

Aberdeen City Council
**Alternative Energy
Strategy for Council
Owned Public Buildings**



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1. Alternative Energy Strategy

Aim

Aberdeen City Council will continue to undertake energy efficiency measures and install low/zero carbon technologies in/on Council owned assets in order to reduce overall energy consumption, reduce carbon emissions and save money.

Objectives

Objective 1: Reduce Aberdeen City Council's annual energy consumption and associated carbon emissions in line with the Council's Carbon Management Plan 2010-2015;

Objective 2: Enable low / zero carbon technologies to be installed on Council owned buildings/ assets;

Objective 3: Make financial savings as set by the Council's Five Year Business Plan;

Objective 4: Facilitate joint working with other public, voluntary and business sector partners within the region.

2. Setting the Scene

Introduction

The Government has placed an emphasis on public bodies to set a leading example on Climate Change. In particular, action by local authorities will be critical to achieving the Government's climate change objectives, such as the long term goal to reduce CO2 emissions by 80% by 2050 as set out in the Climate Change (Scotland) Act 2009 and the UK Climate Change Act 2008, as well as the legally binding target of 15% of total energy from renewables by 2020.

Aberdeen City Council has a strong track record of tackling carbon emissions which is demonstrated through local policy including the Aberdeen City and Shire Structure Plan, which sets targets for the city region's electricity needs to be met from renewable sources by 2020; the Aberdeen City Waste Strategy which aims for no more than 5% of municipal waste to be landfilled by 2025; and the Council's Carbon Management Plan 2010-2015 which sets a carbon reduction target of 23% by 2015.

What is alternative energy?

Energy used in buildings contributes roughly half of the UK's total carbon dioxide emissions.

Alternative energy simply means finding different and more efficient ways of producing this energy, which is key to tackling climate change. This approach will also help to reduce the Council's dependence on fossil fuels and from a financial perspective, decrease the impact of rising gas and electricity prices.

There are a number of alternative or low/zero carbon technologies that can be integrated into buildings. These are listed in more detail in Appendix 2. Renewable energy (effectively zero carbon) is that which is generated from resources that will not run out. Available technology can now capture the power of the sun, the wind, the tides, running water and even the heat of the earth.

Low carbon energy is that which is highly efficient and has a low production of carbon such as Combined Heat and Power.

Why do we need a strategy?

To reduce the Council's carbon dioxide emissions

In 2008/09 the Council emitted over 118,530 tonnes CO₂ to the atmosphere. This is not only damaging to the environment but under the Carbon Reduction Commitment could potentially cost the Council over £500,000 per year.

To future proof the Council from rising energy prices

In 2010/11 Aberdeen City Council spent over £8 million on energy (electricity, gas and heating oil) to heat and power the City's public buildings. This is only set to rise in future as demand for fossil fuel surpasses supply. Installing renewable technologies onto public buildings will reduce the Council's dependence on fossil fuels and decrease the Council's exposure to rising energy prices.

What does this strategy cover?

At present, this strategy will only take into account Council owned buildings and assets including buildings under the management of arms length organisations such as Sport Aberdeen and Aberdeen Performing Arts.

This strategy will not take into account Council housing or assets leased by the Council due to the differing policies which govern the social housing sector. However, it is an aspiration of the Council to include housing and leased properties in to this strategy in the future.

Whilst each project to develop alternative energy technologies will require detailed analysis and evaluation before being progressed, this strategy will provide the overall context in which future projects will be developed.

Context and Drivers

There are numerous external influences supporting the development of an Alternative Energy Strategy, most of which are either politically or financially driven. One of the main political drivers for the Council is the Climate Change (Scotland) Act 2009 which introduced ambitious, world-leading legislation to Scotland to reduce emissions by at least 80 per cent by 2050.

At a time of economic down turn, the Scottish Government has recognised the important role that renewable energy can play and has set ambitious targets to generate 80 per cent of Scotland's electricity from renewable sources by 2020 and 20 per cent of Scotland's total energy use to come from renewables by 2020.

