

## MICROGENERATION

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Microgeneration has the potential to reduce greenhouse gas emissions and cut energy bills for households and businesses. However, to date, there has been very limited uptake of microgeneration. This briefing outlines the technologies and barriers to uptake, it examines Scottish and UK Government policy, and it looks at recent reports on how to achieve widespread uptake and the potential for reducing emissions.

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## KEY POINTS OF THIS BRIEFING

- Microgeneration is the generation of electricity and/or heat on a small scale, using technologies with zero or low carbon dioxide emissions (Scottish Executive 2007).
- Electricity generating technologies include small wind turbines, solar PV panels and hydro systems. Heating technologies include solar thermal panels, heat pumps and biomass stoves/boilers. Another technology, combined heat and power, simultaneously generates electricity and heat through oxidation of a fuel (usually natural gas).
- In 2008 there were about 13,000 microgeneration systems installed in Scotland.
- Along with energy efficiency measures, microgeneration has the potential to reduce greenhouse gas emissions from energy use in the built environment. Microgeneration could also reduce energy bills and, in this way, alleviate fuel poverty.
- The Energy Savings Trust estimates that with new policies microgeneration uptake in households could reduce CO<sub>2</sub> emissions in Scotland by up to 10 million tonnes per year by 2050 (which would be a 16% reduction in emissions compared to 2006). Element Energy considers that with new policies, uptake in households could reduce UK emissions by over 4% by 2030 and by about 6-7% by 2050 (compared to 2006).
- The main barriers to uptake of microgeneration have been cost, lack of awareness, inadequate information and advice, consumer uncertainty about the performance of technologies, and planning permission requirements.
- In March 2007, the Scottish Executive published a consultative Draft Energy Efficiency and Microgeneration Strategy. The current Scottish Government has stated that it will publish an Action Plan in the near future. The Scottish Government's policies include capital grants, interest-free loans for businesses, provision of information and advice, relaxation of planning permission requirements, and the Renewables Obligation Scotland. The Government is also developing new building standards in light of the Sullivan report, which recommended staged increases in energy standards, with the aim of net zero carbon buildings by 2016/17, if practical.
- The UK Government published a Microgeneration Strategy in 2006 and a report in 2008 stated that most actions had been completed. The UK Government has introduced capital grants, interest free loans for businesses, and tax discounts (all of which extend to Scotland). The Government has also introduced a Carbon Emissions Reduction Target (CERT), which requires energy suppliers in Great Britain to assist households to take up energy saving measures. The Government is proposing to introduce feed-in-tariff scheme and a Renewable Heat Incentive (both would also extend to Scotland). The Government has also committed to all new homes in England being zero carbon by 2016.
- Sarah Boyack MSP has lodged a proposal for a Member's bill on energy efficiency and microgeneration. The proposed measures include setting national targets for the take up of microgeneration, requiring local authorities to consider setting local targets, amending building standards to require the installation of microgeneration in all new building developments, and financial incentives such as a one-off reduction in council tax/business rates for houses/businesses that install microgeneration.

## INTRODUCTION

Microgeneration is the generation of electricity and/or heat on a small scale, using technologies with zero or low carbon dioxide emissions (Scottish Executive 2007). The technologies can be installed in households and in commercial, community and public sector buildings.

Along with energy efficiency measures, these technologies have the potential to significantly reduce greenhouse gas emissions from energy use in the built environment, which make up a large proportion of overall emissions. Household energy use accounts for about 30% of Scotland's carbon dioxide emissions, with heating producing about three quarters of this (Scottish Parliament 2008a; Department of Trade and Industry 2007); while energy consumption in non-domestic buildings contributes around 17% of the UK's carbon dioxide emissions (Scottish Parliament 2008b). Another potential benefit of microgeneration is that it could reduce energy bills, particularly for the large number of households and businesses that are not connected to the gas grid. For this reason, microgeneration could also play a role in alleviating fuel poverty. By decentralising electricity generation and diversifying the current energy mix, microgeneration could also contribute to security of energy supply.

In recent years, the Scottish and UK Governments have taken action to promote microgeneration and further measures are being considered or introduced. The Scottish Government is committed to publishing an action plan on energy efficiency and microgeneration in the near future and it is currently changing planning regulations. Sarah Boyack MSP is also pursuing a private Members' bill on energy efficiency and microgeneration. Meanwhile, the UK Government is proposing new financial incentives including feed-in-tariffs.

## TECHNOLOGIES

Most microgeneration technologies have zero or low carbon dioxide emissions because they use renewable energy sources; some only use these sources (and are known as "microrenewables"), while others such as heat pumps use these sources in combination with fossil fuels (sometimes also called "microrenewables"). Another technology (combined heat and power) either uses renewable energy sources or it uses fossil fuels in a way that is much more efficient than conventional energy systems. The technologies are generally considered to be at the "micro" scale if they produce heat at less than 45 kilowatt capacity and/or electricity at less than 50 kilowatt capacity (Energy Act 2004, s 82). Household systems are usually in the range of 1 to 10 kilowatt capacity.

As will be seen, most technologies have certain requirements in order to operate effectively and therefore not all will be suitable for all houses and buildings. The following summary of technologies is largely sourced from [Element Energy](#) (2008a) and [Energy Saving Trust](#) (2008a); see also [Micropower](#) (2009), [NHBC Foundation](#) (2008) and [Isoenergy](#) (2009).

Technologies that generate electricity include:

- **Wind turbines:** The wind rotates blades in a turbine, which drives a generator to produce electricity. Turbines can be mounted on a roof or on a free-standing mast. Output depends on the wind speed and the size and efficiency of the turbine. There is doubt about the performance of wind turbines in urban areas. The Carbon Trust (2008) found that "about four times as much electricity and carbon savings are available from rural sites compared to urban ones"; and that "in many potential urban installation situations, roof-mounted turbines may not pay back the carbon emitted during their production, installation and operation". Another study (Encraft 2009) concluded that small

building-mounted turbines were only likely to make a significant contribution to energy and carbon saving “on the most exposed sites and tallest buildings”.

- **Solar PV:** Sunlight is converted into electricity through Photovoltaic (PV) cells, which are thin layers of semi-conducting material (usually silicon). PV cells are incorporated into solar panels or tiles which are mounted on roofs. The output depends on the intensity of the sunlight and the area and efficiency of the solar panels. The Energy Saving Trust advises that solar PV systems are suitable for “a building with a roof or wall that faces within 90 degrees of south, as long as no other buildings or large trees overshadow it”. It also states that a “2.5kWp system could provide enough electricity to meet around half a household’s electricity needs each year”.
- **Hydro:** Running water turns a turbine, which drives a generator to produce electricity. A source of moving water such as a river or stream is needed. The output depends on the water’s flow rate and the height that the water falls from.

The above technologies can be connected to the electricity grid and surplus electricity can be exported to the grid and sold to an electricity supply company (see Ofgem 2008).

