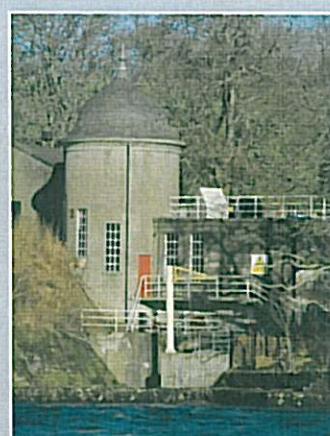
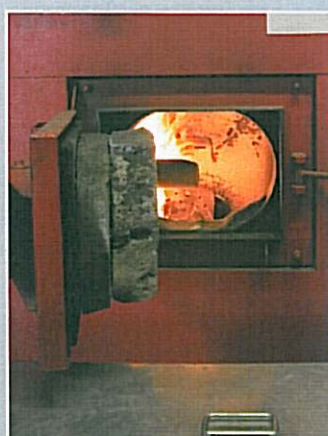


**Managing
Change
in the Historic
Environment**



Micro-Renewables



October 2010

Key Issues

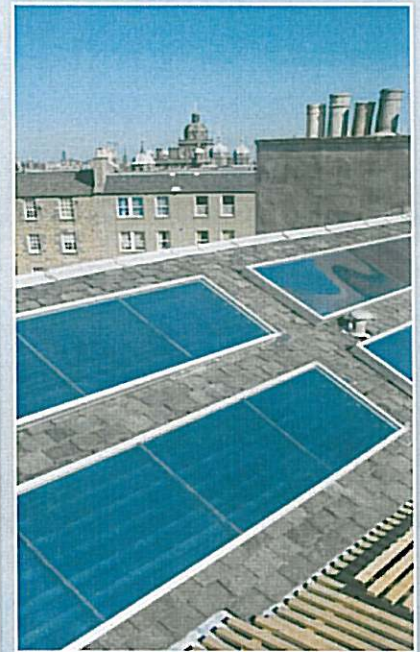
- 1. Listed building consent is required for any works affecting the character of a listed building and planning permission may be required for some types of micro-renewable equipment in a conservation area. Scheduled monument consent is always required for works to scheduled monuments.**
- 2. Many historic buildings or places lend themselves well to some form of micro-renewable energy generation. The micro-renewable installation must be planned carefully to maintain the historic character of each site and to make best use of the available renewable energy sources.**
- 3. Different types of micro-renewable technology suit different locations, and sometimes more than one type can be used in combination.**
- 4. Redundant equipment that is not of historic interest should be removed from buildings or their settings as soon as possible after it becomes inoperable or is superseded.**
- 5. Planning authorities give advice on the requirement for listed building consent, planning and other permissions.**

1. INTRODUCTION

- 1.1 This is one of a series of guidance notes on managing change in the historic environment for use by planning authorities and other interested parties. The series explains how to apply the policies contained in the *Scottish Historic Environment Policy* (2009) ([SHEP](#), PDF 312K) and *The Scottish Planning Policy* (2010) ([SPP](#), PDF 299K).
- 1.2 This note sets out the principles that apply to applications for micro-renewable energy developments affecting historic buildings, monuments and places. The use of renewable energy technology is supported where the character of the historic building or place can be protected through careful siting and design. The guidance makes no recommendation as to one type or brand of micro-renewable technology over another: the circumstances of each site needs individual assessment. This guidance note should inform planning policies and the determination of applications relating to the historic environment.
- 1.3 Monuments scheduled under the Ancient Monuments & Archaeological Areas Act 1979 require scheduled monument consent for any works. Where a structure is both scheduled and listed, the scheduling controls have precedence. Separate advice is available from Historic Scotland's website: [Scheduled Monuments: Guidance for Owners, Occupiers & Land Managers](#) (PDF 718K).

2. BACKGROUND

- 2.1 For the purpose of this guidance, 'renewables' are defined as energy forms that are essentially replenishable, unlike fossil fuel sources, which are finite. 'Micro-renewables' are small-scale non-commercial renewables using zero or low-carbon technologies to provide heat, hot water and/or electricity.
- 2.2 Increased use of renewable energy, including micro-renewables, can make an important contribution to efforts to reduce carbon emissions in support of climate change and renewable energy objectives. The Scottish Government has set a target to generate 50 per cent of Scotland's electricity from renewables by 2020, with an interim target of 31% by 2011. Micro-renewables are expected to play an important role in meeting (or exceeding) these targets, and the historic environment will be able to play a part.
- 2.3 Energy efficiency of the fabric should be optimised before considering installation of micro-renewable technology. Various aspects of policy guidance on energy conservation measures for historic buildings are set out in other titles in this series. Further information is given at the end of this leaflet.