Aberdeen City Council has also recognised the potential value of installing renewable technologies in the City not only to meet carbon reduction targets but also as a potential source of revenue generation. A full list of drivers is provided in Appendix 1.

What is the Council's current energy demand?

Figure 1 shows the Council's energy consumption for 2009/10 was almost 148,000,000 kWh or 42,125 tonnes of CO₂ with gas accounting for almost 60% of this demand, electricity almost 30%. However, Figure 2 shows the Council's energy spend for 2010/11 and although the Council's energy demand has been decreasing in recent years this still equates to an annual energy bill of over £8 million. Electricity accounts for over 60% of the total energy bill with gas accounting for almost 30%.

Figure 1: Council energy consumption in public buildings 2009/10 = 147,932,906 kWh

Council energy spend in public buildings 2010/11

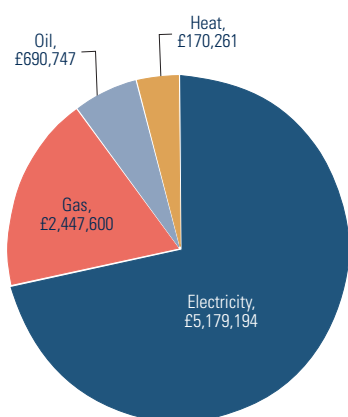
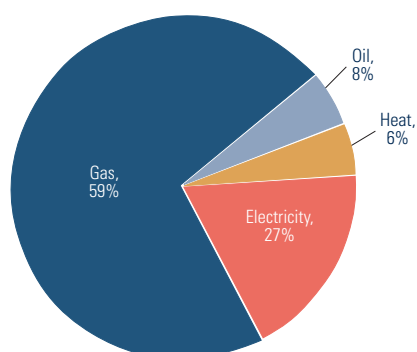


Figure 2: Council energy spend in public buildings 20010/11 = £8,487,802

Council energy Consumption in public buildings 2009/10 (Kwh)



Conditions of Strategy Delivery

It should be noted that:

- investment will only be made in Council owned buildings / assets that have a guaranteed lifespan to cover the pay back period of any works carried out;
- in conjunction with any low / zero carbon technologies being fitted to Council owned buildings / assets, energy efficiency measures will be carried out on the building / asset in question.

Technologies

There is a wide range of technologies that could be considered as being low or zero carbon and many new technologies are developing quickly. This strategy will concentrate on the more established technologies which have a reasonable degree of experience in their use in order to ensure maximum performance and value for money.

Some of the newer technologies are less developed and generally of poorer cost-effectiveness. At present, newer technologies will not feature in this strategy but will be reviewed and considered at a future date.

Appendix 2 provides an overview of the low and zero carbon technologies which this strategy will consider, giving a brief description, an indication of their possible contribution to reducing emissions and a summary of planning issues for consideration.

Available resources

The Council currently owns 330 public buildings in the City as well as other assets including land.

Each of these properties is being assessed to identify ways of reducing energy demand through the implementation of energy efficiency measures, and to determine the most appropriate type of alternative low carbon technology to meet the space and water heating needs. For each proposed alternative energy project, a feasibility study will be undertaken and fully costed business case produced.

Where the total energy demand for these public buildings cannot be met on site, options will be investigated to generate power elsewhere to offset the energy used and carbon emitted from these properties.

Finance

The Council's capital programme is set to be reduced from £40 million in 2011/12 to £17 million in 2013/14. Therefore there is very limited capital money available to implement this strategy.

In order to achieve this strategy alternative methods of financing will be developed on a case by case basis. These can range from 'spend to save' mechanisms; Private and Public instruments, joint ventures, partnerships etc. This strategy will ensure that all financial models are considered and any available financing is fully utilised.

3. Taking the Strategy Forward

Implementation

Implementation of the Alternative Energy Strategy will require commitment from the Council, its staff and stakeholders. This will include partnership working, disseminating information and providing financial support.

Successful implementation will also require a commitment to developing an action plan to deliver the projects on the ground, based on the following strategic actions.