Technologies that generate heat include:

- **Solar thermal (hot water):** Solar panels fixed to roofs or walls collect heat from the sun’s radiation. Generally, fluid is circulated from the panels through to a special solar coil at the base of a hot water cylinder and heat is then transferred to the stored water (Baxi 2008). Output depends on the amount of sunlight and the area and efficiency of the panels. The Energy Savings Trust states that a domestic system will need “3-4 square metres of southeast to southwest facing roof receiving direct sunlight for the main part of the day”. It also states that the systems can provide households with about a third of their hot water needs. Note that another source (Department of Trade and Industry 2006b) states that solar thermal systems can supply 50-70% of household hot water needs. A conventional boiler or biomass system would be needed to supply the balance.
- **Heat pumps:** There are three types. One is a *ground-source* heat pump. A loop of pipes is buried a metre or so underneath the ground in a horizontal trench or borehole, where the temperature is 8-12 degrees all year round. Liquid is pumped around the pipe and absorbs the ground heat. The heat pump unit, which is run using electricity, takes the heat from the pipes and compresses it to a higher temperature. The heat is then distributed through radiators or an under floor heating system. A second type is an *air-source* heat pump, which operates in a similar way but heat is extracted from the outside air (even if the temperature is below zero) using coils fitted to the outside of a building. A third type is a *water-source* heat pump, which also operates in a similar way, but heat is extracted from a water source such as a river or loch.
- **Biomass stoves/boilers:** Heat is generated from the burning of biological material, usually wood pellets, chips or logs. There are two types of system: (1) a stand-alone stove that provides space heating for a single room; and (2) a boiler connected to central heating and hot water systems. There is a need to have storage space for the fuel and a local fuel supplier. Although burning biomass produces carbon dioxide emissions, it is considered to be carbon neutral because it only releases the same amount of emissions as absorbed during growth of the biomass source (although this does not take account of emissions associated with transporting the biomass). One concern that has been raised is the potential for biomass systems to have a cumulative impact on air quality and

Governments are looking at this (Department for Business, Enterprise and Regulatory Reform 2008c; AEA 2008a).

There is also a technology that generates electricity and heat, known as **Combined Heat and Power** (CHP). CHP systems simultaneously generate electricity and heat through oxidation of a fuel (usually natural gas). Output is usually controlled to meet buildings' heating and/or hot water requirements, with electricity available to meet the building's needs as a by-product. CHP systems currently use combustion engines but they may use fuel cell technology in the future. Fuel cells combine hydrogen with oxygen (from air) in a chemical reaction (Micropower 2009). Micro-CHP systems have been slow to reach the market despite product launches by large utilities; many of the products are still being demonstrated (Watson 2009). A major challenge for these systems is achieving an optimal (low) heat to power ratio that is suitable for energy efficient homes with low heat demand (Watson 2009).

## NUMBER OF INSTALLATIONS

Element Energy (2008b), a consultancy firm, recently estimated that there are between 12,590 and 13,100 microgeneration installations in Scotland. As can be seen from the Table below, around 85 percent of these installations are solar thermal. This is mainly due to the fact that in the UK there is a much more established market for this technology, going back to the 1970s.

**Table 1: Microgeneration installations in Scotland**

| Technology    | Number          | Reference date |
|---------------|-----------------|----------------|
| Solar thermal | 10,700 – 11,100 | Jul 08         |
| GSHP          | 1,057           | Aug 08         |
| Wind          | 410             | Dec 07         |
| Biomass       | 196             | Aug 08         |
| ASHP          | 96              | Aug 08         |
| Solar-PV      | 95              | Aug 08         |
| Micro-hydro   | 21              | Aug 08         |
| Micro-CHP     | 16-81           | Dec 06         |

Element Energy also provided estimates of the number of installations for other parts of the UK although it noted that data was captured at different dates. These estimates are shown in the Table below along with figures showing the number of installations per 1,000 population.

**Table 2: Microgeneration installations in the UK**

| Country          | Number          | Number per 1,000 population* |
|------------------|-----------------|------------------------------|
| Scotland         | 12,590-13,100   | 2.55                         |
| England          | 72,600-76,100   | 1.49                         |
| Wales            | 6,130-6,410     | 2.15                         |
| Northern Ireland | 16,700-17,300   | 9.83                         |
| United Kingdom   | 108,000-113,000 | 1.85                         |

\*These figures are based on NOMIS/NISRA mid 2007 population estimates.

The total figure of 108,000-113,000 for the UK compares to an estimate in 2005 of over 82,000 installations in the UK (Energy Saving Trust 2005).

## BARRIERS TO WIDER UPTAKE

### UPFRONT COSTS

The cost of purchasing microgeneration systems has been and (even with existing government subsidies) remains a substantial barrier to wider uptake. The Energy Saving Trust (2008a) provides some typical cost ranges for domestic systems, which are shown in the Table below:

**Table 3: Cost of microgeneration systems**

| Technology                | Typical cost (£) |
|---------------------------|------------------|
| Wind – roof               | 1,500 -          |
| Wind – mast               | 11,000 -19,000   |
| Solar PV                  | 7,500 - 22,500   |
| Hydro                     | 20,000 -25,000   |
| Solar hot water           | 3,000 - 5,000    |
| Heat pump – ground source | 6,000 - 12,000   |
| Heat pump – air source    | 7,000 - 10,000   |
| Biomass – stove           | 2,000 - 4,000    |
| Biomass – boiler          | 5,000 - 14,000   |

The average installed cost of a combined heat and power system is £4,342 (Element Energy 2008c). By way of comparison with this and other microgeneration heating systems, the average cost of an installed condensing boiler is £2,500 (Element Energy 2008c).

Over a period of time, the cost of microgeneration systems may be offset by savings in energy bills. The time taken to offset the initial cost is known as the “payback period”. Current payback periods are relatively long and some (e.g. for solar PV) may exceed the lifetime of the installed system. Most systems have a lifetime between 10 and 25 years (Element Energy 2008a). Three reports that have estimated payback periods are noted below (figures are in years).

**Table 4: Payback periods for some microgeneration systems**

|                        | Watson (2006) | Department of Communities and Local Government (2006a) | NHBC Foundation (2008) |
|------------------------|---------------|--|------------------------|
| <b>Wind</b>            | 7-19          | 10.5   | 15                     |
| <b>Solar PV</b>        | 35-48         | 46   | Beyond lifetime**      |
| <b>Solar hot water</b> | N/S           | 54   | 8-20                   |
| <b>Heat pumps</b>      | N/S           | 12.8   | 8-15                   |
| <b>CHP</b>             | 6-20*         | 6.8  | 3-5                    |

\*Assuming that the price differential with a new condensing boiler is £1,500

\*\*The report does not state a number in years but notes that the payback exceeds the lifetime of the system.

For households not connected to the electricity or gas grid, savings in energy costs are likely to be higher, and payback periods shorter. Around one third of Scottish houses are not connected to the gas grid, mainly in small towns and rural areas (Scottish Government 2008a).

Payback periods for most technologies may need to decrease substantially to result in much wider uptake. A recent report (Element Energy 2008a) concluded that, “consumers place a very low value on ongoing energy costs compared with up-front capital costs”. The report found consumers would only be willing to pay around £3 in up front costs to make an annual saving of £1. According to the report, this implies “consumer time horizons for costs generally less than 3-5 years”, which is “consistent with the slow uptake of energy efficient appliances and insulation measures...observed over the past 20-30 years.”

## **OTHER BARRIERS**

The need to obtain planning permission to install microgeneration technologies and the associated costs of this has been a further barrier preventing uptake. As outlined in the next section, the Scottish Government has recently announced that it is removing the need to obtain planning permission for some technologies, subject to certain limits. Another substantial barrier to wider uptake has been a general lack of awareness about the technologies and inadequate information and advice for households and organisations. There is also a level of consumer uncertainty about the performance of microgeneration technologies.

Other issues have been raised that could prevent widespread uptake in the future. One of these is the capacity of the electricity distribution network to cope with increasing numbers of microgenerators that export electricity. However, a study into this (Department of Trade and Industry 2006a) found that 18% domestic uptake of microgeneration could be accommodated without significant cost to update the distribution network. Another issue is the potential for skill shortages. Energy Action Scotland states, “if the industry is to move from fitting a handful of heat pumps a year to fitting thousands of them each year, we will need to look at reskilling the workforce.” (Scottish Parliament Economy, Energy and Tourism Committee 2009a). The Scottish Higher and Further Education Funding Council has set up a renewable core skills group to address this and Sector Skills Councils are also researching long-term sectoral needs (Scottish Parliament Economy, Energy and Tourism Committee 2009d).