*Above and below:
Part of a block of seven early
19th-century tenements in use by a
housing association in Edinburgh.
As part of the Renewable Heritage
Project, led by Changeworks in
partnership with Lister Housing
Co-operative and Edinburgh World
Heritage, solar water heating panels
have been fitted to the inner south-
facing slopes of the valley roofs
to provide 50% of the hot water
requirements of all the occupants.
The new panels are not visible from
the ground, or in views from higher
vantage points. Energy conservation
measures, such as secondary glazing,
are also in place.*





Montgarrie Mills, Alford, Aberdeenshire, built on an older mill site in 1886. The five pairs of millstones continue to grind oats to oatmeal.

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The refurbished Boving turbine (1930) at New Lanark World Heritage Site has 500kW generating capacity.
© New Lanark Trust.

3. TYPES OF MICRO-RENEWABLE ENERGY

- 3.1 The principal renewable energy sources currently suitable for widespread microgeneration include thermal (ground, water, air), hydro, biomass, solar and wind. There are a number of different technologies and types of equipment available for exploiting each energy source. Sometimes two or more different energy sources and technologies can operate together to maximise renewable energy (e.g. photovoltaic panels can provide the energy to power a ground - or air - source heat pump). Domestic combined heat and power (microCHP) systems require a separate renewable or fossil power source, but can substantially improve energy efficiency. Hydrogen and fuel-cell technologies are not yet widely available, but offer significant potential for future use.
- 3.2 Each type of equipment has specific site requirements, and not all equipment is suitable in technical terms for every location.

4. PRINCIPLES FOR NEW MICRO-RENEWABLE DEVELOPMENT AFFECTING HISTORIC BUILDINGS OR PLACES AND THEIR SETTINGS

Establish what is significant about the building or place and its setting

- 4.1 In planning micro-renewable developments, it is important to start by identifying the significance and character of the historic building or place and its setting, as well as the appropriateness of the proposed technology.
- 4.2 The original purpose, style, height, profile, materials and details of a building can all be factors in defining its character. These factors can play a similar role in groups of historic buildings or streetscapes. Whilst some buildings are designed to be seen from all directions, other buildings may have parts of lesser interest or less visible elevations.
- 4.3 For further guidance on setting see the *Managing Change in the Historic Environment: Setting* guidance note.

Identify potential impacts

- 4.4 Physical impacts on a historic building can include the removal of historic fabric, the attachment of fixtures, or the operational effects of equipment (vibration, emissions etc.). Some micro-renewables will have a fixed life, and this should be taken into consideration when making a fixing. The physical impacts on the setting of the building must also be considered. Physical impacts on the ground can also impact on archaeology.
- 4.5 In relation to the importance of the historic buildings or places the most significant impacts are likely to be visual. Equipment that covers over or replaces historic fabric in obtrusive locations,

or is visible in the profile of the building or a street, is likely to have an adverse effect on the historic character of the building or streetscape/townscape.

- 4.6 Free-standing equipment may also impact on the setting of a historic building if it is located in principal views to or from the building, or interrupts designed spatial relationships with other buildings or natural features. Noise, emissions and vibration are other sensory factors that are considered as amenity issues in relation to planning permission.

Siting and Design

- 4.7 Most micro-renewable developments require a generator and associated equipment and cabling for transforming and distributing heat/electricity. Some equipment can be housed internally, and some requires an external location. External equipment must be sited in the least conspicuous location available and any protective housing should be designed to be as unobtrusive as possible. Existing outbuildings should be considered for housing or mounting equipment. Careful planning of cabling and pipework can also minimise impact by specifying the minimum necessary diameter and length, and by routing to avoid principal elevations. Interior equipment and cabling/pipework should similarly be located to avoid damage to significant historic spaces. New extensions to listed buildings can often be designed from the outset to incorporate micro-renewable technology to provide energy for the historic building.
- 4.8 Where a building, or complex of buildings, is in multiple ownership or occupation, the visual impact of micro-renewable equipment can be minimised and the installation costs reduced by design of a single system to service the whole building or complex.

