The Methodist Church

Solar Panels - (Photovoltaics) on Church Buildings

As Christians it is our duty to care for the world with which we have been entrusted. It is now clear that our modern, energy-hungry lifestyles are changing the planet for the worse.

We must act now.

Solar Panels - Photovoltaics

The term 'solar panel' covers both 'solar thermal' where the sun's energy is used to heat water (the simplest form of solar power technology), and 'photovoltaic' (PV) where the sun's energy is converted into electrical energy. This briefing is exclusively about the later.

The technology

A PV cell consists of one or two layers of a semiconducting material, usually silicon. When light shines on the cell it creates an electric field across the layers causing electricity to flow. And the greater the intensity of the light, the greater the flow of electricity. PV cells will only produce electricity whilst there is daylight. So the energy must either be consumed as it is being generated, or stored for later use or exported to the National Grid.

There are three types of PV cells:

- *Monocrystalline* is the most expensive, but has the longest life span (about 25-30 years) and is the most efficient at converting sunlight into energy. It is composed of thin wafers of refined silicon.
- *Polycrystalline* is similar to monocrystalline, but made of less refined silicon.
- *Amorphous silicon cells* or thin film are made of silicon atoms in a thin layer. This is the least efficient, with a lifespan of around 15-20 years.

Efficiency

Will solar panels get more efficient?
Typical solar panels have an efficiency of about 10%; expensive panels perform at 20%. According to Professor David MacKay (chief scientific advisor to the DECC), a mass-produced device with an efficiency greater than 30% would be quite remarkable.

However photovoltaic panels will become even cheaper and less energy intensive to manufacture, improving the energy yield ratio. There is currently no known major innovation that could justify delayed investment in solar panel technology at this point in time.

Energy conservation

Care must be taken to ensure that the installation of solar panels is not pursued at the expense of other more basic aspects of energy conservation.

Some of the most effective ways to reduce the carbon footprint of a church building (or any building for that matter) are also the simplest. Increasing the efficiency of electricity use lowers emissions, as well as saving money.

For example:

- *Heating* - Use a timer and/or thermostatic controls to prevent overuse; upgrade to a more efficient boiler system; insulate pipes; look to minimise heat loss through draughts; consider metering and efficiencies in the way the building is used.
- *Lighting* - There are numerous ways to make lighting more efficient from low tech printed 'Switch off' signs by light switches, through to motion-activated lighting. The use of energy-saving light bulbs can reduce energy consumption by up to 80%.
- Reduce *water use* by fitting spray taps, dual flush WCs, and harvesting rainwater.
- *Insulation* – Ensure lofts and cavity walls (where applicable) are insulated.
- *Glazing* – Fit double glazing to windows and external doors, and use low emissivity glass.
- Make sure *products* used are recyclable or have a long life.

More complex solutions to reducing the carbon footprint of larger buildings, complexes and institutions might include bio-mass, mini-combined heat and power plants, or turbines.

The Methodist Church aspires to reduce its carbon footprint and recognises that energy consumption in our buildings has a significant contribution to make to this.

Government policy

The Department of Energy and Climate Change (DECC) has used powers in the Energy Act 2008 to introduce a system of feed-in tariffs (in April 2010) to incentivise small-scale (less than 5 MW), low carbon electricity generation. These feed-in tariffs work alongside the Renewables Obligation (RO).

The RO is the primary mechanism to incentivise large-scale renewable electricity generation by placing an obligation on UK suppliers of electricity to source an increasing proportion of their electricity from renewable sources.

Feed-in tariffs

Feed-in tariffs (FITs) have two components:

- *Generation tariff* – is a set rate paid by the energy supplier for each unit (or kWh) of electricity generated. The government has introduced a preferential rate to encourage the take-up of solar photovoltaics. The rate available will be reviewed and potentially reduced every three months for new entrants to the scheme. Once signed up the same tariff will be received for 20 years (or 25 years for systems installed prior to 1 August 2012) and will be index linked.

  For systems installed after 3 March 2012, the generation tariff will be 21p/kWh. (See also energy performance audits below).

  For systems installed after 1 August 2012 a lower tariff of 16p/kWh will be applied.

- *Export tariff* - a further 3.2p/kWh (rising to 4.5p/kWh for systems installed after 1 August 2012) will be received from the energy supplier for each unit exported back to the electricity grid (when it isn't used on site). In the case of smaller systems electricity exported is not usually metered, in which case a nominal export of 50% of total electricity generated is assumed.

These figures are subject to change and consultations are ongoing so for the latest information please check **www.decc.gov.uk**. Churches are lobbying for better tariffs/exemption from tariff reduction for church buildings on the grounds of their community benefit.

The cost of photovoltaic cells has been expensive. However, government subsidy in the form of feed-in tariffs has shortened the payback period and made them financially more attractive, especially in a period of low interest rates.

In May 2012 DECC reaffirmed a commitment to providing an incentive for growth in solar photovoltaics. To this end the department announced criteria for the review of FITs with a view to guaranteeing a rate of return on investment of between 4.5% and 8%.

Energy performance audits

There should be a current and competent energy audit of the building and any proposed installation of solar panels should be part of a wider package of measures already taken towards better environmental stewardship.

