Microgeneration

Snapshot: Microgeneration has an important role to play in reducing carbon emissions from both domestic and commercial properties. Microgeneration technologies can contribute towards our national targets for reducing greenhouse gas emissions by 80% by 2050, as required by the Climate Change (Scotland) Act 2009, and to targets for electricity and heat from renewable sources as well as supporting sustainable economic growth.

Growth in the use of microgeneration technology can also help alleviate fuel poverty and improve fuel security by increasing access to more affordable and locally available supplies of both electricity and heat.

To date, even with the Permitted Development Rights which apply to microgeneration technologies, there has been limited growth in the number of microgeneration installations.

However, there is an onus upon planning authorities to respond to the Climate Change (Scotland) Act and Section 3F of the Town and Country Planning (Scotland) Act 1997, which requires Local Development Plan policies for emissions reduction of new buildings through the use of renewable energy technology.

Scottish Planning Policy (SPP) supports investment in renewable energy projects at all scales of development, including microgeneration.

Additionally, the existing Feed-In-Tariff Scheme (FIT) and the forthcoming Renewable Heat Incentive (RHI) could positively influence demand in the sector.

Suggested areas of focus for planning authorities:-

- Give active consideration to the role of microgeneration in responding to the statutory requirement set out in Section 3F of the Town and Country Planning (Scotland) Act 1997 in preparing greenhouse gas emissions policy in development plans
- Gather data which provides indicators of installations within area as part of the monitoring and evidence base for the preparation of Main Issues Reports and LDPs and consider the scope for different types of microgeneration in the area
- Provide supplementary guidance on information needs / local design considerations with regard to microgeneration to support pre-application meetings and the assessment of proposals for microgeneration.
- Be aware of headline FIT / RHI incentives that could influence demand for particular microgeneration technologies in the area.
- Consider staff learning and development needs in microgeneration
- Use of planning conditions (and agreements) that are reasonable and proportionate to the impact of microgeneration.

Opportunities for planning authorities

Stage in Planning Process	Possible Actions

Monitoring and Evidence Base	• Planning authorities, in order to inform policies and guidance for microgeneration, to
	  ○ compile database of microgeneration installations in area
	  ○ identify local opportunities for renewable heat through heat mapping
	  ○ identify barriers (e.g. areas of sensitivity for natural or cultural heritage) and possible mitigation

Main Issues Report	• Planning authorities could consider opportunities for microgeneration as a main issue or part of a main issue after undertaking a renewable energy resource assessment of their area. Different scales / types of technologies may have greater / lesser suitability depending on urban/ rural context.
Spatial Planning	• There is likely to be limited scope for spatial planning of microgeneration, with the possible exception of micro-hydro and micro-biomass schemes. • Heat Mapping could be used to identify the best locations for micro-biomass. Heat mapping contains useful layers of information on household condition, housing density, grid connectivity, fuel poverty and woodfuel resource. It links supply and demand. A Scottish Government sponsored pilot project undertaken by Highland Council is now being followed up with a heat map in Fife and Perth and Kinross. This will also help developers and domestic property owners identify areas where the greatest opportunity exists for various forms of renewable heat microgeneration including micro-biomass.

Drafting Development Plan Policy	• Planning authorities to consider the role of microgeneration in drafting development plan policy to comply with Section 3F of the Town & Country Planning (Scotland) Act 1997.
	• Policy should set out the relevant criteria for considering microgeneration proposals, which may include:
	  ○ potential impact on sensitive landscape, natural and built heritage;
	  ○ potential impact on residential amenity, visual amenity and tourism;
	  ○ potential cumulative impact where there are other existing or proposed microgeneration developments.
	• Development plan could be supported by supplementary guidance on technologies and possible impact mitigation.

Development Plans Action Programmes	• Consider setting up a local task group with community representative(s) to identify appropriate locations for community microgeneration schemes and to help overcome barriers to deployment, feeding back to the planning authority for development plan review.