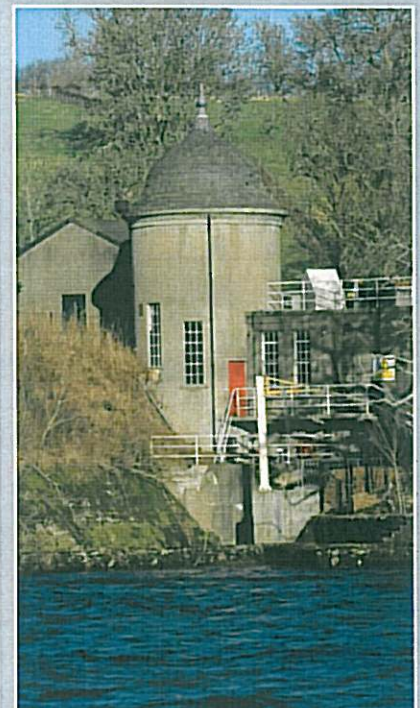
5. CONSIDERATION OF THE REQUIREMENTS FOR EACH MAIN TYPE OF MICRO-RENEWABLE TECHNOLOGY

Heat pumps

- 5.1 Heat pumps exploit the variation in temperature between one place and another. There are three energy sources on which heat pumps rely: ground, water and air. The principle of heat transfer is similar in each case, but the equipment required is different for each energy source and varies between manufacturers. Electricity, which can also be generated renewably, is required to run the pumps.
- 5.2 Ground-source heat pumps require long lengths or coils of special-grade pipe to be laid in either a horizontal trench or a vertical borehole. Once installed, the pipework can be covered over with soft or hard surfaces. The pump equipment generally



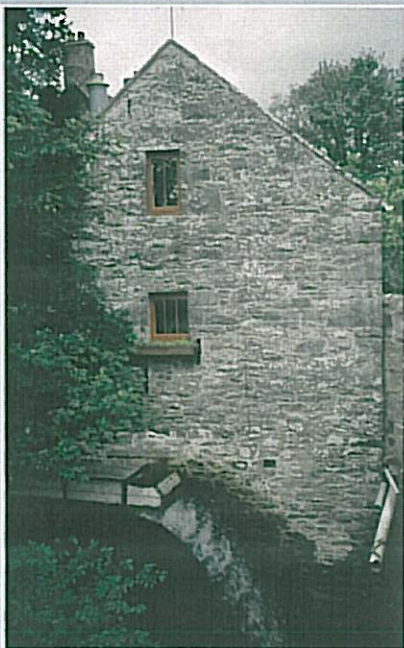
Blackhouses at Garrannan, Isle of Lewis, refurbished for self-catering holiday and hostel accommodation. Three ground-source pumps totalling 51kW output were installed at one central location to service seven cottages. The effect on the character of the buildings is minimal. © Crown copyright: RCAHMS. Licensor www.rcahms.gov.uk.



The 1921 turbine house, Stanley Mills, Perth & Kinross, recently refurbished as part of a new hydro-electricity scheme to supply power to the grid. At 840 kW the scheme is significantly larger than a standard micro-renewable development, but it demonstrates the potential for reuse of an existing historic hydro site.



Morgan Academy, Dundee, where micro-renewables have been incorporated sensitively. Ground- and air-source heat pumps are powered by photovoltaic panels located in the hidden valleys of the roof.



A former corn mill in the Scottish Borders, where a waterwheel was re-introduced to power a pump for a ground-source heat system. The historic mill pond, cauld, lade and wooden launder (trough) were all reused to drive the new wheel.

comes in one or two units and needs to be housed within and/or adjacent to the building to be heated. The principal considerations for historic features are the need to avoid damage to underground archaeology and the need to find an unobtrusive location for the pump equipment and any surface pipework.

- 5.3 Water-source heat pumps have similar requirements to ground-source pumps, but must be located close to a body of water. Careful design and siting of the equipment and its housing can usually minimise the effects on a historic site. In many cases historic millponds can be suitable locations for water-source heat pumps.
- 5.4 Air-source heat pumps normally have two main parts, split between indoors and outdoors. The outdoor unit includes the outdoor heat exchanger, the compressor and a fan. The indoor unit contains the indoor heat exchanger and the fan that distributes heated or cooled air to the distribution system of the house. Some systems have a second indoor cabinet that contains the compressor. More recent developments in this technology include internal roof-space heat exchangers that utilise the heat generated from solar gain of the existing roof covering and exhaust air heat pumps that use heat from internal areas such as kitchens or bathrooms. Again the sensitive design and siting of the pump, its housing and associated cabling, ducting and other equipment are the principal considerations.
- 5.5 An issue to consider is that many heat pumps distribute heat through underfloor heating, this often requires setting of heating coils in a concrete floor slab. This can be damaging to historic floors.