## **SCOTTISH GOVERNMENT POLICY**

Scottish Government policy on microgeneration needs to be considered in the wider policy context. The Scottish Government is seeking to legislate for greenhouse gas emission reduction targets in the Climate Change (Scotland) Bill, currently before Parliament, which would see an 80% reduction in emissions by 2050, with an interim target of a 50% reduction by 2030. The Scottish Government has also set a target for 50% of electricity consumption to come from renewable sources by 2020, with an interim target of 31% by 2011. It has also stated recently that it is aiming to achieve a target of 20% of total Scottish energy use coming from renewable sources by 2020. To meet this target, it is proposed that 11% of heat demand would need to come from renewable sources by 2020. The Government is also committed to ensuring, as far as is reasonably practicable, that people are not living in fuel poverty by November 2016.

## **DRAFT MICROGENERATION STRATEGY**

In March 2007, the then Scottish Executive published a [Draft Energy Efficiency and Microgeneration Strategy](#) for consultation. The summary stated:

“...the Executive is carrying out a significant amount of work to help ascertain what it could and should be doing to support and develop microgeneration in Scotland. All of this work will help to steer future policy developments including the setting of microgeneration targets for Scotland which the Executive will do during 2007.”

In June 2008, the Scottish Government published an [analysis of responses](#) to the consultation. It found that setting targets on microgeneration was supported by nine of the 10 respondents who commented on this; that changes to the planning system to make installation easier was supported by seven of the 17 respondents that commented on barriers; and that nine respondents suggested that the Government should offer increased grants up to 40% of capital costs and council tax rebates for those installing microgeneration (Scottish Government 2008b).

In June 2008, the Scottish Government also published its [response](#) to the consultation (Scottish Government 2008c). With respect to setting targets, the Government noted that it was already committed to challenging targets for renewable electricity and reducing greenhouse gas emissions, and that the UK Government was currently considering the merits of setting microgeneration targets. The Scottish Government stated that it would “consider the possible benefits of targets for microgeneration in this context and against the need for targets to have an impact on actual take-up”. It also stated that it was “carrying out a significant amount of work to support and develop microgeneration in Scotland, including action to help remove barriers (the next section refers to a number of these actions). The Government also noted that “during this year we will develop an Energy Efficiency and Microgeneration Action Plan”.

In November 2008, the Scottish Government published a [Draft Framework for the Development and Deployment of Renewables in Scotland](#) for consultation. The draft framework (which includes an Action Plan for Renewable Heat) does not discuss in detail the development of microgeneration but states that the Government proposes to issue an Energy Efficiency and Microgeneration Action Plan “in the near future”. The consultation document states that the Government plans to publish a final framework by early 2009.

In December 2008, the Government introduced into Parliament the [Climate Change \(Scotland\) Bill](#). The Bill requires Scottish Ministers within 12 months to publish a plan to promote energy efficiency (section 48). Importantly, energy efficiency is defined to include “the use of technologies reliant on renewable sources of energy”. Scottish Ministers would need to report to Parliament on an annual basis on steps taken to implement the plan (s 49). The Government has stated that an outline of what the plan will contain will be published by March 2009, and that it expects the plan to cover microgeneration issues (Scottish Parliament Economy, Energy and Tourism Committee 2009b). The Bill also requires Scottish Ministers to take such steps as they consider appropriate to promote the use of heat produced from renewable sources (s 51).

## **CAPITAL GRANTS**

The [Scottish Community and Householder Renewables Initiative](#) (SCHRI) is the main grants scheme for microgeneration. It was established in 2003 to assist households and communities with the costs of installing a variety of microgeneration technologies. The SCHRI provides grants to home owners of up to 30% of the costs of a renewable energy system up to a maximum of £4,000. To be eligible for a grant, the home owner must undertake certain energy efficiency measures where appropriate and practical. The installer and the microgeneration system must also be accredited. Grants to community groups are on average around 50% of total costs, up to £100,000 although larger and more innovative projects may be awarded higher grants. Community groups (e.g. non-profit associations, housing associations, schools) can also get grants of up to £10,000 for technical assistance such as feasibility studies. The household funding stream is managed by the Energy Saving Trust (EST) and the community stream is managed by the EST and, in the Highlands and Islands, by Community Energy Scotland.

By the end of January 2009, the total number of grants offered under the scheme was 4,174, amounting to £14.35 million (Energy Savings Trust 2009. For grant numbers by year, see Scottish Parliament 2008c). In March 2008, the Scottish Government (2008d) announced that it

would provide £13.5 million towards microrenewables in each of the next three years, including £3.5 million for householders and £5.25 million for community projects. The SCHRI household stream now has an annual budget of £3.5 million (£3.1 million for grants), while the community stream has an annual budget of £2.4 million (£2 million for grants) (Energy Savings Trust 2009). It is not clear where the remaining £2.85 million for community projects has been directed.

The [Scottish Biomass Heat Scheme](#) provides grants of up to £100,000 for the installation of biomass heating systems in small to medium enterprises. The scheme (which replaces the Scottish Biomass Support Scheme), runs from April 2009 to April 2011 and has funding of £2 million. It is a competitive scheme, with applications assessed against various criteria.

There is also a UK-wide capital grants scheme for microgeneration (Low Carbon Buildings Programme), which is discussed in the section on UK Government policy.

## **INTEREST-FREE LOANS**

[Energy Saving Scotland-Small Business Loans](#) provides interest-free loans from £1,000 to £100,000 to help small and medium sized businesses, private sector landlords and non-profit organisations install a range of renewable energy technologies or energy saving measures. Loans for renewable energy installations must be repaid within 8 years.

This scheme was launched in 1999 and until recently focused on energy efficiency measures. In March 2007, a [report](#) evaluated the scheme and concluded that it had had a positive impact and there was a need for it to continue. However, it identified areas that would improve take-up and impact of the loans, including looking at ways of promoting greater use of microrenewables. In March 2008 the Government announced that “small businesses will for the first time be able to get loans for microgeneration as well as for energy efficiency measures” and it committed £2 million to the scheme in each of the next 3 years (Scottish Government 2008d).

The public sector can also access interest-free loans through the Central Energy Efficiency Fund, although this scheme is mainly directed towards energy efficiency measures rather than microgeneration. Halcrow (2008) states, “microgeneration is not normally included unless it can meet the 5 year payback criteria – e.g. certain biomass projects have been funded”.

There are also UK-wide loan schemes for small and medium enterprises and the public sector, which are discussed in the section on UK Government policy.

## **INFORMATION AND ADVICE**

The [Energy Saving Trust](#) (EST) is an independent, not-for-profit UK organisation, which promotes action that leads to the reduction of carbon dioxide emissions. It is funded by the UK Government, devolved governments (the Scottish Government funds the EST’s activities in Scotland) and the private sector. The EST provides a range of information on its website and in addition provides advisory services to a range of groups:

- *Households:* The EST runs 5 regional advice centres in Scotland. Previously, these focused on energy efficiency advice (and were known as Energy Efficiency Advice Centres) but in June 2008, the Scottish Government (2008e) announced an expanded service: the centres are now Energy Saving Scotland Advice Centres, and they provide advice covering energy efficiency, affordable warmth, microrenewables and transport. The Government expects that the new network will reach 250,000 – 275,000 people each year (instead of 100,000 previously). The EST also operates a new free home help service, where advisors visit interested households and provide advice on

microgeneration and energy efficiency measures, and support with the grants and installation process. This service is expected to assist 500 clients between September 2008 and March 2009, and around 2,000 clients in 2009/10 (Energy Saving Trust 2009).

