The Scottish Government

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VETERINARY & ADVISORY SERVICES PROGRAMME

Farm Scale Renewable Energy Guide

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Leading the way in Agriculture and Rural Research, Education and Consulting

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Contents

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The Agri-renewables Strategy

The Scottish Government published its Agri-renewables Strategy for Scotland in 2014 providing a routemap for agri-renewables which sits alongside the *2020 Routemap for Renewable Energy in Scotland* and the *Microgeneration Strategy for Scotland.* It sets out how the Scottish Government will work with industry and other stakeholders to continue supporting the development of a sustainable and viable market for agri-renewables to help deliver the transition to a low carbon economy. The strategy identifies six focus areas which are of key importance for development of renewables on farms and under each a set of actions have been identified to mitigate barriers to uptake.

- **Community involvement and benefits**: actions in this area seek to ensure that local communities share in the advantages of on-farm renewable energy. These include increased community cohesion and confidence, skills development and support for local economic development.
- **Skills and advice:** this section outlines the support available to land managers in considering a renewables development and the initiatives that are underway to increase confidence in the sector.
- **Planning and consents:** planning is an important consideration in developing any renewables project and this section explains the actions being taking to streamline the planning system, including online planning advice and guidance.
- **Grid connection:** the challenges in obtaining a grid connection are acknowledged and this section explains the proposed actions to develop a flexible system that can accommodate the increased penetration of renewables.
- **Finance and technology costs**: this section outlines the range of support in place to encourage growth in the agri-renewables market with initiatives such as the Energy Technology Partnership also examined.
- **Research and innovation:** the Scottish Government's commitment to innovation and research aimed at driving the development and deployment of renewable energy generation is outlined in this section alongside highlighting of achievements.

For Further Information see:
www.scotland.gov.uk/Publications/2014/02/7600/0

Renewable Energy – the opportunities?

The information in this guide highlights the main benefits, issues, resource requirements, financial considerations and any other considerations you need to take into account for each renewable energy technology. This guide will help you start to identify which technology will best fit with your farm and your objectives. Confirming whether or not a renewable technology will be economically and technically viable on your farm will require a detailed and thorough appraisal. You may find independent expert advice useful in this process; for complex projects this will be essential.

Renewable energy offers an excellent opportunity but only if it is carefully planned to fit with your business and your farm!

There are three important questions for you to consider:

1. Why should you invest in renewable energy?

Renewable energy can be an excellent choice for farmers seeking a diversification opportunity. The key benefits of renewable energy to your business are:

- An opportunity to generate a sustainable income for up to 20 years through Government incentives;
- Makes use of on-farm resources – from slurry to woodlands, and wind to rivers;
- Energy generated can be used to reduce electricity and heating bills on-farm, and the excess can be sold to generate additional income; and
- Reduction in emissions of carbon dioxide.

2. Which renewable energy technologies are suitable for farms?

The renewable energy technologies which offer the best diversification opportunities for farms are:

- Wind energy
- Hydropower
- Anaerobic digestion/biogas
- Biomass
- Solar photovoltaic

3. What are your objectives for considering renewable energy?

Each renewable energy technology has different characteristics which will influence whether or not it is suitable for your farm. You need to carefully consider what your objectives are and what you want out of a renewable energy installation. The following factors are important to consider before deciding which renewable energy technology option(s) you wish to investigate:

- How much capital do you have access to for investment?
- What is the scale and pattern of your energy demand?
- What resources do you have available on your farm?
- How much risk are you willing to take?
- How important is it to you to purchase locally?

More in-depth information can be found at www.sruc.ac.uk/renewableenergy

Renewable Development Initiative

Renewable Development Initiative

The Renewable Development Initiative has been developed by the National Farmers Union Scotland with funding from the Scottish Government and is facilitated by Smiths Gore. This project is designed around visits to farms that have or are installing renewable energy schemes (such as biomass, wind, solar photovoltaics, hydro power and anaerobic digestion) across Scotland. The case-study projects demonstrate the challenges faced and solutions adopted at various stages of a scheme's life (from planning, to construction, to operation) and also provide an insight into how renewable energy can provide valuable additional income to an agricultural business. By showcasing renewable technologies in action on farms with those that live and work with them, we aim to provide people with a far greater understanding about the true benefits available and what can be achieved.