Hydro

- 5.6 Most modern small-scale hydropower systems use the kinetic energy of flowing water to power a turbine. In most systems, an intake, usually beside a cauld (weir), diverts water through a pipeline to a turbine house, in which water falls over a turbine and drives a generator to produce electricity. Depending on the site, such schemes typically require the construction of a small weir, pipeline, turbine house, and transmission infrastructure. Where these works affect a historic building or its setting, impacts can normally be minimised by careful selection of sites, equipment, building designs, materials, colours, and routing of pipes and cables.
- 5.7 There is increasing interest in the potential for reuse of old mill sites and waterwheel technology to generate electricity or to drive pumps. Where possible, the repair and reuse of historic caulds, mill lades (feeder channels), turbines and waterwheels is encouraged. Electricity generation requires the installation of an induction motor/generator to replace the direct mechanical gearing. Recording and retention of any existing historic mechanism is recommended.

Biomass

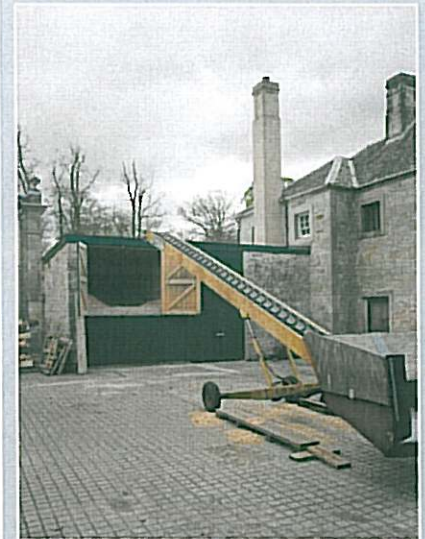
- 5.8 A wide variety of biomass energy sources derive from energy crops or agricultural/municipal/industrial wastes. Small-scale biomass developments are predominantly based on various types of wood fuel. Typically these developments require wood-burning equipment, a boiler house, fuel storage, pipework, and chimneys/flues. In some cases additional accumulator tanks can improve the efficiency of the system.
- 5.9 The general principles of careful siting and design apply to this type of development. Particular care must be given to the location of chimneys/flues and the fuel storage facility. Many older historic buildings were built with solid fuel heating in mind, and contain space for stoves and flues in existing fireplaces and chimneys, which would allow these original features to be brought back into use. Where possible the reuse of existing chimneys is encouraged. If a new chimney or flue is required, it must be designed and located to be unobtrusive in views of the building.

Solar

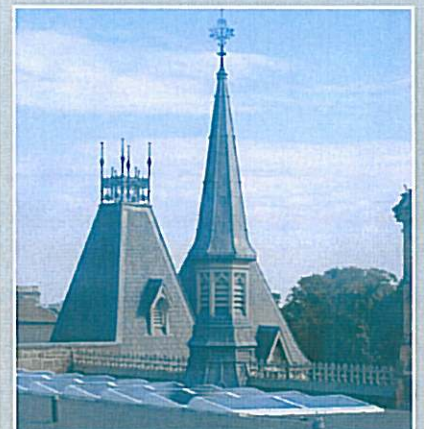
- 5.10 The main types of solar micro-renewable development are solar thermal heating for water and photovoltaic electricity generation. Solar thermal heat is usually derived from panels, either set on roofs or freestanding. Photovoltaic technology is also available in panels, but is increasingly incorporated into building materials such as roof tiles and glazing. Both types of development require pipework/cabling and distribution equipment.
- 5.11 Wherever possible, solar micro-renewable developments should be installed on inconspicuous areas of a roof, such as the inner slopes of a roof valley, or where a flat roof is obscured by a parapet. Principal elevations should always be avoided, and consideration given to the appearance of the development in views of the building from higher vantage points. For the integrity of the building it is usually desirable to mount photovoltaic modules as panels over existing slates, rather than replace historic fabric with look-alike photovoltaic materials in the form of slates. This will also allow straightforward replacement or upgrade in the future.

