changes.

Monitoring of progress towards the aims of the strategy will be undertaken on a regular basis by an appropriate body within the council. The climate change annual report will report on progress to the Council Executive.

RENEWABLE ENERGY TECHNOLOGIES

SOLAR PHOTOVOLTAIC (PV)

HOW IT WORKS...

Solar photovoltaic (PV) panels generate electricity from sunlight. This electricity is connected to the national grid electricity supply via an inverter. Panels are best mounted on a south facing roof or on angle brackets on a flat roof. PV modules have no moving parts and so once they are installed they require minimal maintenance.

Issues such as which direction the building faces, roof load bearing capacity and whether any structures/trees would cast a shadow on the panel are important considerations.

Feed in Tariffs (FIT) are currently available for this technology to encourage uptake and assist with national renewable targets. Systems must be installed by certified specialists to obtain any FIT. The FIT provides an income from the generation of energy and any export of energy. The amount of FIT is subject to change depending on the size of the solar panel system and UK Government reviews of the scheme.

Technical information	Refer to Scottish Government's toolkit to help community groups to develop renewable energy projects: www.scotland.gov.uk/Publications/2009/03/20155542/0
Carbon Trust Guide	A Place in the Sun: guide to help plan, build and manage cost-effective low carbon buildings: www.carbontrust.co.uk/publications/pages/publicationdetail.aspx?id=ctg038
Planning guidance	WLC Planning - Development Management: www.westlothian.gov.uk/1210/161/PlanningApplicationsEnforcement/PlanningDoYouNeedPermission

RENEWABLE ENERGY TECHNOLOGIES

SOLAR PV – THIN FILM TECHNOLOGY

HOW IT WORKS...

Thin film solar panels are commercially available for installation onto the roofs of buildings. This is either applied onto the finished roof, or integrated into the roof covering. Thin films currently account for circa 10% of global PV module sales. They are subdivided into three main families:

- i) amorphous (a-Si)
- ii) Cadmium-Telluride (CdTe)
- iii) Copper-Indium-Diselenide (CIS) and Copper-Indium-Gallium-Diselenide (CIGS).

The advantage over traditional PV panels is that they are very low in weight, are not subject to wind lifting, and can be walked on (with care). The comparable disadvantages are increased cost and reduced efficiency.

A silicon thin film technology is being developed for building integrated Photovoltaic's (BIPV) in the form of semi-transparent solar cells which can be applied as window glazing. These cells function as window tinting while generating electricity.



Thin film photovoltaic panels being installed onto a roof

Technical information	Refer to: www.solarpv.co.uk/solar-pv-laminates.html
Carbon Trust Guide	A Place in the Sun: guide to help plan, build and manage cost-effective low carbon buildings. www.carbontrust.co.uk/publications/pages/publicationdetail.aspx?id=ctg038
Planning guidance	WLC Planning - Development Management: www.westlothian.gov.uk/1210/161/PlanningApplicationsEnforcement/PlanningDoYouNeedPermission

RENEWABLE ENERGY TECHNOLOGIES

SOLAR THERMAL

HOW IT WORKS...

Also known as solar water heating (SWH) this technology uses tube collectors to absorb sunlight. Tubes are more efficient than flat plate collectors but this can be compensated by increasing the size of the flat plate collector. Solar thermal units have no moving parts and so once they are installed they will require minimal maintenance.



Solar panels

Solar thermal is designed to be integrated into a building's existing domestic hot water system.

Solar thermal systems require a south facing slope or flat roof. Issues such as which direction the building faces, roof load bearing capacity and whether any structures/trees would cast a shadow on the system are important considerations.

The UK Government currently offers a financial incentive through the "Renewable Heat Incentive" scheme for installing this technology.

Technical information	Refer to Scottish Government's toolkit to help community groups to develop renewable energy projects: www.scotland.gov.uk/Publications/2009/03/20155542/0
Planning guidance	WLC Planning - Development Management: www.westlothian.gov.uk/1210/161/PlanningApplicationsEnforcement/PlanningDoYouNeedPermission

RENEWABLE ENERGY TECHNOLOGIES

WIND

HOW IT WORKS...

Wind turbines harness the power of wind and convert this into electrical energy. Wind turbines can be directly connected to the local electricity grid as independent stand-alone units. Alternatively they can act as building-integrated off-grid units where they supply the base electrical demand for a site, or provide stored electrical power (via batteries) when excess electricity is generated. Wind turbines generally work best in exposed areas.

Turbines are either:

1. Free standing (commercial and small scale)
2. Building mounted.



Quiet Revolution's urban turbine

Technical information	Refer to Scottish Government's toolkit to help community groups to develop renewable energy projects: www.scotland.gov.uk/Publications/2009/03/20155542/0
Planning guidance	Planning Advice Note (PAN 45) Renewable Energy Technologies For turbines see Micro Renewables Annex to PAN 45 WLC Planning - Development Management: www.westlothian.gov.uk/1210/161/PlanningApplicationsEnforcement/PlanningDoYouNeedPermission

RENEWABLE ENERGY TECHNOLOGIES

HYDRO ELECTRIC

HOW IT WORKS...