- *Business, local authorities and community groups:* The EST provides information and advice to small-medium sized businesses on microgeneration and energy efficiency through a team of regional business advisors. In addition, it operates a practical help programme, providing free email and telephone support for local authorities and housing associations on sustainable energy initiatives. In connection with the SCHRI grants scheme (see above), the EST also provides advice and project management support for community groups on renewable energy projects. The EST also runs Community Action for Energy, a network that promotes community-based energy projects.

The [Carbon Trust](#) (CT) was set up by the UK Government in 2001 as an independent company and it works with private and public sector organisations to reduce carbon dioxide emissions. The Scottish Government funds the CT's activities in Scotland. For small and medium sized enterprises (SMEs), the CT offers free energy saving assessments by telephone and – if its energy bill is higher than £50,000, the business may be eligible to receive an on-site carbon survey. The CT also provides advice to SMEs. In addition, the CT operates a Carbon Management Programme, which is a five step process to help organisations understand and manage their carbon dioxide emissions. There are four different streams: (1) Large private sector businesses (energy bills over £1.5 million per year); (2) Local authorities; (3) Higher Education Institutions and (4) NHS Trusts. The CT also operates a Low Carbon Design Advice Service to help promote the construction of more energy-efficient non-domestic buildings.

On 5 January 2009, the Scottish Government (2009a) announced new measures to work towards low carbon school buildings. The measures include funding two Schools Renewables Development Officers to work with local authorities to increase the uptake of microrenewables in schools by developing packages of funding from public and private sources; working with the CT to “up-skill” local authorities to ensure they can secure sustainable school design; and creating a sustainable schools “web portal” containing advice and guidance.

## **THE RENEWABLES OBLIGATION SCOTLAND**

The Renewables Obligation Scotland (ROS) was introduced in April 2002, alongside an almost identical obligation in England and Wales. The ROS requires licensed electricity suppliers in Scotland to source an increasing proportion of their electricity from renewable sources (9.1% in 2008/09). Electricity suppliers can meet their obligation by presenting sufficient Renewable Obligation Certificates (ROCs) to the industry regulator, Ofgem, or paying a buy-out price. ROCs are issued to an accredited electricity generator for renewable electricity generated and supplied to customers by a licensed electricity supplier. One ROC is issued for each megawatt hour (MWh) of renewable electricity generated. Depending on its size, a microgenerator could receive up to 1-2 ROCs per year (Department for Business, Enterprise and Regulatory Reform 2008a). The price of a ROC is subject to the market but microgenerators could currently receive around £20-£30 per ROC.

The Scottish Executive (2007) noted that microgenerators could face difficulties in gaining ROCs as they often did not meet the criteria of generating at least 0.5 MWh per annum, and even if they did, the accreditation process could be difficult. Accordingly, on 1 April 2007 the Executive introduced changes to help small scale renewable generators access the ROS system. The changes enabled small generators to appoint agents to act on their behalf; and to allow the output from a number of small generators to be amalgamated. However, the

bureaucracy of the scheme still inhibits access by microgenerators (UK Parliament House of Commons Select Committee on Innovation, Universities, Science and Skills (2008).

In June 2008, the Scottish Government (2008c) stated that it was “currently considering, with Ofgem and other UK administrations, how we can make access to the [ROS] even simpler”. The Scottish Government also intends to follow the UK Government in introducing (in April 2009) a banding scheme for the ROC, which would mean that microgeneration receives twice the current level of support. Banding is discussed in the section on UK Government policy.

## **PLANNING POLICY**

*Permitted development rights:* Following a [consultation](#), on 9 February 2009 the Scottish Government (2009b) announced new laws that would allow householders to install microgeneration systems without requiring planning permission (known as “permitted development rights”). There will be limits on these rights: for example, solar panels on houses will be allowed “if installed on a pitched roof or a wall and protruding not more than 200mm”. The rights will not apply to wind turbines, air-source heat pumps or hydro systems. With respect to micro-wind and air-source heat pumps, the Government explained:

“It emerged from the consultation that further work was needed to explore the feasibility of introducing permitted development rights for air source heat pumps and wind turbines. Ministers have therefore decided to commission an independent study to examine the issues in further detail, with recommendations expected before the end of this year.”

*Planning policy framework:* [Scottish Planning Policy \(SPP\) 6](#) sets out the planning policy framework for renewables. It aims to facilitate successful achievement of the Government’s renewable energy target for 2020. The policy states that the Scottish Government is “keen to see a major increase in the smaller-scale production of heat and electricity from renewable sources.” The policy also states that development plans “should support the development of all technologies, regardless of scale, whilst ensuring that...renewable energy potential is realised in a way that is compatible with other development plan policies and objectives”. The policy also has a section on “Low and Zero Carbon Developments”, which states:

“Development plans should set out local policies on the provision of on-site low carbon and renewable sources of energy in new developments. Policies should ensure that, in all instances, opportunities for incorporating these technologies are fully explored by developers as part of the planning application process. The expectation should be that all new developments with a total floorspace of 500 sq metres or more should incorporate on-site zero and low carbon equipment contributing at least an extra 15% reduction in CO<sub>2</sub> emissions beyond the 2007 building regulations carbon dioxide emissions standard.”

Planning Advice Note (PAN) 45: Renewable Energy Technologies supports SPP 6 by providing information and best practice on renewable energy developments. The [Annex to PAN 45](#) contains advice in relation to microgeneration, dealing separately with the different technologies: wind, solar thermal, photovoltaic, heat pumps and biomass. In addition, [PAN 84](#) provides guidance on reducing carbon emissions in new developments – in particular, on implementing the target set out above for developments with a floorspace of 500 square metres or more.

Concerns have however been raised about the extent to which local authorities have implemented SPP6 (Scottish Parliament Economy, Energy and Tourism Committee 2009d).

## **BUILDING STANDARDS**

[Building Standards](#) are set out in the Building (Scotland) Regulations 2004. Part 6 of the Building Standards is on energy and Standard 6.1 requires every building “to be designed and constructed in such a way that the energy performance of the building is capable of reducing carbon dioxide emissions.” Technical Handbooks provide guidance on achieving the standards.

In August 2007, the Government appointed an expert panel chaired by Lynne Sullivan to recommend measures to improve the energy performance of houses and buildings in Scotland and thereby reduce carbon dioxide emissions. The panel's [report](#) (Sullivan 2007) recommended staged increases in energy standards in 2010 and 2013 to substantially reduce carbon emissions from new buildings; with the aim of net zero carbon buildings by 2016/17, if practical..

For domestic buildings, the report recommended that the 2010 change in energy standards should deliver carbon dioxide savings of 30% more than 2007 standards; and that the 2013 change should deliver carbon dioxide savings of 60% more than 2007 standards. For non-domestic buildings, the changes to energy standards would have to deliver higher savings (50% for the 2010 standards and 75% for the 2013 standards). The report commented on microgeneration (referred to as “low carbon equipment”):

“It is clear that, alongside energy efficiency measures, certain types of installations of low carbon equipment should have a part to play in achieving the Scottish Government’s targets for reducing carbon dioxide emissions. However having considered evidence from research and from recent experience, we do not consider that the industry is yet sufficiently well developed to justify mandatory requirements in building regulations for low carbon equipment or to require all buildings to become generators of electricity.”

On 27 February 2009, the Scottish Government (2009c) announced that “new building standards for homes and non-domestic buildings would reduce carbon emissions by 30 per cent beyond current standards”. The Government decided not to adopt the recommendation for a 50% reduction in carbon dioxide for non-domestic buildings because of the economic climate. The Government will consult in summer 2009 on the best way to implement the new standards.