For Further Information see www.renewableenergyonfarms.co.uk/

Incentives for Renewable Energy

Feed-in Tariff – Quick Facts

What is the Feed-in Tariff (FIT) Scheme?

- The scheme is designed to encourage the installation of small scale (up to 5 MW), low carbon electricity production. It makes a payment of every unit of renewable electricity produced.
- The FIT Scheme pays two types of tariffs:
- Generation tariff: Payment made for every unit of electricity you generate.
- Export tariff: Payment for every unit exported to the electricity grid.

What are the key eligibility criteria?

- You cannot have any kind of public grant AND the FIT.
- The plant must be new (second hand equipment is not eligible).
- For installations with a capacity of 50 kW or less (excluding anaerobic digestion) both the equipment and the installer must be certified with the Microgeneration Certification Scheme.
- Installations over 50 kW and all anaerobic digestion installations must apply through the ROO-FIT process.
- For solar PV installations with a total installed capacity of 250 kW or less, the building attached or wired to the installation must have an Energy Performance Certificate rating of Level D or above.

What technologies are eligible?

The small scale (less than 50 MW), low-carbon technologies, which are eligible for FITs include:

- Wind (building mounted or free standing)
- Solar PV (roof mounted or stand alone)
- Hydropower
- Anaerobic digestion
- Micro combined heat and power (with a capacity of 2 kW or less)

What about the tariff rates?

- The tariff rates for the FIT depend on the technology you are installing.
- The tariff rates are increased annually in-line with inflation.
- The payments are made for 20 years.

- The rates are also subject to review to both control the budget and ensure that uptake meets Government targets. However, the rate you receive for the 20 years will be the rate when you make your application. It will be adjusted annually in line with inflation.
- The most up to date rates can be found at: www.sruc.ac.uk/renewableenergy

Scottish Renewable Obligation Certificates – Quick Facts

What is the Scottish Renewable Obligation?

- The scheme is designed to encourage the installation of large scale renewable electricity production.
- Accredited renewable electricity installations are issued with Scottish Renewable Obligation Certificates (ROCs) for the electricity generated on a monthly basis.
- Electricity suppliers have an obligation to generate a given number of ROCs. If they do not meet their obligation, they must buy ROCs from other parties.
- Renewable electricity suppliers can then trade their ROCs with these energy suppliers.
- For the majority of farm-scale renewable electricity installations the FIT scheme will be the preferred option.

What are the key eligibility criteria?

- Renewable energy installations can be in either the ROCs or Feed-in Tariff Scheme, but not both and it is not possible to switch once accredited.
- ROCs can only be issued on electricity supplied to customers in the GB and NI or electricity used in a permitted way. This can include electricity exported to the grid, electricity used on site by the operator of the installation or supply via a private wire.
- There are range of other more complex criteria dependent on the scale and technology.

What technologies are eligible?

- Wind energy (building mounted or free standing)
- Solar PV (roof mounted or stand alone)
- Hydropower
- Anaerobic digestion
- Wave and tidal
- Biomass electricity production (dedicated, co-firing and Combined Heat and Power)
- Sewage gas and landfill gas

What about the tariff rates?

- The number of ROCs received per MWh depends on the technology and scale. The most up to date information on bands can be found at: www.ofgem.gov.uk
- There are regular reviews of the ROC banding.
- The value of a ROC depends on the current market value – they are a tradable commodity with no fixed price.

Non-domestic Renewable Heat Incentive – Quick Facts

What is the Renewable Heat Incentive (RHI)?

- The scheme is designed to encourage the installation of renewable heat technologies. It makes a payment of every unit of renewable heat produced.
- The scheme is open to non-domestic properties or domestic properties on district heating schemes (it is not open to single domestic premises).
- A farmhouse on its own would be classed as domestic, unless business rates are paid on all or part of the property (e.g. because it is substantially used as a B&B).

What are the key eligibility criteria?