Objective 1	Reduce Aberdeen City Council's annual energy consumption and associated carbon emissions in Indicator / Parameter line with the Council's Carbon Management Plan 2010-201	Indicator / Parameter
Strategic Action 1.1	Identify the buildings / assets with the greatest energy consumption and carbon emissions and target these first.	Energy consumption data
Strategic Priority 1.2	Ensure buildings / assets identified for alternative energy technologies are energy efficient.	Energy consumption data before and after / Carbon Management Plan Annual Footprint
Objective 2	Enable low / zero carbon technologies to be installed on Council owned buildings / assets	Indicator / Parameter
Strategic Action 2.1	Identify suitable buildings / assets for alternative energy technologies.	Asset Management Plan
Strategic Priority 2.2	Commission studies to identify suitable buildings / assets for alternative energy technologies.	Complete Heat Plan and Site feasibility as part of EU Projects
Strategic Priority 2.3	Work with Officers across the Council to develop project feasibility studies.	Number of feasibility studies undertaken
Strategic Priority 2.4	Work with Officers across the Council to implement alternative energy projects.	Number of alternative energy technologies installed
Objective 3	Make financial savings as set by the five year priority based budget	Indicator / Parameter
Strategic Action 3.1	Research potential funding sources / financial model case studies and implement	Number of case studies / amount of financial savings made
Objective 4	Undertake joint working with other public, voluntary and business sector partners with the region	Indicator / Parameter
Strategic Action 4.1	Identify business partners who are willing to deliver alternative energy projects in conjunction with Council	Number of business partners involved
Strategic Priority 4.2	Explore models for delivering alternative energy projects in conjunction with community partners	Number of partnership projects developed

Monitor and Review

The Alternative Energy Strategy will be reviewed and updated on a regular basis and reported through current and future annual reporting mechanisms.

Successful implementation will be monitored through the indicators / parameters as outlined in the tables above.

Appendix 1: Drivers and Policy Context

Financial Drivers

Potential to save the Council money:

The Council has recently completed a priority based budget exercise which identifies potential savings of £127m over the next five years. Within the budget there are financial savings attributed to improved energy efficiency in Council buildings and renewable energy technologies. Reducing energy demand in Council buildings and installing renewable energy technologies will create financial savings for the Council as well as reducing the Council's carbon footprint.

Carbon Reduction Commitment Energy Efficiency Scheme (CRC):

is a mandatory scheme aimed at improving energy efficiency and therefore cutting CO2 emissions in large public and private sector organisations. These organisations are responsible for around 10% of the UK's CO2 emissions. The scheme features a range of reputational, behavioural and financial drivers which aim to encourage organisations to develop energy management strategies to reduce energy usage and carbon emissions.

UK Government Clean Energy Cash Back Scheme:

the UK Government recently announced the introduction of a clean energy cashback scheme which pays people for creating their own "green electricity". With the introduction of this scheme there is now the opportunity for renewable installations to deliver a financial return from the electricity/heat generated during the lifetime of the equipment by way of a pre-determined tariff set by the UK Government. The tariff rate varies depending on the type of technology in use and the source of the power and rates are reviewed annually.

International / National Policy

Europe 2020:

calls for sustainable growth: promoting a more resource efficient, greener and more competitive economy. It also calls for inclusive growth: fostering a high-employment economy delivering social and territorial cohesion. Such requirements may be fulfilled through this strategy.

Climate Change (Scotland) Act 2009:

Part 4 of the Act places duties on public bodies relating to climate change. The duties on the face of the Act (section 44) require that a public body must, in exercising its functions, act:

- in the way best calculated to contribute to delivery of the Act's emissions reduction targets;
- in the way best calculated to deliver any statutory adaptation programme; and
- in a way that it considers most sustainable.

The duties came into force on 1 January 2011 and apply to all public bodies.