## **IMPROVING ENERGY USE OF EXISTING BUILDINGS**

The Sullivan report also considered *existing* buildings. In relation to domestic buildings, the report recommended “consideration of measures and targets for reducing carbon emissions from the existing stock and incentives to encourage home owners to undertake improvements”. With respect to non-domestic buildings, the key recommendation was legislation to require all owners of non-domestic buildings to conduct a carbon and energy assessment and produce a programme for upgrading. This would be an extension of the Energy Performance Certificates [scheme](#) (which requires certificates to be produced when a building is sold or rented out).

In September 2008, the Government published a [consultation](#) in relation to the Sullivan report’s recommendations for non-domestic buildings. In addition, the Climate Change Scotland Bill includes provisions which enable Scottish Ministers to make regulations for the purpose of implementing new measures for non-domestic buildings (s 50). The Scottish Government has stated that “after the consultation report has been published we will develop options whereby the Scottish Ministers can progress section 50 of the bill” (Scottish Parliament Economy Energy and Tourism Committee 2009c). In November 2008, the Scottish Government stated that “shortly we will consult on additional measures that are needed to reduce energy use and carbon emissions in Scotland’s existing housing” (Scottish Parliament 2008d).

## **NEW FUEL POVERTY MEASURES**

On 19 November 2008, the Scottish Government announced a new Energy Assistance Package (EAP) to tackle fuel poverty (Scottish Government 2008f). The EAP will replace the Central Heating and Warm Deal Programmes and will commence in April 2009. There are four stages to the EAP; the last stage comprising more enhanced measures such as renewable heating systems. The Government confirmed that the EAP will enable people in off gas-grid houses to obtain air-source heat pumps (Scottish Parliament 2008d). The introduction of the EAP follows a [report](#) by the Scottish Fuel Poverty Forum and a Renewable Heating Pilot. The pilot involved the installation of renewable heating systems (mainly heat pumps) in properties off the gas-grid. An [evaluation](#) of the pilot concluded that “when correctly specified and installed, with adequate levels of support provided to allow householders to understand how to use the systems cost-efficiently, heat pump technologies are an effective, cost-efficient way to tackle fuel poverty” (Clear Plan UK and Logan Project Management 2008).

## **FIELD TRIALS OF TECHNOLOGIES**

The Energy Saving Trust is currently undertaking three UK-wide field trials of domestic microgeneration technologies, including micro-wind; ground and air-source heat pumps; and solar thermal systems (Energy Savings Trust 2009). Each of the three trials has been part funded by the Scottish Government and includes a sample of properties in Scotland. The goal is to establish the actual in-situ performance, compared with lab-based testing, from each of these technologies. The results will be provided to government and industry to help improve policy and product design. The EST plans to expand its portfolio of field trials over the next 1-3 years and is currently consulting to identify the most suitable technologies for trial.

## **UK GOVERNMENT POLICY**

Looking at the wider policy context, the UK Government has set a target of reducing greenhouse gas emissions by 80% by 2050, with at least a 26% reduction by 2020. In 2000 the Government set a target of 10% of electricity supply from renewable energy by 2010, and in 2006 it announced an aspiration to double that by 2020. The EU has set a target for 20% of the EU's energy to come from renewable sources by 2020; and it has been proposed that the UK's share of this target would be to achieve 15% of energy from renewables by 2020.

To what extent do UK Government policies on microgeneration apply to Scotland? Most UK Government policies outlined below apply to the whole of the UK or to Great Britain. Some do not. The Renewables Obligation (almost identical to the Renewables Obligation Scotland) only applies to England and Wales and policies relating to planning and building standards only apply to England. These policies which do not apply in Scotland are only outlined in this paper for the purpose of comparing Scottish and UK Government policies in these areas.

## **MICROGENERATION STRATEGY**

In March 2006, the UK Government published a [Microgeneration Strategy](#), which had a list of 25 actions to tackle the barriers to widespread uptake of microgeneration (Department of Trade and Industry 2006b). There were five categories of action: (i) cost constraints; (ii) information constraints; (iii) technical constraints; (iv) regulatory constraints/opportunities; and (v) other.

In June 2008, the Government provided a [progress report](#) on the strategy, which stated that “to date, 21 of the 25 actions have been completed and three have been overtaken by other events or measures (Department for Business, Enterprise and Regulatory Reform 2008b). The one that remains open will be completed later in 2008”. A number of these actions are outlined in the next section of this paper. The report concluded:

*providing research and information services to the Scottish Parliament*

“Much has been achieved through the delivery of the Microgeneration Strategy. However, more can be done to further encourage uptake. Two of the biggest remaining barriers are cost and lack of information, and these issues are being considered by the Renewable Energy Strategy and subsequent consultations and the EST’s Act on CO<sub>2</sub> advice service”.

The Government [consulted](#) on a draft Renewable Energy Strategy in June 2008 and the Strategy is due to be published in Spring 2009. In the meantime, the Government has announced the introduction of measures proposed in the consultation, including feed-in-tariffs for small-scale low carbon electricity generators and a Renewable Heat Incentive (discussed further below). On 12 February 2009, the Government also published a [consultation](#) on a Heat and Energy Saving Strategy, which sets out an aim for emissions from existing buildings to be approaching zero by 2050 (also discussed further below).

## **WILL TARGETS BE SET?**

The Climate Change and Sustainable Energy Act 2006 (which resulted from a private member’s bill sponsored by Mark Lazarowicz MP) requires the Secretary of State to, between 1 November 2008 and 31 March 2009, publish one or more national microgeneration targets unless he considers that it would be inappropriate to do so (section 4). Such targets must be in respect of the number of microgeneration systems installed in England and Wales or in respect of the number of electricity generating microgeneration systems installed in Scotland. In its Renewable Energy Strategy consultation the UK Government stated it was “not currently minded to introduce a specific target for microgeneration technologies at this stage in its development” (Department for Business, Enterprise and Regulatory Reform 2008c). The Government’s reasons for this are that “research shows that it is in fact a positive policy environment and not targets per se that drive decisions”; and that existing targets (e.g. emission reduction targets) already have the potential to stimulate the market for microgeneration.

## **CAPITAL GRANTS**

The **Low Carbon Buildings Programme** (LCBP) provides grants for the installation of certified microgeneration technologies throughout the UK. It has two phases:

[Phase 1](#) was launched in April 2006. It has total funds of £30 million and has two streams. Stream 1 funds grants for households and small-scale community projects. Households could obtain grants of up to £2,500 or 20%-50% of the costs of the system, whichever was lower. Householders had been able to obtain much higher grants until the Government changed the scheme in 2007 (Guardian 2007). Stream 2 funded grants to private, public and community organisations for medium scale projects (up to £100,000 or 40-50% of the costs) and large scale projects (up to £1 million or 40-50% of the costs). Phase 1 has closed except for the householder stream, which runs until June 2010 or when the funds run out.

[Phase 2](#) of the LCBP was launched in December 2006. It has a total pool of £50 million and it provides grants of up to £1 million to public sector buildings (including schools, hospitals, housing associations and local authorities) and not-for-profit organisations. Grants are limited to 50% of the total project costs. Although grants can be made for a range of microgeneration technologies, almost half of the £50 million total funding pot is available for solar PV systems. Phase 2 grant applications are being accepted until the end of June 2009.