- You cannot have any kind of public grant AND the RHI.
- The plant must be new (second hand equipment is not eligible).
- For installations which are 45 kW_{th} or under, both the plant and the installer must be accredited with the Microgeneration Certification Scheme.
- The heat use must be 'wholly enclosed' e.g. an outdoor swimming pool would not be eligible.
- The installation must be heating a permanent structure.

What technologies are eligible?

- Biomass boilers
- Ground source heat pumps
- Water source heat pumps
- Deep geothermal
- Solar thermal
- Biogas combustion
- Biomethane injection to the grid

What are the tariff rates?

- The tariff rates for the RHI depend on the technology you are installing.
- The tariff rates are increased annually in-line with inflation.
- The payments are made for 20 years.
- The rates are also subject to review to both control the budget and ensure that uptake meets Government targets. However, the rate you receive for the 20 years will be the rate when you make your application. It will be adjusted annually in line with inflation.
- The most up to date rates can be found at: www.sruc.ac.uk/renewableenergy

Domestic Renewable Heat Incentive

The Government announced in summer 2013 that the domestic RHI will open for applications in spring 2013. The technologies that will be eligible include:

- Air to water heat pumps
- Biomass-only boilers and biomass pellet stoves with back boilers
- Ground (and water) source heat pumps
- Flat place and evacuated tube solar thermal panels

For more information on eligibility criteria, please see www.sruc.ac.uk/renewableenergy

Wind Energy

Wind turbines harness the power of the wind and use it to generate electricity. They are an effective renewable energy option on-farm in terms of electricity output and the best sites are those with an average windspeed of at least 5 m/s with an unobstructed flow of wind.

Key benefits	High financial returns with little input once operational. Long-lasting and robust technology; wind turbines will last in excess of 20 years. Require a small footprint of land which means that agricultural land loss is minimal.
Main issues	High risk – upfront costs can be considerable with no guarantee of gaining planning consent, i.e. submission of a planning application for a single medium to large scale wind turbine can cost upwards of £25,000. Grid connection costs may be significant and are dependent on the distance to the nearest connection point, line capacity and any upgrades needed. This cost may result in a project not being economically viable. Adverse impacts on the surrounding environment – careful assessment needs to be conducted to ensure any impacts are minimal and this would be addressed through the planning process. Wind flow is not constant and varies in force and with the seasons. There will be times when no electricity is produced at all. Wind energy may be a controversial option depending on the location and opinion of local communities.
Resource requirements	Average wind speed greater than 5 metres per second. A site with an unobstructed flow of wind e.g. no obstacles, such as trees and buildings, obstructing the prevailing winds.

Financial considerations	Capital costs – typically £1,600 to £3,500 per kW for single grid-connected turbines (costs per kW are lower for larger turbines). Grid connection costs can also be significant. Operational costs – typically costs about 2% to 3% of the capital cost. Income from financial incentives – eligible for FITs or ROCs depending on the scale of installation. Energy bill savings – electricity generated can be used on-farm and result in savings in electricity bills. Income from exporting electricity – excess can be exported to the grid and can claim either the FITs Export Tariff or negotiate a power purchase agreement with an electricity company. Loans – the Community and Renewable Energy Scheme (CARES) offers Pre Planning Loans to rural landowners and community groups. If the project successfully obtains planning permission the loan will be repayable at commercial rates. If the project is prevented from proceeding for an insurmountable reason, the loan drawn down to that point can be written-off.

Other considerations	Planning permission – will be required. Noise – there are rules on the allowable levels of wind turbine noise at nearby properties. Ownership of land – who owns the land on either side of the proposed scheme? Who owns the land needed to access the site for construction etc? Access – is the access for construction and maintenance suitable? Environmental and landscape impacts – will development have an impact on sites protected for their natural heritage or landscape value, such as a Sites of Special Scientific Interest (SSSI), Special Areas of Conservation (SAC), SNH Wild lands, or National Parks, etc. Archaeological and cultural heritage impacts – are there any designated sites such as Listed Buildings or Scheduled Ancient Monuments that could be affected. Impact on airport/MOD radar and the interruption of microwave links – solutions are available but in areas this will mean turbine development is not possible e.g. within 50 km of the UK Seismological Array at Eskdalemuir.