Strategic Environmental Assessment (SEA) of Spatial Guidance and Development Plans	• Ensure that monitoring focuses on key issues for the SEA such as likely effects on natural heritage species and habitats; cultural heritage and cumulative effects. • The planning authority should consider whether an Appropriate Assessment would be required where there is the possibility of multiple micro-hydro installations within a designated water course and to consider how this issue ties into the SEA.
Pre-Application Stage	• Pre-application discussion can help communicate Permitted Development Rights, determine whether proposals require planning permission, identify likely consultees, determine via screening whether Environmental Impact Assessment is necessary, offer tips on information needs and design, and direct applicants to sources of information where other consents are required. • Planning authorities could consider alternative mechanisms for pre-application advice to applicants such as drop-in sessions, guides and online tools which might be particularly suited to microgeneration proposals.
Securing Sufficient Information to Determine Planning Applications	• Information requests for microgeneration need to be proportionate to the scale of development, as early as possible in the planning process, in close consultation with key consultees. • Engage agencies and stakeholders at an early stage in the process to assist in timely determination of applications. Any such participation should be proportionate to the scale of the development.
Determining Planning Applications	• Planning authorities should draw on experience in dealing with microgeneration proposals to develop best practice, reflecting this in supplementary guidance where appropriate. • SEPA has compiled a useful checklist of its requirements for run-of-river hydropower schemes, including micro-hydro schemes. The checklist includes information to help potential developers identify sites where obtaining a water use licence is likely to be straightforward. SEPA's guidance also sets out the mitigation it will require to protect the water environment. • Planning authorities are encouraged to ensure proportionate and reasonable conditions are applied to planning consents and have regard to the scale of development and likely impact, with consideration for the tests set out in Circular 4/1998. • Planning authorities should consider specialised training for staff and decision-takers on the most regular / likely forms of microgeneration within their area. Training on the issues raised by specific microgeneration equipment and aspects of siting and technical efficiency could assist in the determination process.

Technical Information for Microgeneration

Definition: Sometimes referred to as Micro-renewables, 'Microgeneration' includes a range of technologies. It refers to the generation, from low or zero carbon sources, of electricity of up to 50kW capacity and heat of up to 45kW capacity, as set by the Energy Act 2004.

Benefits: Households use more than a third of the electricity and more than half of the heat consumed in Scotland. Using renewable sources of heat and/or electricity can reduce reliance on fossil fuels. For domestic properties, microgeneration can reduce household costs and alleviate fuel poverty. The Feed-in-Tariff operated by the Department for the Environment and Climate Change (DECC) incentivises the roll-out of renewable electricity technologies in domestic properties by offering the opportunity to sell any excess electricity generated back to the grid.

Design: Key determinants in choosing the most suitable microgeneration technology are likely to be the location and design of the building for which the energy is being generated and existing energy demand. Some microgeneration technologies will introduce new features, shapes and height into the street-scene; managing these impacts is an important part of the Development Management process, ensuring the new features enhance a sense of place rather than adding to design clutter.

The Microgeneration Certification Scheme (MCS): This is an industry-led scheme focussing on ensuring the quality of micro-renewable technology and installations.

Types of technology

A variety of microgeneration technologies produce either electricity or heat, or a combination of both.

Renewable heat is heat produced from low carbon or renewable sources such as ground, air or water source heat pumps, biomass, waste, anaerobic digestion, solar panels, and wind-to-heat and geothermal technologies.

(i) Micro wind*:* Micro-wind turbines can provide power to a property and supply excess electricity to the grid. These are often used as a source of power in rural or remote locations where traditional forms of power can be costly, difficult or impractical to access.

Types of Turbines
Turbine design can be either horizontal axis or vertical axis, but most available designs are horizontal axis. Smaller turbines can be attached to the roof or gable of a building; these should be carefully sited so as to maximise output, avoid local turbulence, and enhance the appearance of the building.