Wind

- 5.12 Wind turbines are either building-mounted or free-standing. Building-mounted turbines are often not advised, in large part due to the fact that larger turbines are generally more efficient and generate more meaningful amounts of power. Building-mounted turbines also have the potential to cause vibrations damaging to historic fabric, and to have an adverse visual impact through breaking of the building profile and movement of the blades. Free-standing, mast-mounted turbines have the additional advantage that they require fewer works to the historic building, and can generate its power from a different



*Above and below: an ancillary building at Arniston House, Midlothian, was converted to a boiler room and fuel storage for a 460kW wood-chip biomass system. The new flue is detailed to match the existing chimneys. Wood-chip fuel is sourced locally and fed into the store using a moveable agricultural conveyor.
© N. Haynes.*



Photovoltaic panels located discreetly on hidden parts of the roof at Morgan Academy, Dundee. The panels power a ground-source heat system.



Above: A small scale wind turbine in a domestic setting in Bladnoch, Dumfries and Galloway.

(albeit adjacent) location. The general principles for development affecting the setting of a historic building must be taken into consideration in choosing a site for free-standing turbines. Historic Scotland's *Managing Change in the Historic Environment: Setting* guidance note gives further information.

Cumulative effects

- 5.13 Local authorities should consider the potential incremental and cumulative effects of micro-renewable development on the historic environment. They may consider it appropriate to produce specific policies or guidance for significant groups of historic buildings or places.

Archaeology

- 5.14 It is possible that archaeological resources survive within or beneath a historic building or place. Planning authorities should seek to manage archaeological issues, such as recording or preservation in situ.

6. CONSENTS

- 6.1 Listed building consent is required for any work to a listed building that affects its character. The local authority determines the need for consent.
- 6.2 Although planning permission is not required for some types of micro-renewable development; however listed building consent is required for most works to listed buildings and scheduled monument consent is required for all works to scheduled monuments. Other restrictions apply to some types of microgeneration in conservation areas and World Heritage Sites. Advice is available from local authorities.
- 6.3 Where listed building consent is required, an application must be made to the local authority. It should include accurate scale drawings showing the existing situation and proposed scheme with its associated equipment in context. It is always helpful to provide detailed technical information and photographs.

Below: Westray Parish Church in Orkney became self-sufficient in energy with a 6kW wind turbine, ground-source heat pump and back-up diesel generator. The turbine is far enough (80m) from the building to avoid turbulence or, from some viewpoints, intrusion into setting. © EASE Archaeology.



FURTHER INFORMATION AND ADVICE

Details of all individual scheduled monuments, listed buildings, designated gardens and designed landscapes, and designated wrecks can be obtained from Historic Scotland (see contact details below) or at: www.pastmap.org.uk. Details of listed buildings can also be obtained from the relevant local authority.

Advice on the requirement for listed building consent, conservation area consent, building warrants, and other permissions/consents should be sought from local authorities. Advice on archaeological sensitivity should be obtained from the planning authority's archaeological adviser at an early stage.

Historic Scotland
Longmore House
Salisbury Place
EDINBURGH
EH9 1SH

Tel: 0131 668 8981 or 8717
Fax: 0131 668 8765
E-mail: hs.inspectorate@scotland.gsi.gov.uk
Web: www.historic-scotland.gov.uk

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Cover images

Changeworks' Renewable Heritage Project. Solar panel installation in a tenement roof valley, City of Edinburgh.

Wood-chip biomass boiler, Arniston House, Midlothian. © N. Haynes, by kind permission of the Arniston Estate.

Water turbine, Stanley Mills, Perth & Kinross.

Other selected Historic Scotland publications and links

[Inform Guide: Energy Efficiency in Traditional Homes](#) (2008) (PDF 715K)

Other selected publications and links

Scottish Government, [Planning Advice Note \(PAN\) 45: Renewable Technologies](#) (revised 2002)

Scottish Government, [PAN 45 Annex 1: Planning for Micro-Renewables](#) (2006)

Changeworks, [Renewable Heritage](#) (2009) (PDF 700Mb) and [Energy Heritage](#) (2008) from www.changeworks.org.uk

Selected contacts

Community And Renewable Energy Scotland (CARES)
Community Energy Scotland
2b Fodderty Way
Dingwall Business Park
DINGWALL
IV15 9XB

Tel: 01349 860120
E-mail: info@communityenergyscotland.org.uk
Web: www.communityenergyscotland.org.uk/cares.asp

Energy Saving Scotland home renewables grants
Tel: 0800 512012
Web: www.energysavingtrust.org.uk/scotland/Scotland-Welcome-page/At-Home/Grantsand-offers/Energy-Saving-Scotland-home-renewables-grants