Scotland's Zero Waste Plan (2010):

sets out key actions, including new targets, to tackle the near 20 million tonnes of waste produced by Scotland every year. The two new targets that will apply to all waste are 70 per cent target recycle and maximum five per cent sent to landfill, both by 2025. Action 10 of the Plan recognises that energy from waste has an important role to play in the delivery of the Low Carbon Strategy and states that the Scottish Government will "support the utilisation of renewable energy generated from resource management facilities thereby contributing to Scotland's renewable energy targets." Energy from waste could contribute up to 31% of Scotland's renewable heat target and up to 4.3% of Scotland's renewable electricity target.

Scotland's Climate Change Declaration:

all 32 Scottish Local Authorities have signed the declaration and pledge to ensure that greenhouse gas reduction and climate change adaptation measures are clearly incorporated into our new and existing strategies, plans and programmes.

Scottish Planning Policy: Planning Advice Note (PAN) 45: Renewable Energy Technologies supports the policies in NPPG 6 by providing information and best practice on renewables developments, particularly larger installations such as wind farms and waste to energy plants.

Local Policy

Aberdeen City and Shire Structure Plan (2009):

sets targets for the city region's electricity needs to be met from renewable sources by 2020 and for all new builds to be carbon neutral by 2016.

Aberdeen City Waste Strategy (2010):

provides a statement of the key outcomes for all waste management in the city for the next fifteen years and provides a framework for the development of the next generation of waste infrastructure and services. Key points of this strategy include -

- **Goal 6:** Recover value from all waste
- **Objective 7:** Ensure that residual waste is treated as a resource recovering both energy and value where possible at every stage.
- **Objective 9:** Work to establish a commercial environment that facilitates the expansion of district heating infrastructure.

Aberdeen City Council's Carbon Management Plan 2010-2015:

is a five year plan which sets out key activities and projects that will enable the Council to reduce carbon emissions to meet our target of a 23% reduction carbon dioxide emissions by 2015 (using a 2008/09 baseline).

Aberdeen City and Shire Economic Future (ACSEF) Building on Energy Manifesto:

aims for the Aberdeen City Region to be recognised as one of the most robust and resilient economies and a location of choice for renewable energy organisations.

Aberdeen City Council proposed Local Development Plan:

is due to be adopted in 2012. There are several policies included in the proposed plan which are important to the Alternative Energy Strategy. These include:

- Policy R3 - New Waste Management
- Policy R4 - Sites for New Waste Facilities
- Policy R5 - Energy from Waste
- Policy R6 - Waste Management Requirements for New Development
- Policy R7 - Low and Zero Carbon Buildings
- Policy R8 - Renewable and low carbon energy developments

Further details of each policy can be found in the proposed local development plan:
<http://www.aberdeencity.gov.uk/nmsruntime/saveasdialog.asp?IID=31978&slD=14413>

Proposed Supplementary Guidance on Low and Zero Carbon buildings: The purpose of this supplementary guidance is to provide the methodology for developers to demonstrate compliance with Aberdeen Local Development Plan policy R7, which requires all new buildings to install low and zero carbon generating technology.

Appendix 2: Overview of Available Technologies¹

This strategy will consider a number of alternative energy technologies some of which are outlined below. It should be noted that for Council owned public buildings planning permission for alternative energy technologies is not required unless the equipment is valued over £100,000. If the equipment is valued over £100,000 then planning permission must be sought.

Technology: Heat Pumps

Ground source, air source and water source heat pumps are three different ways of extracting ambient temperature and using that heat in your property. They work like fridges only in reverse. In other words, the heat pumps take heat from a source (the ground, the air or the water) and pump it into the hot water system in your building. The heat pump uses electricity to extract the heat, but delivers typically 2½ to 4 kW of heat for every kW of electricity used. They also work effectively when the outside temperature is freezing.

Capital cost per kW: Medium - High

Running costs: Low

Payback period: Low - Medium

Lifetime CO₂ reduction per £: High

Technology: Solar thermal

Solar water heating is a well-established renewable energy system in many countries outside the UK. Solar hot water can be applied in a number of non-domestic building types, such as hospitals, nursing homes and leisure facilities, which have high demands for hot water. These systems are not often installed in commercial buildings, due to the hot water demand being lower.