For further information see the wind energy section at www.sruc.ac.uk/renewableenergy

Hydropower

Hydropower schemes harness the energy from flowing water to generate electricity, using a turbine or other device. The volume of flowing water, and the height it falls, determines how much electricity can be generated.

Types of technology	Storage based - rainfall and surface drainage water is stored behind a man-made dam and then released to provide a constant, or demand-based, flow of water to the turbines to generate electricity. Run-of-river - water is taken out of a stream, then fed downhill in a pipe and returned to lower down river via a turbine.
Key benefits	Annual energy output and seasonal variation is relatively predictable, varying with annual rainfall patterns. Slow rate of change e.g. the output power varies more gradually following a rainfall event than output from a wind turbine does as wind speed changes. Good correlation with demand i.e. output is maximum in winter. Low environmental impact when installed on a suitable site. Long-lasting and robust technology
Main issues	Environmental impact – storage based systems can have a significant ecological impact due to the effect of the dammed water course on the surrounding environment. SEPA guidance requires the quantity of energy produced to be sufficient to justify any negative environmental effect to the watercourse and therefore sites with shallow falls may not be suitable. Locating a suitable site – it can be difficult to find a site with all required characteristics, including both sufficient head and year-round water flow. Grid connection costs may be significant and are dependent on the distance to the nearest connection point, line capacity and any upgrades needed. This cost may result in a project not being economically viable.

Resource requirements	Available head - this is the vertical distance the water would drop between the intake and the site of the turbine. The higher the head the greater the power produced for a given flow of water. Flow rate - the volume of water that is available in the watercourse. This will depend upon the annual rainfall and nature of the catchment area.
Financial considerations	Capital costs – these will vary depending on scale, site and type of system used. Typical costs for micro-schemes can range from £2,000 to £9,000 per installed kW. Grid connection costs can also be significant. Operational costs – estimated to be in the region of 2% of the capital cost per annum, less if a high proportion of the installation cost is infrastructure. Income from financial incentives – eligible for FITs or ROCs depending on the scale of installation. Energy bill savings – electricity generated can be used onfarm and result in savings in electricity bills. Income from exporting electricity – excess can be exported to the grid and can claim either the FITs Export Tariff or negotiate a power purchase agreement with an electricity company.

Other considerations	Planning permission – will be required. Ownership of land – who owns the land on either side of the proposed scheme? Who owns the land needed to access the site for construction etc? Access – is the access for construction and maintenance suitable? Operational input – low; regular oiling of the bearings and cleaning of the intake screen is required and this can be easily undertaken by local staff. Environmental impacts – will development have an impact on sites protected for their natural heritage value, such as a Sites of Special Scientific Interest (SSSI) or Special Areas of Conservation (SAC). Interests of fisheries and leisure users of the watercourse also need to be considered. Archaeological and cultural heritage impacts – are there any designated sites such as Listed Buildings or Scheduled Ancient Monuments that could be affected. Water use licence – this will be required under The Water Environment (Controlled Activities) (Scotland) Regulations 2005 from SEPA.

For further information see the hydro energy section at
www.sruc.ac.uk/renewableenergy

Anaerobic Digestion

Anaerobic digestion (AD) is the process of biological decomposition of a feedstock (biodegradable plant or animal matter) in the absence of oxygen. This produces carbon dioxide and methane. The methane can be used to generate renewable electricity, heat or injected into the grid.

Types of technology	There are several different types of anaerobic digestion plant, some of the main options include: Thermophilic or mesophilic digestion – almost all AD plants in the UK are mesophilic (digestion at 30 to 40°C) as they are generally considered to be more stable than thermophilic systems (digestion at 50 to 60°C). ‘Wet’ or ‘Dry’ systems – this depends on the feedstocks used. ‘Wet’ systems are typically up to 15% solids whereas ‘dry’ are usually 15 to 40% dry matter. Single or multi-stage designs – multi-stage systems offer the advantage of potentially higher biogas output as each stage provides optimal conditions for different bacterial groups required. However, this adds greater complexity to the system and increases capital cost.
Key benefits	Reduces emissions of methane from manures and agricultural residues (methane is a much more potent green house gas than carbon dioxide). May make use of waste products that have little or no other value. Reduces nuisance odours as the digestion process takes place in a sealed tank. Provides water quality benefits from improved management of nitrogen and other nutrients present in manures and slurries. The digestate (material left over after digestion) can be used as a fertiliser replacement or soil improver.

