Community Solar Roof Guide

Installing a community owned solar roof has become a reality in the UK since the introduction of the Feed-in-Tariff in April 2010, which pays renewable energy generators a premium for the energy they produce. Capital grants are therefore a thing of the past, certainly in England, and only a relatively small amount of start up finance will be needed to get a project off the ground.

This guide aims to give community groups an outline of the key criteria they will need to find a suitable roof, which is the first step in the process.

Technical Factors

Orientation

The orientation of panels will have a significant bearing on their energy generation. Due South is the optimal orientation in the UK, however, there is some scope for variation and panels facing South-West or South-East will not reduce the energy generation too dramatically. If the roof you are considering is sloping and faces east or west, energy generation will be reduced by approximately 20%, which is unlikely to be financially viable, even if other factors such as the angle of the slope is favourable (see below).

If you are unsure which way your roof faces, it is recommended that you have a look at a map or look at the building on the internet using an appropriate website or tool, such as:

Google Earth

http://maps.google.co.uk/maps?hl=en&tab=wl

Construction Type

It is possible to install panels on sloping roofs and also flat roofs. If the roof is sloping, the panels will be fixed directly to the roof, whereas if it's a flat roof the panels will require mounting on a frame at an appropriate angle. This will have cost implications, though this may be balanced out by other factors in favour of the roof, (such as good access or the building being only one storey, so little scaffolding for installation is required).

Angle

The optimum angle for most of the UK is between 30-40 degrees, but it can vary by 10 degrees in either direction without reducing the energy production too significantly. Clearly the closer the roof is to the optimum angle, the better. However, for the large roof areas that will be required for larger arrays (e.g. 50kW), roof slopes may be shallower than this, as they have to cover a large span. If other factors are positive, these types of angle are unlikely to be a problem.

Panels located on the ground in a field, car park or other open space are likely to be affected by similar issues to flat roofs. However, they are also likely to be more vulnerable to vandalism or theft than if they are located on a roof so security issues will need to be considered.

You can estimate the pitch (angle) of your roof by eye. As a rough guide, most industrial roofs are in the range of 22-25 degrees. If you happen to know the height (H) and length (L) of the roof then you can easily calculate the angle using a calculator or spreadsheet: in Excel the function is =DEGREES(ATAN(H/L))

Area

For the purposes of a community solar roof, a large roof area will be required. Under the Feed-in-Tariff as it was introduced in April 2010 the optimum size was around 100kW, which would cover approximately 800m^2 of roof. However, assuming the revisions proposed by government in their emergency review of the Feed-in-Tariff (April 2011) are adopted, the new optimum size will be 50kW, which will only require 400m^2 of roof. This is still a large roof and not all community buildings will have sufficient roof space, even if it is all orientated in a suitable direction. It is more likely that a school or leisure centre will have a larger roof, as will some industrial users, both of which are more likely to have high on site energy use year round, which is also beneficial (see Building Energy Use section below).

In some cases it may be possible to install the panels on a neighbouring building to the one that has the high energy requirement. It may even be possible to install the panels on more than one building, serving one or more of those buildings with solar electricity. However, installations on multiple buildings are likely to be more costly to install, as more scaffolding is likely to be required. Also installing an array on one building to serve another may complicate legal arrangements and therefore introduce more cost, assuming these are in different ownership and/or occupation. It may be, however, that at a hospital or university type site there are groups of buildings where this would not be a significant issue.

One way of roughly calculating roof size is to use google maps online as this has a ruler icon, which allows you to draw lines on the map and it then tells you the length of the line in metres (and other units). You can multiply the length of your roof by the width to give the area, and if there are several sections of well-oriented roof, you can add these together. This doesn't allow for the angle, obviously, so will not be wholly accurate, but is a good place to start.

Otherwise you could use this tool created by a US based PV company, which works quite well for the UK too: http://www.roofray.com/ You can search for your address using the address box at the top then use the buttons on the map to zoom in and out and find your roof. You will then need to follow the directions on the website.

