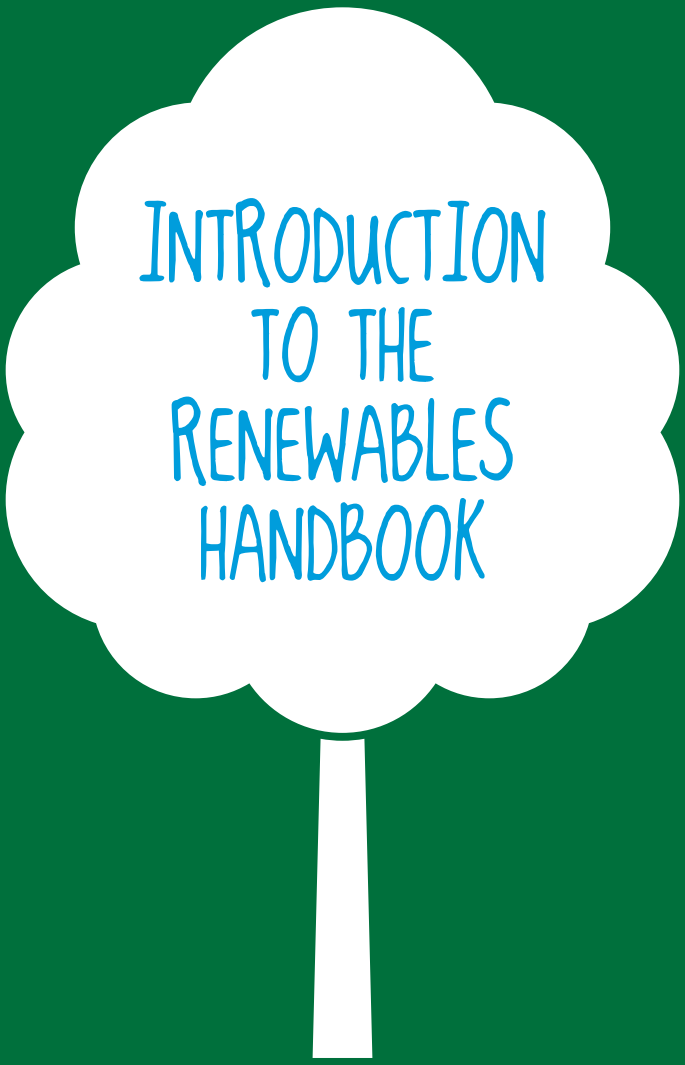
INTRODUCTION TO THE RENEWABLES HANDBOOK



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Purpose and Structure of this Guide

This handbook is intended to provide guidance and advice on the planning requirements associated with the installation of renewable and low carbon energy generation equipment.

Although primarily aimed at householders, it can also be used by developers, communities or businesses that are looking to utilise these sources of energy, in order to understand when you are likely to need planning permission to do so, how to submit a planning application and the factors that will taken into account when determining a proposal.

The handbook provides advice on six common forms of renewable and low carbon energy: Wind, Solar, Biomass, Combined Heat and Power, Hydro Electric and Air, Water and Ground Source Heat Pumps.

Each of these technologies is covered by an individual factsheet to provide a quick reference guide to the principles of the technology and equipment concerned, any planning requirements that will need to be met before it can be installed and used, plus links to further sources of guidance and advice.

Every effort has been made to ensure that the information contained in this handbook is accurate and up to date, but if you are thinking of installing or developing renewable or low carbon energy generation equipment, it is recommended that you speak to an energy specialist, an installer and your local authority in the first instance, in the early stages of planning your work. The information contained in this handbook is intended as general information only and it should not be taken as replacing the advice of these professionals.

THE CASE FOR RENEWABLE ENERGY

Reducing CO_2 Emissions

Renewable energy can make a significant contribution to reducing the amount of CO_2 that enters the Earth's atmosphere from energy generation. CO_2 is one the principle greenhouses gases known to be responsible for causing the greenhouse effect.

The Earth's climate varies naturally as a result of interactions between the ocean and the atmosphere, changes in the Earth's orbit and fluctuations in the energy received by the sun. However, over the past 20 years it has become increasingly agreed that the current change in climate being seen worldwide is a direct result of human activity and the release of excess green house gases into the earth's atmosphere.

Some of the energy from the sun is trapped inside our atmosphere as it is reflected back from the earth towards space by naturally occurring green house gases. Without this process the Earth's temperature would be 30°C cooler. Modern lifestyles however have increased the emissions of greenhouse gases and their concentrations in the atmosphere. These gases effectively form a blanket around the earth, enhancing the greenhouse effect and as a result raising temperatures.