## **INTEREST-FREE LOANS**

The Carbon Trust (CT) provides interest-free [Energy Efficiency Loans](#) of between £5,000 and £200,000 to small and medium enterprises in England and Scotland (and any business in Wales

and Northern Ireland) if they have been trading for at least 12 months and have an acceptable credit rating. This includes loans for the purchase and installation of micro-generation systems. Loans are repayable over a period of up to 4 years. The amount that the CT will loan for a project depends on the potential for reducing emissions and saving energy costs. The Carbon Trust also funds [Salix Finance Limited](#) (set up in 2004) to provide interest-free loans for UK public sector organisations to invest in energy saving equipment.

## TAX DISCOUNTS

There are three tax discounts. First, a reduced rate of VAT (5%) applies to the installation of microgeneration systems in households in the UK (HM Revenue and Customs 2006).

Second, the [Enhanced Capital Allowance](#) (ECA) scheme enables UK businesses to claim accelerated tax relief on investments in eligible energy saving equipment. Capital allowances enable businesses to write off the capital cost of purchasing plant and equipment against their taxable profits. The general rate of capital allowance is 20% per year on a reducing balance basis, which means the cost can be written off over a period of years. The ECA scheme, on the other hand, provides a first-year capital allowance at the rate of 100% (there is no further relief after the first year). The ECA can provide a cash flow boost of £224 for every £1,000 a business spends on energy saving equipment, in the year of purchase (Carbon Trust 2009). The only microgeneration technologies that appear to qualify are solar thermal, heat pumps and CHP.

Third, microgenerators do not have to pay tax on income from the sale of surplus electricity back to the grid or from Renewable Obligation Certificates (Department for Business, Enterprise and Regulatory Reform 2008b).

## FEED-IN-TARIFF SCHEMES

The Energy Act 2008, which was enacted on 26 November 2008, contains a broad framework for introducing at a later date two new financial incentives that were proposed in the UK Government's [consultation](#) on a Renewable Energy Strategy (Department for Business, Enterprise and Regulatory Reform 2008c):

- (1) *Feed-in-tariff scheme* (section 41): Electricity supply companies would be required to pay small-scale generators of low-carbon electricity (up to 5 megawatts) a tariff for each kilowatt hour generated or (this is still to be decided) for each kilowatt hour that is exported to supply companies. Instead of ongoing payments, the scheme might allow for an up-front payment to be made for the electricity that is 'deemed to be generated' (Department of Energy and Climate Change 2008b). The Government has not yet made a decision on the level of the tariff, which will have an important impact on whether the policy is successful. The Government will consult on the details of this scheme in summer 2009, with a view to introducing it in April 2010 (Hansard 2008). Feed-in-tariff schemes have been used in Germany, Spain and other countries (Department for Business, Enterprise and Regulatory Reform 2008c; Redpoint 2008).
- (2) *Renewable Heat Incentive (RHI)* (section 100): Similar to the above scheme, suppliers of fossil fuels for heating would make payments to renewable heat generators (of all sizes) for each unit of heat generated (Department for Business, Enterprise and Regulatory Reform 2008c). Alternatively, a central fund would make these payments and suppliers of fossil fuels would pay a levy into the fund. As with feed-in-tariffs, it may be possible for households that generate renewable heat to receive an upfront payment rather than an income stream (Department of Energy and Climate Change 2009a). The RHI "would be the only mechanism of its kind across Europe" (Department of Energy and Climate

Change 2008b). The Government will be consulting on the RHI during 2009 and it is also discussed as part of the recent consultation on a Heat and Energy Saving Strategy (Department of Energy and Climate Change 2009a).

It is important to note that both schemes would apply to England, Wales and Scotland. As renewable heat is devolved, the Scottish Parliament passed a [legislative consent motion](#) to enable the UK Government to implement the RHI in Scotland (Scottish Parliament 2008e).

The UK Government also has powers under the Climate Change and Sustainable Energy Act 2006 to require electricity suppliers to offer to purchase electricity generated by microgeneration (section 7). It has until August 2009 to make a decision on this. However, the introduction of feed-in-tariffs is likely to remove the need for intervention (Department of Energy and Climate Change 2009b). Note also that the regulator, Ofgem (2008), recently reviewed the market for exported electricity and concluded that suppliers “are offering fair value export offers for households wanting to sell back surplus power” but it was not clear whether this was sustainable. Ofgem also commented that the market would benefit by better provision of information to consumers.

## **INFORMATION AND ADVICE**

Like the position in Scotland, the UK Government funds the Energy Saving Trust and Carbon Trust as the main sources of advice and information on energy efficiency and microgeneration. In 2007, the UK Government also set up a [Microgeneration Certification Scheme](#) (MCS) for products and installers (Department for Business, Enterprise and Regulatory Reform 2008b). The MCS aims to provide consumers with confidence that products and installers meet quality standards. The MCS also links into eligibility criteria in other schemes such as the Low Carbon Building Programme. Since November 2008, the MCS has been funded and regulated by the industry rather than government.

## **THE RENEWABLES OBLIGATION**

The Renewables Obligation (RO), which applies only in England and Wales, is almost identical to the Renewable Obligation Scotland (which was referred to above) . The UK Government has also made changes to the RO to make it easier for microgenerators to claim ROCs. The UK Government is now proposing to reform the RO by introducing a new banding scheme and microgenerators would then be able to claim 2 ROCs for every 1 megawatt hour (MWh) of renewable electricity generated (Department of Energy and Climate Change 2008a). The new scheme aims to increase support to less established, higher risk technologies by awarding them more than 1 ROC/MWh of generation; and reduce support for technologies which are relatively mature or low risk. Banding up of microgeneration would “reflect that the capital costs of small generation technologies are, typically, significantly higher per MWh than for larger-scale...technologies”. The Government [consulted](#) on these changes and intends to introduce them in April 2009.

## **CARBON EMISSIONS REDUCTION TARGET**

The [Carbon Emissions Reduction Target](#) (CERT) is a statutory obligation on energy suppliers in Great Britain to achieve carbon targets by assisting households to take up energy efficiency and low carbon measures. The CERT follows two three-year phases of the Energy Efficiency Commitment (EEC), which ran from 2002-2005 and 2005-2008 respectively. Energy suppliers must, by 2011, deliver measures that will provide carbon dioxide savings of 154 million tonnes (Mt) CO<sub>2</sub>, which is equivalent to the emissions from 700,000 homes each year (Department for Environment, Food and Rural Affairs 2009). The regulator, Ofgem, sets a CERT for each energy

supplier having regard to this overall target and to customer numbers. Suppliers can meet their targets by increasing the take up of microgeneration as well as through energy efficiency measures. Suppliers must focus 40 per cent of their activity on a priority group of vulnerable and low-income households. On 11 September 2008, the Prime Minister proposed a 20% increase in the CERT target, as a part of a new package of measures to help households cut their energy bills (Department for Environment, Food and Rural Affairs 2009). On 12 February 2009, the Government published a [consultation](#) on this proposal.

## **COMMUNITY ENERGY SAVINGS PROGRAMME**

The package of measures announced in September 2008 also included a new Community Energy Savings Programme (CESP). It would be a CERT-like obligation (operating alongside CERT) that requires energy suppliers and electricity generators to deliver energy saving measures to areas in Great Britain with significant levels of low income households (Department of Energy and Climate Change 2009d). An overall target would be set and energy suppliers and electricity generators would each be set a share of this overall target. On the current proposal, it is estimated that suppliers and generators would install energy saving measures costing £350 million in around 90,000 homes, and resulting in 3.9 million tonnes of CO<sub>2</sub> savings. CESP would also promote a whole house approach, giving suppliers and generators bonus points for every additional measure installed within a single house. In addition, CESP would promote measures that give households the biggest fuel bill and carbon savings (in contrast to CERT which is designed to deliver CO<sub>2</sub> savings in the most cost-effective way). A number of measures will be available under CESP including solid wall insulation and microgeneration technologies. On 12 February 2009, the Government published a [consultation](#) on the CESP.