Main issues	Lack of tried and tested models for technically and financially successful farm-scale projects. Security of feedstock supply and sensitivity to fluctuations in cost can make project finances uncertain and obtaining a loan difficult. It is often difficult to get a farm-scale AD plant to stack up financially. Regulation and licensing can be onerous under the current rules for farm-scale plants (depending on the feedstock and use of digestate). Grid connection cost may be significant and is dependent on the distance to the nearest connection point, line capacity and any upgrades needed. This cost may result in a project not being economically viable.
Resource requirements	Feedstock - any biodegradable plant or animal matter that is not woody e.g. animal manures and slurries, energy crops or food waste can be used. The key consideration is the cost of the feedstock versus the biogas production per tonne (e.g. slurry maybe be a cheap feedstock but has very low biogas production)

Financial considerations	Capital costs – vary depending on the scale of system but typical costs for can range from £2,500 to £6,000 per installed kW. Additional capital costs such as grid connection and feedstock storage (for example silage clamps or slurry storage) can be significant.
	Operational costs – vary considerably and are dependent on the scale of the plant and feedstocks used – costs include: feedstock cost, transport and storage, labour and management, biological monitoring, maintenance and permits and licensing.
	Income from financial incentives – electricity generated will be eligible for FITs or ROCs depending on the scale of installation. Heat generated above that required to heat the digester may be eligible for RHI payments.
	Energy bill savings – electricity and heat generated can be used on-farm and result in savings in electricity and heating bills.
	Income from exporting electricity – excess can be exported to the grid and can claim either the FITs Export Tariff or negotiate a power purchase agreement with an electricity company.
	Income from selling excess heat – if there is a third party heat demand in the vicinity of the plant.

Other considerations	Planning permission – will be required. Operational input – a small system running on silage and slurry will require significantly less input on a day-to-day basis than a larger plant taking in catering waste. Space – is there sufficient space for the digester tank, feedstock storage, digestate storage and ancillary equipment. Location – if planning to use the heat, the plant will need to be located near heat demand Access – are access roads suitable for feedstock delivery vehicles and they may need to meet the requirements of various licences and regulations. Regulations and licensing – this will vary depending on the nature and source of the feedstock and use of the digestate e.g. EU Animal By-products Regulations, BSI PAS 110, PPC Regulations, Waste Management License, Duty of Care and Waste Carrier License.

For further information see the anaerobic digestion section at www.sruc.ac.uk/renewableenergy

Biomass

Biomass boilers use either woodfuel or straw to generate heat, which can be used for almost any heating need on the farm.

Types of technology	There are several types of biomass boiler: • Woodchip boilers. • Pellet boilers. • Log boilers. • Straw boilers. • Multi-fuel (e.g. straw and logs, log and pellet).
Key benefits	Fuel bill savings – price per kWh for biomass fuels is usually significantly lower than oil, LPG or electricity Biomass boilers produce water at the same temperature as conventional fossil fuel boilers, so there is no need to change your existing wet heating systems. Technically and financially viable on almost any farm. Generally no external barriers to installation e.g. if required obtaining planning permission is usually relatively straight forward. Tried, tested and efficient technology. No specific resources are required on-farm, only a heat demand.
Main issues	Poor design and installation – can lead to systems which do not function efficiently. Poor design of the fuel store – can lead to inefficient and expensive deliveries. Mismatch of boiler fuel requirements to the type and quality fuel available locally. Poor fuel quality – issues such as high moisture content, contaminants or out of specification particles, will lead to a variety of problems.