(ii) Micro Hydro*:* In their simplest form, hydro-electricity systems abstract water from water courses and use it to turn a turbine, which then generates electricity, before returning the water to the water environment through an outfall structure. In Scotland there is an increasing number of 'pico-hydro' turbines, generally taking the form of 'run-of-river' projects, generating up to 10kW of electricity. While such schemes generally have little individual impact owing to their scale, they can cause cumulative impacts across a water body or water catchment area. Planning for and mitigating against any such impacts would be likely to require co-ordination with SEPA, and possibly SNH, in relation to habitats and species.

Planning authorities may be able to assist in identifying sites for possible micro-hydro development – for example, historic sites of water mills, weirs and locks now in disrepair. The criteria used to identify possible sites should be consistent with the criteria required by SEPA as set out in guidance for developers of run-of-river hydropower schemes.

(iii) Solar Photovoltaic Panels (PV)
Photovoltaic panels consist of semi-conductor cells that convert sunlight into electricity – the panel produces electricity even in cloudy conditions but the power output increases with the intensity of the sun.

For this reason the siting and orientation of PV panels in either domestic or non-domestic properties is crucial. Ideally they will face between south-east and south-west to maximise the amount of light. However, the main issue is the potential for overshadowing, for example from trees and existing buildings.

(iv) Solar Hot Water Systems:
Solar water heating systems can operate well in diffuse light conditions thereby making them a popular option for Scottish properties. While mainly used for domestic water heating they can also be used in light industrial, agricultural use and to heat swimming pools. They comprise solar collectors (normally tubes or flat plates), a heat transfer system and a hot water store (for example a domestic hot water tank or cylinder). Solar hot water systems work on the principle of water being pumped through the solar panel and heated by solar energy when the sun is shining – the heated water then usually flows through a 'heat exchanger' warming the water stored in the cylinder.

Although the systems can operate in diffuse light conditions, ideally they should face between south-east and south-west to maximise the amount of light. They are less sensitive to shading than PV panels but will still perform better if shading is kept to a minimum.

(v) Heat Pumps (Ground, water and air source)*:* Heat pumps transfer the heat contained in any one of the natural heat sources of ground, water or air to a building for the purposes of providing heat. They require electricity to operate but they generally produce more energy as heat than the electricity they use, unless the operation is reversed such that the system can be used for cooling, which dramatically increases their electricity use.

The method of installation and operation varies according to the type of pump: ground source heat pumps (GSHPs) rely on an underground closed loop, installed vertically in a borehole or horizontally in a trench, to capture the heat below the surface – this can be a difficult practice in built-up areas where space is restricted or at a premium. Water source heat pumps (WSHPs) operate in a similar manner to ground source pumps, but require the coil/loop to be buried below the surface of a water body. SEPA should be consulted on the need for a water use licence.

Air source heat pumps often have the appearance of air conditioning units and can be attached to a building or be free standing. They are commonly very quiet in operation and can transfer the heat to an air blown heating system or a hot water system.

(vi) Micro CHP/ Renewable CHP: Micro-CHP is a technology that produces electricity and heat. A micro-CHP unit resembles a gas-fired boiler and produces electricity from mains gas or LPG. It also produces heat as a by-product and can be more efficient than heating the home with gas and using electricity from the mains. Most micro CHP schemes that use fossil fuels are capable of being subsequently converted to utilise renewable sources of energy.

***(vii) Biomass*:** At the microgeneration scale, almost all biomass systems burn wood pellets or logs to provide heat. The fuel is usually used to heat water to run a conventional heating system. On-site storage for the fuel is required.

Biomass will deliver environmental benefits in the form of greenhouse gas savings provided the fuel supply originates from sustainable sources. Biomass is most effective when a local fuel source is used as this reduces both carbon emissions and costs associated with transport of the fuel. Most biomass installations, at micro scale, tend to only involve minor building alterations limiting the scale of any potential adverse impact.

Typical Planning Considerations in determining planning applications for microgeneration:

Landscape Impact: The potential for microgeneration to adversely impact upon the natural landscape is largely dependent on the type of technology and the scale of the installation. Micro-wind is the technology which most commonly raises landscape issues , but issues can also be experienced in relation to micro-hydro, solar PVs and the flues and hoppers associated with biomass systems.