## **PLANNING POLICY**

*Permitted development rights:* In April 2008, the UK Government introduced permitted development rights for installing in households in England certain microgeneration systems including solar PV, solar thermal, certain heat pumps, biomass and CHP (The Town and Country Planning (General Permitted Development) (Amendment) (England) Order 2008)). This is subject to limits for all equipment except for ground source and water source heat pumps. For example, solar PV or solar thermal equipment cannot protrude more than 200mm beyond the plane of the wall or the roof slope. Permitted development rights have not yet been conferred in respect of micro-wind or air-source heat pumps. In June 2008, the Government explained:

“Due to concerns about noise and vibration issues, permitted development for micro wind and air source heat pumps is being linked to the Microgeneration Certification Scheme. As a result the General Permitted Development Order (GPDO) Statutory Instrument for these technologies needs to be notified to the EU Commission under the technical standards directive. We expect this to be completed later in the year.” (Department for Business Enterprise and Regulatory Reform 2008b)

*Planning policy framework:* The planning policy framework for renewable energy is set out in [Planning Policy Statement 22](#) (which applies to England only). It states that local planning authorities should specifically encourage small-scale renewable energy schemes “through positively expressed policies in local development documents”. It also states:

“Local planning authorities may include policies in local development documents that require a percentage of energy to be used in new residential, commercial or industrial developments to come from on-site renewable energy developments.”

A [report](#) (Department of Communities and Local Government 2006b) found that 56% of local development plans lodged that could be expected to contain such a percentage policy did so.

In December 2007 the UK Government published a [Planning Policy Statement](#) on Climate Change and Planning (this applies to England only). One of the principles of this statement is that “new development should be planned to make good use of opportunities for decentralised and renewable or low carbon energy”. The policy statement also states that planning authorities should “set out a target percentage of the energy to be used in new developments to come from decentralised and renewable or low-carbon energy sources where it is viable”.

## **BUILDING STANDARDS**

In a July 2007 [policy statement](#), the UK Government confirmed its intention for all new homes in England to be zero carbon by 2016 (Department of Communities and Local Government 2007) . This would be achieved in three steps: first by moving in 2010 to a 25% improvement in carbon emission standards set out in building regulations; then, in 2013 to a 44% improvement; and finally, in 2016, to zero carbon. In Budget 2008, the Government also announced its intention that all new non-domestic buildings should be zero carbon from 2019 and all new public sector buildings should be zero carbon by 2018 (Department of Communities and Local Government 2009). The Government also has a target for new school buildings to be zero carbon by 2016.

In December 2008, the UK Government published a [consultation](#) on zero carbon homes together with a preliminary consultation on zero carbon non-domestic buildings (Department of Communities and Local Government 2008). For homes, it proposes the following hierarchy of measures for meeting the zero carbon homes standard by 2016:

- (1) High energy efficiency standards;
- (2) A minimum standard of carbon emissions reduction compared to current building regulations (somewhere between 44% and 100%; possibly around 70%) should be achieved through a combination of energy efficiency measures, incorporation of onsite low and zero carbon technologies, and directly connected heat (not necessarily onsite);
- (3) A range of allowable solutions (including off-site renewable electricity) could be used for dealing with residual emissions after applying the above standards.

## **UK HEAT AND ENERGY SAVING STRATEGY**

As noted above, on 12 February 2009 the UK Government published a [consultation](#) on a Heat and Energy Saving Strategy, which sets out an aim for emissions from existing buildings to be approaching zero by 2050. As part of this, there is an aim for all homes and other buildings to receive by 2030 a package of cost-effective measures. The policies in the consultation aim to reduce annual emissions by up to 44 million tonnes of CO<sub>2</sub> in 2020, which would be a 30% reduction in household emissions (Department of Energy and Climate Change 2009a). The consultation comments on the territorial extent of the proposals as follows:

“Many of the policies and arrangements described in this paper and most of the proposals in this document apply to England and Wales. Although many of the policy areas in this document are devolved to Scotland, Scottish Ministers will consider responses to this consultation in developing their policies, particularly those from Scottish stakeholders.”

Some of the key proposals in the strategy are:

- A home energy advice service delivered by accredited domestic energy assessors;

- Financing mechanisms that spread the cost of energy saving measures and renewable technologies over time, so that costs are more than offset by savings on bills;
- Consideration of delivery models that would take over from CERT after 2012;
- Consideration of widening building regulations that require energy saving measures to accompany certain types of building work;
- Removing barriers to the development of district heating schemes (where heat for an area is produced centrally and transported to buildings through a network of pipes);
- Promoting the development of combined heat and power including micro-CHP.

## SARAH BOYACK'S PROPOSED BILL

In December 2005, Sarah Boyack MSP lodged a draft [proposal](#) for an Energy Efficiency and Micro-generation (Scotland) Bill. This proposal fell at dissolution but was re-lodged on 14 June 2007, and it has gathered sufficient support for a bill to be introduced. According to the initial proposal, the microgeneration measures include:

- Setting national targets for the take up of microgeneration and annual reporting of progress to meeting such targets;
- Requiring local authorities to consider setting local microgeneration targets;
- Granting permitted development status to specified microgeneration technologies which have been assessed for noise and visual intrusion;
- Amending building standards to require the installation of microgeneration technologies in all new building developments;
- Financial incentives such as a one-off flat rate reduction in council tax for houses that incorporate certified energy efficiency/micro-generation measures (set initially at £100); and a reduction in Business Rates for companies that incorporate certified energy efficiency/micro-generation measures into their buildings.

A consultation on the proposal drew 62 responses. The [summary](#) of the responses concluded that “the Bill proposal has met with overwhelming support in principle”. However, it did note that some respondents did not support an amendment to building standards because they considered that this might discourage new development. In addition, one respondent (Highland Council) did not support a reduction in council tax as this would have resource implications for local authorities. Many respondents also doubted whether the bill would assist those in fuel poverty because the costs of installing micro-generation technologies would be too prohibitive. On 13 November 2008, the Scottish Parliament (2008d) debated a motion by Sarah Boyack on energy efficiency and microgeneration. Sarah Boyack stated:

“My member’s bill is drafted, but with the imminent introduction of the climate change bill and John Swinney’s announcement that he is prepared to include measures on energy efficiency and microgeneration in that bill, I am keen to work constructively with him to ensure that the measures in my bill are included in the climate change bill.”

Following the debate, the Parliament adopted a [motion](#), which called on the Scottish Government “to take steps, as set out in [Sarah Boyack’s proposed bill], such as fiscal incentives for householders and businesses, to ensure that microgeneration technologies become widely available and used”. The motion also called on the Government to consider a scheme with funding in the order of £100 million “to provide energy audits, insulation provision and financial support for micro-renewables where appropriate”.

The Climate Change (Scotland) Bill (referred to earlier in this paper) does not contain any of the microgeneration measures proposed by Sarah Boyack. This was raised with the Minister for the Environment in the Economy, Energy and Tourism Committee's inquiry into the bill:

"Marilyn Livingstone: Given the important and effective contribution that microgeneration can make to reducing emissions, why has the Scottish Government not included targets on it?...How much of the proposed member's bill on microgeneration will be taken into account? That proposal has been put on hold until we see what happens with the bill.

Stewart Stevenson: I am not able to respond in detail on Ms Boyack's proposed bill because it has not been published. When that bill is introduced I will be able to make detailed responses on it. However, on the substantive question, power generation is a reserved matter, so we cannot deal directly with it..." (Scottish Parliament Economy, Energy and Tourism Committee 2009d).