Resource requirements	Do not need to have biomass supply available on-farm – still an attractive investment based on buying in your fuel. Logs or woodchip can be produced on-farm; pellets cannot. Woodfuel production on farm can stimulate improved woodland management and may result in increased value of the woodland in the long term. It usually results in lower fuel costs and increased security of supply.
Financial considerations	Capital costs – vary depending on the size of the system, fuel, level of sophistication, whether it is a retro fit, containerised system or new build. In general, basic straw bale burners and log boilers are the cheapest of the biomass boilers, followed by more sophisticated log, pellet then woodchip boilers. Operational costs – fuel costs depend on the fuel selected, whether produced on-farm or bought in, delivery distances and production methods employed. Pellets are the most expensive woodfuel. Maintenance costs depend in part on the type and size of the system, as well as how hard the boiler is working. Average servicing costs are between £500 and £1,000 per year. Income from financial incentives – the Renewable Heat Incentive will make a payment for every unit of heat produced for 20 years. Energy bill savings – woodfuels are significantly cheaper the oil, LPG or electricity. Income from selling excess heat – if there is a third party heat demand in the vicinity.

Other considerations	Planning permission – not always required, but is usually straight forward to obtain. May be more complex if Listed Buildings are involved. Space – biomass boilers require more space than an equivalent oil boiler and often needs extra space around them for access and servicing. Size of the fuel store will depend on the fuel and the desired frequency of deliveries. Access and fuel delivery – fuel store should be designed based on delivery vehicles which are available in area and which can access the site. Manual loading or automatic feed – log boilers are manually loaded; pellet boilers and woodchip boilers are automatically fed. Operational input – pellet boilers tend to require less day-to-day attention than a woodchip system. Boilers vary in their level of sophistication, for example some have features for cleaning the boiler tubes, flue and grate, whereas other boilers will need this to be done manually.

For further information see the biomass section at www.sruc.ac.uk/renewableenergy

Solar Photovoltaic

Solar power refers to energy derived from the sun in terms of either direct heat or daylight. Solar photovoltaic (PV) systems convert sunlight into electricity for use in the home or to export to the grid.

Types of technology	There are several PV systems that can be used: • Solar panels retrofitted onto building roofs. • Solar tiles and slates integrated into roofs (usually new build). • Ground mounted solar panels.
Key benefits	Easy to install and can be retrofitted to existing infrastructures. Require minimal maintenance. Very few external barriers to installation. Short lead time from feasibility to installation.
Main issues	Intermittent electricity generation – entirely dependent on weather and seasons. Times of electricity generation may not match the times of your electricity demand.
Resource requirements	Roof-mounted installations require a large area of unshaded roof which faces between south east and south west. Ground mounted solar PV installations require a large, unshaded area of land.
Financial considerations	Capital costs – vary depending on the scale of system but typical costs for can range from £1,000 to £1,200 per installed kW. Operational costs –components of the system are simple and require little maintenance – an annual service is recommended by suppliers. Income from financial incentives – eligible for FITs or ROCs depending on the scale of installation. Energy bill savings – electricity generated can be used onfarm and result in savings in electricity bills. Income from exporting electricity – excess can be exported to the grid and can claim either the FITs Export Tariff or negotiate a power purchase agreement with an electricity company.
Other considerations	Planning permission – may not be required as some solar PV installations fall under the Permitted Development rights – your local authority will be able to advise.

For further information see the solar PV section at http://www.sruc.ac.uk/renewableenergy

Useful Terms

Anaerobic digestion	A biological process where bacteria breakdown organic matter under oxygen-free conditions to produce a biogas containing methane.
Biogas	A combustible gas produced by the biological breakdown of organic matter in anaerobic conditions (for example, methane). Used to generate heat and electricity, or can be cleaned and concentrated into gas for the grid.
Biomass	Any biological material derived from living, or recently living organisms. Includes everything from wood waste to other plant and animal matter.
Combined heat and power	The sequential production of electricity and heat from the same fuel source.
Controlled Activity Regulations	A framework for the development of risk-based and proportionate measures to control impacts on the water environment and safeguard sustainable water use for now and future generations.
Digestate	A nutrient-rich substance produced by anaerobic digestion that can be used as a fertiliser. It consists of left over indigestible material and dead micro-organisms. Often separated into solid and liquid portions prior to spreading on land.
Digester	The tank in which anaerobic digestion takes place. Many AD plants will have both a primary and a secondary digester to maximise gas production.
Environmental constraints	Environmental constraints data is made up of the locations and classifications of areas deemed to be of natural importance. These areas have restrictions that may limit the extent and type of development that can take place and knowing the type and location of these designated areas is important during the planning process.
Environmental impact assessment	A study of the environmental effects of a proposed project.
Feedstock	Generic term for any biomass resource used for conversion to energy or biofuel.