In determining applications for free-standing micro-wind, planning authorities should consider the scale and number of turbine(s) and any siting implications; tower and blade colour; number of blades and rotation speed; requirement for tracks and cable trenches, and any associated infrastructure impacts. This information could be used to determine whether any potential landscape impact would be acceptable. However all considerations should be proportionate to the scale of the proposed development. SNH guidance is available to assist in assessing wind energy developments of between 15 and 50m in height.

Assessment of landscape impacts from micro-hydro developments should include consideration of colour; location and screening of ancillary buildings or structures, and visibility from key viewpoints. Also important are the materials proposed (eg. concrete), associated pipe work and track construction, and any changes in or reduction of river flows (i.e. waterfalls etc). The latter is also taken into account by SEPA when considering applications for a water use licence.

PV panels, biomass flues and hoppers (storage buildings) could impact negatively on the appearance of a landscape or a settlement from a distance, especially if located within a National Scenic Area or area designated for its landscape quality and/ or characteristics. Such an impact could lead to requirements for mitigation measures or could be deemed by a planning authority to be unacceptable and result in the refusal of a planning application. PV arrays can cause 'flashes' of reflected light which can be seen from a long distance and which impact on the users of a landscape including walkers, cyclists, aviators and farmers.

Landscape Assessment: An assessment of potential landscape impacts may be requested in order to determine planning applications for microgeneration. However, planning authorities must be alert to impacts on scheme viability in terms of time and cost and therefore all such requests should be proportionate to the proposal.

Impacts on Wildlife and Habitat, Ecosystems and Biodiversity: As with other forms of renewable energy, microgeneration has the potential to exert both positive and negative impacts on wildlife, habitats, ecosystems and biodiversity. Although the technology contributes to countering the effects of climate change, it also has the potential to adversely impact on ecology, eg. habitats, setts and roosting sites (birds and bats), through disturbance, blocking of entrances/exits and collision risk. SNH's guidance note on 'Micro-renewables and the Natural Heritage' provides further guidance to applicants.

In determining applications for microgeneration, planning authorities should consider whether the footprint of the installation and any ancillary infrastructure would be sited on or near to a sensitive habitat or a known breeding site; whether construction or excavations necessary for the installation might impact on groundwater quality or create drainage problems; what level of disturbance might occur, either during installation or operation, that could impact on movement or roosting patterns of birds or bats; and if there is potential for disturbance to peatlands or wetlands or other sensitive habitats, or species supported by these, through construction of roads or laying of cable trenches.

Ground source heat pumps have potential to cause soil disturbance owing to the need to bury underground pipes across a potentially large area or via a borehole.

The water abstractions, water intake structures (dams/weirs) and the outfall structures required for a micro-hydro scheme require prior-authorisation from SEPA under the Water Environment (Controlled Activities)(Scotland) Regulations 2011. Any authorisation granted by SEPA will be subject to appropriate conditions for the protection of the water environment. SEPA requires developers of hydro schemes to include mitigation to protect the water environment – this would apply equally to micro- or pico-hydro as well as larger scale hydro energy. For run-of-river schemes, SEPA's mitigation requirements are set out in its guidance to developers of run-of-river hydropower schemes.

Impact on Communities: Common issues to be addressed generally relate to siting, design/ appearance, public safety and noise.

In considering noise related to applications for micro-wind turbines and air source heat pumps, planning authorities should consult the Scottish Government's Planning Advice Note 1/2011 on Planning and Noise which provides advice on the role of the planning system in helping to prevent and limit the adverse effects of noise.

Free-standing turbines generally have a higher energy output than those attached to buildings but their location should take account of potential for noise and shadow flicker on sensitive receptors, for example nearby homes, residential institutions, schools or commercial units. In considering building mounted micro wind turbines, useful information may be found in Structure-borne noise and vibration from building mounted micro wind turbines, which was a joint-funded project by Defra, DECC and DCLG which investigated a methodology for quantifying and predicting noise and vibration levels when a micro wind turbine is connected to a multi-occupant property.