Since the 19th century levels of Carbon Dioxide (CO_2) in the earth's atmosphere have risen by 30%, mainly as a result of the use of fossil fuels in industry, running vehicles and powering homes and businesses.

At the national, regional and local level it is predicted climate change will have a range of effects and impacts in the UK. The latest UK climate projections (2009) suggest how the climate in the UK may change as a whole. These reveal that all areas of the UK get warmer, that the warming is greater in summer than in winter, that there is little change in the precipitation that falls annually, but it is likely that more rain will fall in the winter and less in summer and that sea levels rise, but mostly in the South of the country.

The UK climate projections also provide information on suggested changes for UK regions, showing that by 2080 in the North West, under a medium emissions scenario, mean winter mean temperatures will increase by 2.6°C, that the increase in summer mean temperature is predicted to be 3.7°C , that the change in winter precipitation is predicted to be a 16% increase and that the change in summer mean precipitation is predicted to be -21%.

Within the North West, the North West Climate Change Impact Study, 2003 predicted that a changing climate will result in a range of physical impacts, in a number of areas. These are likely to include:

a. **Flooding**
   Much of the North West is low lying, making it particularly susceptible to predicted storm surges and rising sea levels.

b. **Water Supply**
   Droughts may occur due to reduced rainfall, creating water supply issues.

c. **Agriculture**
   Increased temperatures and precipitation will change the range of crops that can be supported.

d **Biodiversity**
   Habitats and species may have to adjust to warmer and wetter conditions.

e. **Tourism and Leisure**
   Increased temperatures may have a positive effect on tourism and leisure, attracting more visitors to the region and encouraging recreation.

The North West, together with the rest of the UK could also see an increase in individual severe weather events.

Additional Drivers

Alongside the need to reduce CO_2 emissions, there are additional drivers for using renewable sources of electricity. Energy prices are increasing, traditional fuel stocks, such as gas, are in decline, whilst the UK's existing fleet of coal-fired and nuclear power stations are all due to come off-line in the next twenty years. There is also the need to ensure a mix of energy supply, whereby we are not over reliant on one form of energy production to meet our energy needs.

Whilst both large and small scale sources of renewable and low carbon energy won't be the only solution to these issues, alongside the need to reduce CO_2 emissions, they have a key and recognised role to play.

At the micro and decentralised scale, additional benefits of renewable and low carbon sources of energy can include reduced energy bills, community co-operative ownership, and a potential income from funding incentives such as Feed-in Tariffs (FITs) and the Renewable Heat Incentive (RHI).

Further details on these initiatives can be found on the Department of Energy and Climate Change's website at:

http://www.decc.gov.uk/

whilst additional information of the benefits of renewable and low carbon sources of energy can be found through the links provided in the individual technology factsheets contained within this handbook.

National and International Legislation

At the national and international level, formal legislation and targets are also behind the need for increasing the proportion of energy produced from renewable and low carbon sources of energy.

The UK has committed itself to the Kyoto Protocol, an international treaty that became legally binding in 2005. Under the requirements of the Kyoto Protocol, the UK is committed to and is on track to reduce its greenhouse gas emissions by 12.5% below 1990 levels by 2012. At the European level, the UK is committed to reducing its greenhouse gases by 20% by 2020, based on 1990 levels, by 80-95% by 2050, and to producing 15% of its energy from renewable sources by 2020. This last target will currently require a seven-fold increase in renewable energy consumption from 2008 levels.

Code Level	Standard (Percentage better than Part L 2006)
1	10
2	18
3	25
4	44
5	100
6	Zero Carbon

Source: DCLG 2006

At the national level, the Climate Change Act 2008 commits the UK to legally binding targets of a 20% reduction in greenhouse gas emissions by 2010, a 34% reduction by 2020 and an 80% reduction by 2050. Although the 2010 target has been met, the target for 2020 is currently considered to be challenging.

The UK Government has also set targets for new housing to be 'zero carbon' by 2016 and for all new commercial buildings to be zero carbon by 2019. The principle means of achieving these targets in domestic properties is to use revisions to Part L of the Building Regulations, which covers the conservation of fuel and power. The revisions to Part L of the Building Regulations correspond to achieving CO_2 reductions in line with the Code for Sustainable Homes, as shown in the table opposite. It is likely that renewable and low carbon sources of energy will be needed to achieve the higher CO_2 reduction targets.