Feed-in Tariff	An incentive scheme designed to promote the generation of renewable electricity production via long-term index-linked payments. Launched in April 2010. Payment rates vary depending on type and size of technology employed and are subject to periodic review.
Hydropower	Using running water to generate electricity, whether it's a small stream or a larger river.
Impoundment scheme	An impoundment is any dam, weir or other structure that can raise the water level of a water body above its natural level.
Kilowatt (kW)	A measure of electrical power equal to 1,000 W. Kilowatts are a measure of power, in the same way as a tractor's power is rated in horsepower – 1hp is about three quarters of a kW. Energy installations are often rated by their maximum power output in kW. Heat installations are measured as kW thermal (kWth).
Kilowatt hour (kWh)	A measure of total energy produced, one kWh being also known as a unit of electricity e.g. a boiler of 500kW rating, running at full power for one hour, will produce 500kWh of heat.
Microgeneration Certification Scheme (MCS)	An industry-funded assurance scheme to ensure the quality of renewable technology installations, companies and products. MCS-certified products and installation company needed to qualify for FITs in sub-50kW category.
Megawatt (MW)	A unit of power equal to one million watts.
Methane	The odourless, flammable gas produced during anaerobic digestion. Can be captured and used to generate energy.
Pellets	Wood pellets are manufactured on an industrial scale from a variety of products such as saw dust, virgin timber, and saw mill co-products.
Permitted Development	A type of development that can be carried out without planning permission.

Renewable Heat Incentive	Renewable Heat Incentive is a Government scheme to encourage the uptake of renewable heat technologies. It makes a payment for every unit of heat produced.. Payment rates vary depending on type and size of technology employed and are subject to periodic review. This is the first financial support scheme for renewable heat in the world and opened in November 2011
Return on investment	Return on investment analysis compares the magnitude and timing of investment gains directly with the magnitude and timing of investment costs.
Renewables Obligation	The main support scheme for renewable electricity projects in the UK. It places an obligation on UK electricity suppliers to source an increasing proportion of their electricity from renewable sources. Suppliers meet their obligations by presenting sufficient Renewables Obligation Certificates. Where suppliers do not have sufficient ROCs, they must pay an equivalent amount into a fund, the proceeds of which are paid back on a pro-rated basis to those suppliers that have presented ROCs.
Renewables Obligation Certificate	A green certificate issued to an accredited generator for eligible renewable electricity and supplied to customers within the UK. One ROC is issued for each megawatt hour (MWh) of eligible renewable output generated, although some technologies get more, some less.
Run-of-river scheme	Run of river hydro projects use the natural downward flow of rivers and micro turbine generators to capture the kinetic energy carried by water.
Solar energy	The conversion of sunlight into electricity.
Solar thermal	The conversion of sunlight into thermal energy (heat).
Solar photovoltaic	Capable of producing a voltage, usually through photoemission, when exposed to radiant energy, especially light.

Woodchip	Wood chips in the UK are usually produced from poor quality virgin timber, with a chipper designed to produce woodfuel quality chip. There are strict quality standards.
Woodfuel	Wood used as a fuel (generally includes logs, woodchip and pellets)
Yield	The amount of energy produced by a renewable energy technology.

Useful Contacts

Carbon Trust www.carbontrust.com

Community and Renewable Energy Scheme www.communityenergyscotland.org.uk/support/cares

Department of Energy and Climate Change (DECC) www.gov.uk/governmentorganisations/department-of-energy-climate-change