Whether a small stream or a large river, running water can be used to generate electricity. Hydro systems harness the power of running water to spin a turbine which in turns generates electricity. Hydroelectric power systems are very efficient and convert 70-90 per cent of water energy to electricity.



"Archimedes Screw" turbines

Generating hydroelectric power produces no waste. Once installed, hydroelectric power systems can operate for many years.

Many small scale hydro schemes use "Archimedes Screw" turbines as illustrated. Hydro power is predictable, can be available 24/7 and can produce enough electricity for on-site electrical demand, with any excess electricity being exported to the grid.

Technical information	Refer to Scottish Government's toolkit to help community groups to develop renewable energy projects: www.scotland.gov.uk/Publications/2009/03/20155542/0 SEPA guidance for small sustainable hydro projects: www.sepa.org.uk/about_us/news/2009/sepa_guidance_for_small_sustai.aspx
Planning guidance	WLC Planning - Development Management: www.westlothian.gov.uk/1210/161/PlanningApplicationsEnforcement/PlanningDoYouNeedPermission

RENEWABLE ENERGY TECHNOLOGIES

COMBINED HEAT & POWER (CHP)

HOW IT WORKS...

Also known as co-generation, Combined Heat and Power (CHP) systems generate heat and electricity simultaneously. This is more energy efficient than conventional grid supply electricity and traditional heating boilers as the waste heat which is inherent with conventional grid electricity generation is put to good use rather than discharged to the atmosphere.

CHP comprises an engine driving a generator. The engine cooling water is used as a heat source. This dual use of the engine fuel, generally gas, results in lower overall costs and reduced carbon emissions. As a decentralised generator it contributes to the decarbonising of the power grid. For the full benefit the system must serve a balanced thermal and electrical power load. For most sites the main thermal load falls off in summer so a CHP capacity must be based on a “base load” which may be domestic hot water, swimming pool or process heating.

CHP is a common energy source for heat/energy networks.

Tri-generation expands the utilisation of a co-generation system by using heat as an energy source for absorption chillers so producing hot water & chilled water and electrical power, usually from a gas energy source.



CHP System

Technical information	Refer to Scottish Government's toolkit to help community groups to develop renewable energy projects: www.scotland.gov.uk/Publications/2009/03/20155542/0
Planning guidance	WLC Planning - Development Management: www.westlothian.gov.uk/1210/161/PlanningApplicationsEnforcement/PlanningDoYouNeedPermission

RENEWABLE ENERGY TECHNOLOGIES

HEAT PUMPS

HOW IT WORKS...

Heat pumps extract heat from a source and transfer it to a heating medium, generally water or air. They can be air source heat pumps (ASHP) or ground source heat pumps (GSHP). Heat pumps are used to provide space heating, usually via a low temperature under floor heating system. Both systems use the vapour compression refrigeration cycle to generate heat from the condenser side. Air source uses ambient air and is usually easier and cheaper to install, but is less efficient than ground source as a greater temperature lift is required during the heating season (i.e. in winter air temperature may be -3°C , whilst ground temperature may be around $+7^{\circ}\text{C}$).

Technical information	Refer to Scottish Government's toolkit to help community groups to develop renewable energy projects: www.scotland.gov.uk/Publications/2009/03/20155542/0
Planning guidance	WLC Planning - Development Management: www.westlothian.gov.uk/1210/161/PlanningApplicationsEnforcement/PlanningDoYouNeedPermission

RENEWABLE ENERGY TECHNOLOGIES

BIO-FUELS

HOW IT WORKS...

Biomass systems combust organic wood/crops to generate heat. When naturally grown wood fuel is combusted to produce heat it has a zero carbon equivalent emission. Willow trees are the current favourite for biomass power stations.

Short Rotation Coppice (SRC) is the most appropriate means of producing a sustainable supply of wood for chipping and/or producing pellets; wood chips and pellets being the sources of wood fuel that best lend themselves to automatically fed (rather than hand fed) biomass boilers.

The main issues with biomass heating systems are often access and storage of the fuel at the site/ facility. Biofuel systems burn biodiesel to generate heat. The biodiesel is typically produced from vegetable oils and works on a similar principle as an oil fired boiler.

Technical information	Refer to Scottish Government's toolkit to help community groups to develop renewable energy projects: www.scotland.gov.uk/Publications/2009/03/20155542/0
Planning guidance	WLC Planning - Development Management: www.westlothian.gov.uk/1210/161/PlanningApplicationsEnforcement/PlanningDoYouNeedPermission
Link to 'Renewable Heat Incentive – Emission Limits For Total Particulate Matter	www.defra.gov.uk/environment/quality/industrial/other-regulation/