Strength

The roof needs to be of sufficient strength that it will be able to easily bear the extra weight of the panels and the fixtures, which is in the order of 35kg/panel, (for a panel which will produce 230kWp). In order to assess this properly, it will require a site visit from a structural engineer, which is usually undertaken later in the process, once the building owner is on board. However, it is worth considering this from the outset, as if there are obvious problems with the structure of the roof it will not be worth pursuing. A starting point for understanding the carrying capacity of the roof is to find out the size (width) of the roof joists and how far apart they are spaced. This will help a structural engineer give some indication.

Life Expectancy

The roof also needs to have an expected life expectancy of 25 years or more as once the panels are in place, there needs to be minimal disruption to the roof and their ability to generate energy. 25 years is also the guaranteed period in which eligible photovoltaic panels will receive a FIT payment for the energy they generate and the energy they export to the grid. Some flat roof materials will only have a life expectancy of approximately 15-20 years, so may be less suitable for this reason. Equally roofing materials which require regular maintenance are less likely to be suitable. Please also refer to the section on materials below. Information from the building owner on when the roof was installed and/or substantially replaced, along with information on the roofing material will help determine the likely life expectancy.

Overshadowing

Shadow falling on a panel from a tree, a neighbouring building or a higher part of the same building will reduce and may even stop the effected panel from working for the time even part of it remains in shadow. If this is for any significant period of time, particularly in summer, this will reduce the energy generated from the panel and make the scheme less viable. Identifying potential shading issues is one of the first things that should be considered when assessing the suitability of a roof. Determining how much of a difference this will make is something to talk to installers about as one tree or similar obstruction may not cause too much of a problem, but being overshadowed by a line of trees could mean the project is not viable.

Materials

Most roofing materials are suitable for use with solar panels, although some will be easier, speedier and/or cheaper to attach panels to. Some roofing materials and construction types will also make the risks of leaks lower, which will count in their favour. An exception to this is asbestos roofs, which should not be considered. Old, historic roofs are also unlikely to be suitable, if they require regular maintenance.

Accessibility

Installation of an array of approximately 50kW will take in the order of 2-4 weeks to install, depending on weather conditions and other variables. One of the significant costs of installing solar panels is providing safe access for the installers to get the panels into position and fix them to the roof. In many instances this involves having sufficient space around the affected area of roof to erect scaffolding, with the means to lift the panels mechanically to the roof. It does also mean that the lower the roof, the less scaffolding is required and therefore costs are minimised. Installers will advise on the specifics of this, but it is worth considering early on, particularly if there are other factors that will also increase the cost of the project.

Grid Connection

The solar array will need to be connected to the national grid, so that at times of energy generation where the onsite energy user (e.g. leisure centre) does not require electricity this can be automatically fed into the grid and the project will receive a payment for this from the energy provider. A suitable grid connection will therefore need to be made, with another meter installed that measures the amount of electricity going onto the grid. It is assumed that any large energy user who is connected to the national grid will be able to accommodate this and a cost for connection for the District Network Operator (DNO) would usually be sought later in the feasibility process.

If there is another solar array already onsite or planned for the site that will be connected to the same meter, this will count towards which Feed-in-Tariff band you are able to apply for – and generally mean that you receive a lower payment, even if the second array is installed at a later date.