Energy Saving Trust www.energysavingtrust.org.uk

Farming for a Better Climate www.sruc.ac.uk/farmingforabetterclimate

Farming Futures www.farmingfutures.org.uk

Ofgem www.ofgem.gov.uk

Renewable Development Initiative www.renewableenergyonfarms.co.uk/about

Renewable Energy Association (REA) www.r-e-a.net

RenewableUK www.renewableuk.com

SRUC Renewable Energy Database www.sruc.ac.uk/renewableenergy

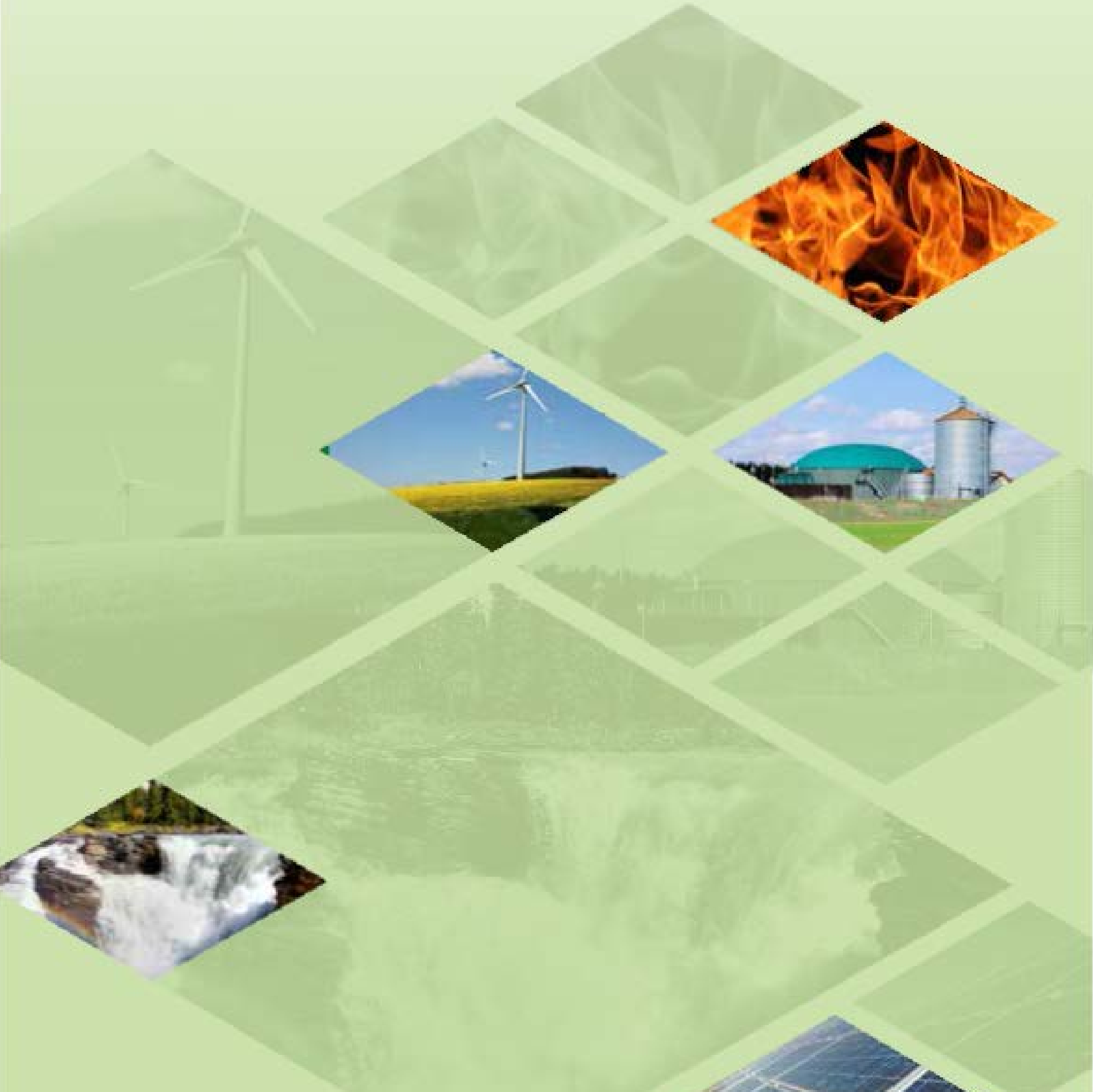
SAC Consulting Renewables Team www.sruc.ac.uk/renweables

Scottish Natural Heritage (SNH) www.snh.gov.uk

Scottish Renewables www.scottishrenewables.com

SEPA www.sepa.org.uk

The Microgeneration Certification Scheme www.microgenerationcertification.org



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