The latest revisions to the Part L of the Building Regulations came into force in 2010 and call for a 25% reduction in the CO_2 emissions of new dwellings and domestic extensions over 2006 requirements, equivalent to a 40% emissions improvement over a dwelling built to 2002 regulations. The 2010 revisions also place a 25% CO_2 emissions reduction target on new non-domestic buildings, but this is aggregated across all new building stock on a particular site and is not based on individual buildings. The requirements also apply to extensions to non-domestic properties.

ENERGY EFFICIENCY FIRST

When considering the use of renewable or low carbon sources of energy to supply a house, community or commercial building, it is important to remember that energy efficiency and conservation measures should be explored in the first instance, with the priority being to reduce energy consumption first and foremost. There is less benefit in generating renewable energy if a high proportion of that energy is lost through inefficiency in building design and energy use.

In most circumstances, an energy hierarchy, as set out below, should be followed before installing renewable and low carbon sources of energy.

1. **Energy conservation** through behavioural changes resulting in the reduction or elimination of unnecessary energy use. For example, no cost measures such as switching equipment off when it is not being used.

2. **Energy efficiency** improvements in equipment, from central heating boilers to washing machines and freezers, insulation of buildings to minimize energy loss and design measures such as passive solar heating, building orientation and use of low impact building materials.

3. **Renewable, sustainable resources.** Having reduced the energy demand of a building as much as possible, the remainder of power must be generated. This involves generating heat and electricity from renewable resources.

4. **Exploitation of non-sustainable resources using low-carbon technologies.** For the energy which can not be generated through renewables, low carbon technologies can be used. These include ground/air/water source heat pumps.

5. **Exploitation of conventional resources as we do now.** With no other options left, the final part of a building's energy demand will be generated through using conventional polluting options. In an optimum development this final phase will not be reached.

Home energy use is responsible for over a quarter of UK energy consumption and space and water heating and lighting account for around three quarters of energy use in the home.

Therefore making homes more energy efficient, especially in these three areas will address the Energy Hierarchy Levels 1 and 2. Whilst behavioural changes, such as turning off lights and other equipment, and purchasing choices, such as choosing energy efficient appliances, will produce small benefits, the design and structure of the building will have the largest influence.

CALCULATING SAVINGS

A lot the guidance and advice contained in this handbook makes reference to the energy and cost savings that can achieved by using energy efficiency and conservation measures and renewable and low carbon sources of energy.

This section therefore sets out information on how to estimate the energy requirements of an existing or proposed dwelling, for a benchmark to work out the savings that can be made. A lot of the methodology, plus the guidance provided through the further sources of information, can also be applied to estimating the energy costs of non-domestic properties.

The major component of fuel costs is associated with space and water heating and lighting, with appliances contributing a smaller proportion. The energy needs of occupied properties can be worked out by tabulating energy bills, electricity and gas, for twelve months.

If earlier years' bills are available, this tabulation could be performed for each year to give an average value. The year on year change can be correlated with harsh winters, changes in heating equipment or insulation as well as the impact of rising energy costs.

If bills are not available, for example at the time of purchase of a new or unoccupied existing dwelling, the fuel cost can be calculated or estimated.

An Energy Performance Certificate (EPC) must be available for all properties for sale or rent. In the case of new properties, this can be calculated at the design stage to give a Predictive Energy Assessment which should be replaced with an EPC once the building is completed.

The EPC provides a prediction of the energy use and fuel costs for space and water heating and lighting based on a Standard Assessment Procedure (SAP) rating, which is part of the UK national methodology for the calculation of the energy performance of buildings. SAP is used to demonstrate compliance for dwellings with Part L of the Building Regulations (England and Wales) and to provide energy ratings for dwellings.

In the case of existing dwellings, a reduced data SAP (rdSAP) is established by an on-site inspection and, as the intrinsic thermal properties of the building components is not available, inferences are made based on building age and design.

Besides design and materials of construction, the SAP process also takes into account heating type, fuel type and the presence of renewable energy sources. The SAP and associated fuel use and costs assume a standard dwelling occupancy and heating use of 9 hours on weekdays and 16 hours at weekends. The effect of variation from this may be estimated on a pro-rata basis.

The EPC report will indicate energy use and running cost directly and also provide recommendations on improvements to reduce the energy use.