Capital cost per kW: Low - Medium

Running costs: Low

Payback period: Low - Medium

Lifetime CO₂ reduction per £: High

Technology: Solar (photovoltaic)

Photovoltaic (PV) systems use cells to convert solar radiation into electricity. When light shines on the cell it creates an electric field across the layers, causing electricity to flow. The greater the intensity of the light, the greater the flow of electricity. A PV installation can be sized to generate carbon zero electricity to a level equivalent to any percentage of the total carbon emissions of the building subject to there being sufficient suitable surface area to mount the required area of PV.

Capital cost per kW: High

Running costs: Low

Payback period: High

Lifetime CO₂ reduction per £: Medium

Technology: Wind power

Wind turbines work through the wind turning the blades which are linked to an internal generator which produces electricity. The stronger the wind, the more electricity is produced. In order to generate worthwhile quantities of electricity, average wind speeds of more than 5 metres per second (approx 11 miles per hour) are typically required.

Capital cost per kW: Medium - High

Running costs: Low

Payback period: Low - Medium

Lifetime CO₂ reduction per £: High

Technology: Hydro

Hydro power is any system that generates electricity from water. On a commercial scale, the UK has had hydro dams in Scotland and Wales for many years. The most common technology involves turbines placed in running water to generate electricity.

Technology: Combined Heat & Power / Micro CHP

Combined heat and power (CHP) refers to the simultaneous generation of electricity and heat in the form of hot water or steam. CHP is also referred to as 'cogeneration'. Electricity is generated using an engine or a turbine, with heat being recovered from the exhaust gases and cooling systems. The fuel supply can come from a variety of sources identified below. CHP can also employ fossil fuels such as natural gas and have a significant efficiency advantage over traditional, electricity only power generation.

Capital cost per kW: Medium

Running costs: Low - Medium

Payback period: Medium

Lifetime CO₂ reduction per £: High

Technology: Biomass CHP

Biomass boilers are essentially big boilers that burn wood rather than gas or oil. For the purposes of this strategy biomass fuel is taken to be carbon neutral over the lifecycle. In practice, if biomass fuel is obtained from a local source (<25 miles) this is a safe assumption.

Capital cost per kW: Medium

Running costs: Low - Medium

Payback period: Medium

Lifetime CO₂ reduction per £: Medium - High

Technology: Anaerobic digestion CHP

Anaerobic Digestion (AD) is a way of processing biomass sources such as energy crops, farmyard residues or food waste. The input material is broken down by naturally occurring micro-organisms in the absence of air, creating a biogas which can be used to generate electricity (CHP), biofuel and can be fed directly into the gas grid. AD also produces a solid residue known as digestate, which can be used as a fertiliser. The process is not suitable for woody biomass as the micro-organisms cannot breakdown the lignin in the wood.

Technology: Energy from Waste CHP

There are many different technologies available for the treatment of residual waste to produce energy. The main technologies are described below:

Incineration

The input material is burned in a furnace in the presence of oxygen causing full combustion. The by-products of this process include: heat, exhaust gases, bottom ash and salvageable ferrous metals. Excess heat from the furnace can be put through a boiler/steam turbine and used to generate CHP. Bottom ash can be used as an aggregate and exhaust gases are cleaned in line with pollution control regulations, prior to release.

Gasification and Pyrolysis

Gasification and pyrolysis differ from incineration, and each other, due to the amount of oxygen present during the process. Gasification restricts the amount of oxygen in the heating chamber, resulting in partial combustion and pyrolysis treats the waste in the absence of oxygen. Both gasification and pyrolysis produce similar outputs, mainly syngas and char. The syngas is cleaned and put through a boiler/furnace/gas engine to generate CHP. The char can be put to use as an aggregate.

Further sources of information:

The Scottish Government, Planning for Micro Renewables Annex to PAN 45 Renewable Energy Technologies:

<http://www.scotland.gov.uk/Publications/2006/10/03093936/0>

The Energy Saving Trust, Generate your own energy guidance:

<http://www.energysavingtrust.org.uk/Generate-your-own-energy>