Human Factors

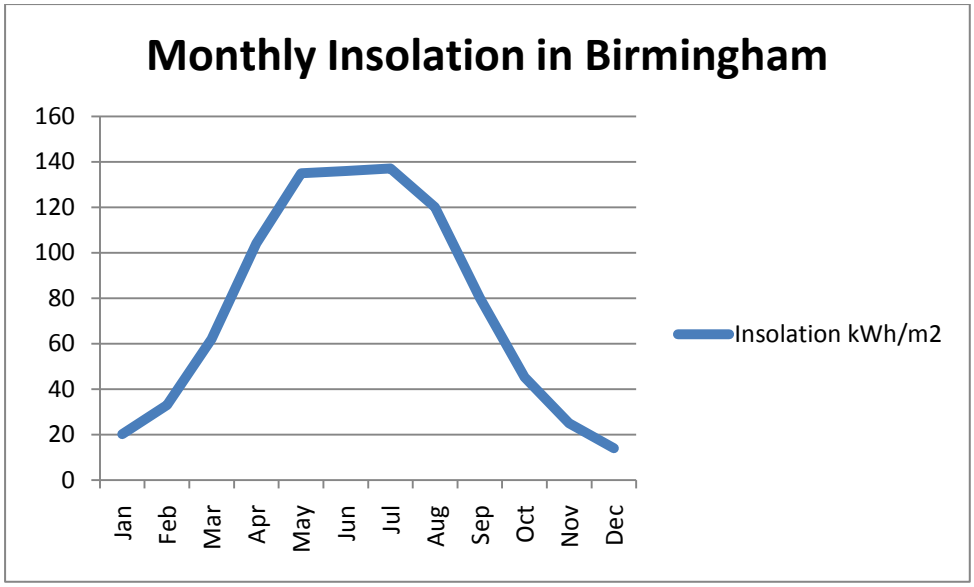
Building Owner

Once there is a basic understanding of whether from a technical point of view it is a suitable roof for a community solar project, the building owner should be approached to determine if they would be interested or not, before any detailed feasibility work is carried out. Ideally they building occupant will also be the freeholder and will be able to grant the community a 25 year (minimum) lease for the use of the roof space. If this is not the case, then other arrangements may be able to be made but this should be fully explored and resolved before much work is put into feasibility work and a planning application submitted.

Building Energy Use

The building owner can choose to receive a fixed rent for the use of their roof space or a discounted supply of electricity from the solar array. Either of these arrangements can be incorporated in the lease, with the necessary review periods. However, it will generally be better for the project if a discounted price for electricity is negotiated, as the user will probably be able to pay more than the default payment from an energy supplier, which is currently 3.1p/kWh. For the same reason, it is also generally financially beneficial to the project if the majority of the electricity is used on site, with only a relatively small excess going back to the grid when it is not required for the building itself. Buildings that typically have these sorts of energy demands are certain types of industrial users, hospitals and swimming pools. Some offices may also have suitable demands, though electricity usage could be relatively low in the summer. Village halls, churches, scout huts and similar types of community building do not typically have high electricity consumption that is sufficiently year round. This does not necessarily rule them out, but it will affect the project finances and in some cases it will not be viable.

Understanding what financial and carbon benefits the project will bring the building user will depend on their energy consumption – both the total amount they consume and their consumption pattern and how closely this tallies with when the solar panels are generating. The building will ideally have high year round electricity use, especially in the daytime in summer, when the photovoltaic panels are producing the most energy. If they can supply a year's worth of electricity consumption data, this will help to determine this, particularly if they are on half-hourly meters. The graph below of insolation shows how much energy is available to a panel throughout the year for a particular location in the UK.



Planning Constraints

There are currently exemptions for domestic solar applications within the Permitted Development regulations. However, these will not apply to non-domestic buildings so it should be expected that for a community building such as a school or swimming pool, a planning application will need to be submitted unless you receive other advice from your local planning officer. For any building mounted system that is well designed, the visual impact should not be excessive and it would be expected there would be no major objections to the application. It should take the planning authority no longer than 8 weeks to determine the application, though there is no guarantee on this.

If a building is listed or within a Conservation Area, this is likely to be subject to much tougher planning laws and the likelihood of achieving planning will be significantly reduced and this may be a longer and more costly process. However, if a building is close to a Conservation Area but not within it, it may still be worth considering, as it will depend on the specifics of the site, whether the local planning authority consider the impact a problem or not. If this is the case, it is wise to speak to the local planning officer early in the process.