From 1 April 2012 eligibility for the preferential generation tariff will be restricted to buildings with an Energy Performance Certificate (EPC) rating of D or above. Otherwise a much lower generation tariff of 9p/kWh will apply.

Pre-installation

Consultation/Consents
Churches should consult with, and/or obtain consent (dependent on significance, period, location etc) from:

- Conservation officer – Consultation is required with the Connexional Team conservation officer for listed chapels.
- Local planning authority – Planning permission may be required.
- Insurers – A letter of consent is essential.

Building-specific considerations
When considering the feasibility of installing solar panels, there is no 'one size fits all' solution; the best installations are tailored to the specific needs and resources of the church.

You should consider the following:

- Can the panels be seen from significant places?
- Are the panels intrusive?
- Will the panels have a detrimental impact on the character and appearance of a significant building?
- Is the site free of shading? (Note: Just a small amount can radically reduce the panel effectiveness.)
- Has the roof structure been assessed by a professionally qualified structural engineer or chartered building surveyor to ensure that it can carry the additional weight of the equipment and is a good state of repair?
- Can the panels be easily accessed for maintenance?
- Has a discreet and secure space been identified for the inverter equipment? (Note: The inverters create a humming noise which will increase with age, therefore the location needs to take this into consideration.)
- How will the panels be attached in such a way that they do not adversely affect the existing fabric?
- Does the fixing of the panels allow for easy removal in the future and ensure that wind lift won't be a problem?

Panels have an estimated life of at least 25 years and are generally expected to be maintenance free. However, consideration needs to be given as to what might happen to them at the end of their life and how the property fabric can be restored to its condition prior to the installation of the panels.

Case Study

Bethesda Methodist Church, Cheltenham, Gloucestershire is a Grade II listed church. It had 32 photovoltaic panels installed on the south-facing roof during 2009 at a total system cost of £39,000. (Today this system would be considerably less costly). It was estimated that the system would generate 7,000 kWh each year. In 2011 the system generated 6,693 kWh, of which 5,174 kWh was exported. The church received at total of £2,677 – £2,517 for generation (at 37.8p/kWh at the end of 2011) and £160 for export. (For further information go to **www.bethesda-church.org.uk**.)

Minimum standards expected of the supplier
Contractors should provide a feasibility document identifying the expected efficiency of the installation, annual energy production, monetary and carbon payback periods.

Post-installation

It is recommended that churches consider the installation of a visual display monitor to provide a public account of the amount of electricity generated. It is also recommended that energy records are retained for inclusion in the quinquennial inspection report.

Finance

There are a number of options which could be considered for sourcing funding.

Grants
There are many grant-making foundations that will consider this sort of project eg Landfill Communities Fund. Some energy companies run grant funds, for example EDF Green Fund **www.edfenergy.com/products-services/for-your-home/our-services/green-energy-fund.shtml**, Scottish Power Green Energy Trust **www.scottishpowergreentrust.co.uk/content**, Energyshare Fund **www.energyshare.com/fund**. Property grants may also be available through the Connexional Team (email: **grants@methodistchurch.org.uk**).

Loans
It may be worth considering taking out a loan to enable work to proceed in one continuous operation, whilst fundraising is going on. However weigh the implications carefully, as even with the FIT repayment may take several years.

Local fundraising
Many people are happy to contribute to projects of this nature, especially if it is part of a reordering project that improves the wider community use of the building. They will also like the fact that the project will provide a long-term income for the church through the FITs.

Cooperative or community-funded options
It may also be possible for a group of people to fund the installation under a community share issue, or similar funding mechanisms, in return for the FIT payments.

Supplier led options
There are a number of schemes (eg 'rent your roof' or 'free panels' deals), which pay the costs of installing PV panels in return for the FIT payments. The owner of the building will usually benefit from the electricity generated by the panels. (Note: You would need to be using the building in the daytime to benefit from this electricity and listed buildings are not eligible for many of these schemes.) Issues around insurance, maintenance, removal etc also need to be clarified.

Solar panels: should you buy or lease?
On balance it has been decided that 'free' solar schemes (ie leasing the rooftop for 25 years to a company to install and maintain solar panels on it) are not as economical as installing your own panels. For this reason, amongst others, it is advised that churches considering using solar panels should proceed by buying their own PV system.

Switching to a green energy provider

When buying green electricity it is important to decide what you want the company to be investing in: encouraging more consumers to play their part by buying electricity from renewables? investing in new development of generation? making renewables more accessible to people in other parts of the world? where do you want your green premium to go?

The government requires electricity supply companies to source 'green' electricity at an increasing percentage every year under the Renewables Obligation, but currently consumer demand for green electricity is lower than the total electricity generated from renewable sources. So it is helpful if we, as consumers, demonstrate to the government the demand for electricity produced by renewable means, and that we are prepared to reduce our demand.

If you are looking for a company to provide a high percentage of electricity from renewable resources, you will need to know the fuel mix that the company uses. The website www.electricityinfo.org/suppliers.php gives that information.

The Methodist Church is looking to procure discounted energy with a renewable energy option.

Further information

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Other helpful information is available at:
www.methodistchurch.org.uk/co2
www.creationchallenge.org.uk
www.shrinkingthefootprint.org

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