Biomass installations could affect or exacerbate existing air quality, particularly in Air Quality Management Areas. Planning authorities should be alert to potential health issues in relation to all scales of biomass. Further information is available in Scottish Government's online advice on Woody Biomass.

The Historic Environment: Permitted Development Rights do not apply to buildings that are listed or located in Conservation Areas, or sites of archaeological interest. Microgeneration installations also have the potential to affect the setting of the historic environment and Scottish Planning Policy sets out policy on protecting the historic environment. PV units may have direct impacts on listed buildings or scheduled monuments and/or visual impacts on unlisted buildings in conservation areas. The same considerations apply to solar hot water systems. In locating ground source heat pumps, consideration of potential damage to archaeological remains may be required.

In many circumstances, microgeneration installations will be appropriate in historic environments – planning authorities should refer to Historic Scotland's guidance on Micro-renewables and Managing Change in the Historic Environment and to Changeworks' Renewable Heritage: Guide to microgeneration in traditional and historic homes which demonstrate how sustainability of Scottish historic and traditional homes can be improved.

Road safety could be an issue in relation to micro-turbines proposed near to a road and planning authorities should be alert to any issues that might arise in relation to siting of micro-turbines. It is advised that planning authorities consult Transport Scotland's Trunk Roads Network Management Directorate to discuss any concerns in this regard.

Aviation and Defence: It is recognised that all scales of wind energy, even micro-turbines, have potential to adversely impact on both civilian and military aviation interests. The main impact is on radar operations through electromagnetic interference generated by micro-turbines. Further advice is available in both the Scottish Government's online advice for Onshore Wind Turbines and in Circular 2/2003 (Safeguarded Aerodromes, Technical Sites and Military Explosives Storage Areas). Readers could also refer to the CAA's publication on Wind Turbines, or on the websites of the MOD, National Air Traffic Services (NATS) or the Civil Aviation Authority (CAA).

Cumulative Impact: Assessing the cumulative impact of a range of technologies installed close to each other requires consideration of their effects in combination. As the number of microgeneration installations increases, so also does the need for cumulative impact to be assessed. In relation to microgeneration technologies however this is likely to be relatively localised and any cumulative impact assessment should not therefore be required to be extensive.

In determining applications for microgeneration, planning authorities should consider existing planning consents locally for microgeneration technologies, even if these have not been implemented, as a proliferation of installations in a particular area could exceed the carrying capacity of that area. An increase in deployment of renewables, including microgeneration, should take account of existing land uses and the environmental situation. Overall however, the cumulative effects of microgeneration are expected to be much less significant than those of medium or large technologies and therefore the number of micro installations should not be a primary concern.

Assessment of micro-hydro schemes is likely to include consideration of reduced flows and sediment movement and any evidence of migrating fish barriers. At micro-hydro scale this is likely to be constrained to a small area however potential for impact on the wider catchment should be considered. Early advice and input from SEPA should be sought on these matters who, should it grant a water use licence for the scheme, could impose conditions relating to impacts on the water environment.

Assessing micro-wind or solar installations will usually include consideration of the impacts on biodiversity and habitat (for example birds or bats roosts and badger setts) as well as adverse visual impact in the landscape and on the historic/built environment, including local character. Planning authorities should also be alert to potential adverse impact on quality on life and amenity, for example through noise from turbines or air-source heat pumps, shadow flicker from turbines or glare from solar PV units.

Note: there are considerations that are particularly relevant to the installation and operation of wind energy, at all scales. See advice for Onshore Wind Turbines on the Scottish Government website.

Useful References

The Routemap for Renewable Energy in Scotland offers guidance on the micro- renewables context.

Scottish Natural Heritage

Scottish Environment Protection Agency (SEPA)

Historic Scotland

Energy Savings Trust Scottish Planner Support Pack

Scottish Renewables

Change works

Department of Energy and Climate Change Feed-in Tariffs