Other Energy Use

The cost of running appliances may be established by listing all the appliances in the household, estimating the time for which the appliance is used and then calculating energy use. Appliances such as kettles, televisions or computers will have a label indicating their power consumption in watts. The running cost can be calculated as follows:

> Running cost (£/year) = (Watts/1000) x hours used per year x fuel price (£/kWh)

Some appliances, such as fridges, do not use energy continuously, while others, such as washing machines, use varying amounts during their operating cycle. Manufacturers of such appliances must provide an energy label on the appliance which indicates energy efficiency and typical energy use per year or per cycle. The householder must then estimate the number of cycles used per year.

If the householder does not wish to carry out the calculations shown above, typical appliance running costs may be found on websites for organisations such as the Energy Saving Trust:

> www.energysavingtrust.org.uk

These indicate assumptions made on time or frequency of use so that a householder can establish whether changes need to be made to reflect individual behaviour. They may also indicate the hidden energy consumption of appliances left on standby when not in full use.

Overall Energy Costs and Saving

The sum of the costs in the two sections above will indicate the overall energy costs for a household.

While the heating and lighting costs are largely determined by the construction and heating system for the building, the EPC will provide recommendations to improve the energy performance and likely cost savings.

The exercise of establishing appliance energy use will immediately indicate where behavioural change will result in most cost saving. Beyond that, changing to more energy efficient appliances might be considered. Appliance manufacturers must provide, at point of sale, information on energy use including a simple A-G rating, where A is the most energy efficient.

Sources of further information and advice

Further information on estimating energy usage can be found through the following websites.

SAP ratings and Energy Rating of Dwellings

http://www.bre.co.uk/sap2009/page.jsp?id=1642

www.nher.co.uk

SAP ratings and Energy Rating of Dwellings from designs

www.nher.co.uk/content/plan-assessor

Performance Assessors for Existing Dwellings

www.nher.co.uk/findd-anassessor

www.dealocal.co.uk

Running costs of Appliances in use and on standby

www.nieenergy.co.uk

Steps to Installation

Finally, although each renewable and low carbon energy scheme is likely to be different, as a rough guide it is recommended that the following steps are followed when planning a project.

Start to plan at the beginning how sustainable energy will be integrated into a development.

Some features such as site layout, building design and orientation will impact on energy efficiency and generating renewable energy. If these factors are addressed early on, there will be a wider range of options available that are viable and the solutions will probably be more cost effective.

Plan to achieve the highest possible standard of energy efficiency.

The greater the energy efficiency, the lower the energy consumption will be. This will reduce the target level of renewable energy that will need to be generated.

Think carefully how energy will be or is consumed.

A development of one or two bed apartments, for example, will have a very different pattern of hot water consumption than a sheltered housing development, and solar water heating may not be the most effective way of generating renewable energy for both developments. This means that the amount of hot water consumed in the development may be lower than what is specified by an installer.

Each development will have its own characteristics

The technology used in one development may not have the same expected output if used in another development. For example the solar resource available to generate energy will vary from site to site depending on overshadowing by other buildings or trees. The wind resource will also vary depending on the interference of buildings and trees nearby.

Get advice from an energy specialist

Calculating the energy consumption of a development and conceiving to accomplish high energy efficiency and integrated renewable energy generation requires particular skills. Early involvement of the right expertise will help to achieve a successful solution and avoid delays. Advice for householders is provided by the Energy Saving Trust and for commercial development by the Carbon Trust. Incorporating energy efficiency in a development need not be at odds with achieving good design; in many cases it can be used to enhance design.

Many measures such as wide cavities; insulation and ground source heat pumps have very little or no visual impact and can therefore be successfully incorporated into development even in more sensitive locations such as Conservation Areas. Improvements are continually being made to products to lessen their visual impact such as photovoltaic tiles.

Speak to your local council and other organisations at an early stage

It is recommended that you speak to your local planning authority at an early stage in the development of your project and prior to submitting a planning application. They will be able to advise you on the need to obtain planning permission, any planning policies or considerations that will need to be taken into account when planning permission is required, plus the information that will required to support an application and for it to be registered.

Consent may also be required from other bodies such as the Environment Agency and the Civil Aviation Authority, in certain circumstances. More details are provided on when this is likely to be the case in the individual technology factsheets. It is also recommended that you speak to these bodies as necessary at an early stage in the development of your project.

FURTHER INFORMATION ON PLANNING REQUIREMENTS WILL BE AVAILABLE FROM YOUR LOCAL COUNCIL.

CHESHIRE EAST COUNCIL

Development Management

T: 0300 123 5014
E: planning@cheshireeast.gov.uk

CHESHIRE WEST AND CHESTER COUNCIL

Development Management

T: 0300 123 7027
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WARRINGTON BOROUGH COUNCIL

Development Management

T: 01925 442819
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