While electricity generation is a reserved matter (Scotland Act 1998, Schedule 5, D1), "the encouragement of energy efficiency other than by prohibition or regulation" is devolved (Scotland Act 1998, Schedule 5, D5); and the Scottish Government has interpreted "energy efficiency" as including "the use of technologies reliant on renewable sources of energy" (see Climate Change (Scotland) Bill, s 48(8)). In addition, heat generation from renewable sources is considered to be a devolved matter (Scottish Government 2008g). Note also that Scottish Ministers have devolved powers in relation to planning matters and building standards.

## RECENT RESEARCH REPORTS

### ENERGY SAVING TRUST

In May 2008, the Energy Saving Trust (2008c) published a [report](#) on policy options to achieve widespread microgeneration penetration in Scottish households. The report used a consumer behaviour model to estimate the impact of policy interventions on uptake through to the year 2050. Looking first at what would happen if there were no further policy interventions other than those currently in place, the report found that microgeneration was "likely to play a very limited role in the Scottish energy mix to 2050" and it would not lead to significant CO<sub>2</sub> savings.

The EST examined the impact of individual policies as well as policy combinations. It concluded that one particular policy combination, requiring action at both Scottish and UK level, could achieve savings of 9.6 million tonnes (Mt) CO<sub>2</sub> per year by 2050, with heating technologies (including CHP) contributing most savings (8.7 Mt CO<sub>2</sub>). This represents a 16% saving of total greenhouse gas emissions in Scotland compared to 2006 levels (59 Mt CO<sub>2</sub> equivalent) (AEA 2008b). The potential for carbon savings by 2020 would be more limited (3.3 Mt CO<sub>2</sub>).

The report ultimately recommended a package of 12 measures to encourage mass market uptake of microgeneration. Measures requiring Scottish Government action included:

- *Regulation:* As microgeneration becomes more cost-effective, the least efficient heating products should be taken off the market so that only low carbon options are available for householders wanting to replace their heating system. In the longer-term, more demanding regulation should be considered such as requiring the installation of microgeneration when a house is sold or when it is re-roofed. The report also discusses a requirement for new buildings to incorporate microgeneration.

- *Subsidies and loans:* For microgeneration heating measures, the value of support needs to be at least at current SCHRI levels (30 per cent). The Government should also provide support to consumers through a soft loan scheme (e.g. 10 year loan with an interest rate of 5 per cent). In addition, it should consider providing a council tax rebate for the installation of microgeneration: EST notes that “there may be legislative reasons why this may not be possible in Scotland. We recommend steps are taken to overcome these”.
- *Awareness and information:* The Government should fund an awareness programme so that consumers value the environmental benefits of microgeneration. It should also set up an independent advice service on microgeneration (as noted above in June 2008, the Scottish Government expanded the role of the EST’s advice centres to include advice on microgeneration and it has also set up a new home visits service).
- *Technological development:* The Government should establish a clear and supportive framework and should consider setting microgeneration targets. It should also create a unified policy for microgeneration and electricity grid decarbonisation so that overall CO<sub>2</sub> savings are achieved at lowest cost. Further, it should work with the other UK administrations to support early commercialisation measures, including field trials.

The report also recommended action by the UK Government, including pricing carbon at least at £20 per tonne of CO<sub>2</sub> and, for electricity generating technologies, either a feed-in-tariff or the creation of a “Microgeneration Obligation”, which would be part of or separate to CERT. As noted above the UK Government is proposing to introduce a feed-in-tariff scheme.

## **HALCROW GROUP LIMITED**

The Scottish Government commissioned Halcrow to undertake an independent review of the impact and effectiveness of energy efficiency and microgeneration support in Scotland. The [report](#) (Halcrow 2008) was published in June 2008 and it contained seven recommendations, some of which were directed more at energy efficiency measures. On microgeneration, key recommendations for the Scottish Government were that:

- It should “consider the development of a virtual organisation, comprising an overarching brand and executive committee of key funders to facilitate a more streamlined approach to the delivery of energy efficiency and microgeneration support”.
- It should “seek to ensure that the funding available through the CERT is maximised for Scottish households”. The report noted that Scotland’s pro-rata share of funding under CERT would be around £75 million per year but early indications were that energy supply companies would be unlikely to allocate this level of funding in Scotland. One reason for this was that in England energy companies and local authorities had developed strategic relationships through an energy-efficiency council tax rebate scheme. Note that the
- It should “consider developing further the provision of high quality advice as a means of supporting the microgeneration sector in Scotland”. The report noted that “a high number of consultees identified a lack of specialist, impartial microgeneration advice available for households and businesses as one of the most important gaps in the current provision of support for energy efficiency and microgeneration.”

The Scottish Government has said recently that it is preparing a CERT strategy to increase its uptake in Scotland (Scottish Parliament Economy, Energy and Tourism Committee 2009b).

## ELEMENT ENERGY LTD

Element Energy Ltd was commissioned by a consortium of the UK government, non-government organisations and the industry to: (i) provide an overall picture of the current and potential future level of demand for microgeneration, and (ii) to assess the likely impact of different policies and setting of microgeneration targets. The research involved surveys and economic modelling and it covered England, Wales and Scotland. The [report](#) was published in June 2008 (Element Energy 2008a). Key findings in relation to the domestic sector included:

- If current UK policies are continued, there is likely to be fairly slow uptake of the most cost-effective technologies (primarily gas fired CHP) by 2020, increasing towards 2030. By 2030, there would be over 3 million microgeneration units installed (representing around 10% of UK homes). This would save only about 2.6 Mt CO<sub>2</sub>/year (compared to total UK emissions of 554 Mt CO<sub>2</sub> in 2006). The two key policies that drive this uptake are CERT and the reduced rate of VAT on installations.
- The Zero Carbon Homes (ZCH) policy was excluded from the analysis of current policies because its impact depends on how zero carbon is defined – in particular, the degree to which developers are allowed to offset their consumption using off-site electricity generation. If no net offsite electricity were allowed, this would have a large impact on microgeneration uptake, leading to around 9 million installations by 2030 (compared to about 3.5 million if offsite electricity was allowed).
- With increased government support, there is potential for much wider uptake and higher emissions reductions. Two of the potential policy combinations that were modeled would lead to over 30 million microgeneration units being installed by 2030; and this would save around 25 Mt CO<sub>2</sub>/year by 2030, which would represent a 4.5% saving of total UK CO<sub>2</sub> emissions compared to 2006. By 2050 the policy combinations could save 35-40 Mt CO<sub>2</sub> per year, which would be a 6-7% saving of total UK CO<sub>2</sub> emissions. .
- One of the policy combinations that would lead to much wider uptake was (i) a ban on conventional heating systems after 2016, requiring consumers to install microgeneration when they replace their boilers and (ii) requiring developers to install microgeneration at the time of roof replacement. Another policy combination involved the ZCH (with no net offsite allowed), a feed-in-tariff scheme, and soft loans.

The report concluded that a range of policies could support a microgeneration target of over 500,000 units by 2015; and 2-3 million units by 2020 (in both domestic and non-domestic sectors). However, it considered that targets should only be established after the government has made a firm decision to adopt supporting policies. It is also worth noting the comment in the report that “the most effective microgeneration policy in terms of reducing CO<sub>2</sub> is highly sensitive to the wider energy debate, in particular to the availability of low cost natural gas and the carbon intensity and price of grid electricity”. Currently, the most appropriate policy is to promote widespread use of gas-fuelled CHP. However, if there is a rapid decarbonisation of the electricity grid and at low cost, heat pumps and biomass would be more effective.

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