Solar panels factsheet

Solar panels may be used to generate electricity or heat in many churches, church halls and homes. It is necessary to assess whether your building might be suitable for solar panels, and plan any such project carefully supported by the best information and advice.

Solar power

The Diocese of London encourages suitable churches to consider installing solar panels. Solar panels contribute to the Diocese's effort to reduce the fossil fuel energy use and therefore carbon emissions from its buildings. There are two main uses for solar power:
to generate electricity through Solar PV (photovoltaics)
to use the sun's radiation to heat water (solar hot water).

Photovoltaics

Solar PV systems are solar panels used to generate electricity by means of the photo-electric effect (discovered by Einstein). Churches often have large south-facing roofs, which can be exploited by installing solar panels. Solar PV is already the most tried and tested renewable technology applicable to churches. Usually, solar PV consists of the familiar flat panels. Sometimes they may take the alternative form of tiles – usually imitation 'slates' – or exceptionally, thin film. The capital cost of PV has reduced hugely, by at least 80% in the last decade.

Benefits and impacts

Reasons to install solar panels include:

- Reducing the energy use and carbon footprint of a church or building
- Reducing a parish's costs.

Inevitably there is some environmental impact from the materials and processes involved in manufacturing the system hardware. The carbon savings can pay back emissions from manufacture and installation within about 3-4 years. Some non-renewable resources such as 'rare earth' elements are employed in the manufacture of system hardware, especially in the electronics. This needs to be recycled at the end of a system's life. The quantities required should reduce as technology improves and better substitutes are found. Although issues about materials and technology are important, the climate crisis is so imminent that we think cutting our carbon emissions should be top priority.

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Projects

At least 42 premises in the Diocese of London so far have installed solar PV systems. A list is at the end of this document.

Preparation

Installation contractor

The first step is to request a visit by a reputable solar PV installer. Installers of PV systems are required to belong to the Microgeneration Certification Scheme, to qualify for any statutory subsidy. This also provides some assurance of competence.

The following factors should be considered at the outset:

- Make sure the panels are viable in terms of their orientation, pitch (slope) and any shading eg from trees. Your installer should assess whether the position is sufficiently free of shading and surrounding buildings to produce an acceptable return.
- The panels usually need to be set at a pitch of between 30 and 50 degrees.
- Solar PV requires bright daylight, but not necessarily direct sunlight – it can still generate some power in lightly clouded weather. However, the greater the intensity of light the greater the flow of electricity, and viability of the system.
- Traditionally an orientation close to south has been preferred, but a south-west or south-east orientation may also be viable. In some cases it may even be viable on a north facing roof – at a low enough angle for the sun to shine over the top of the ridge;
- The visual effect of solar panels can be reduced or eliminated if they are mounted on a flat roof, or behind a parapet or balustrade. On a flat roof, it is usual for the panels to be raised at an angle on a frame. They can be self-supporting, making it easier to remove them at the end of their lifespan.

Pre-planning

In addition to your installation contractor's information and proposals, the advice of your architect, and in some cases a structural engineer, will be needed. First the structure of building itself should be assessed for its suitability for a solar PV installation, in relation to:

- Loads from the panel array: although solar panels are getting lighter, the roof must still be strong enough to take their weight.
- Wind uplift needs to be assessed compared to the strength of fixings and the structure.

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Access and scaffolding for erection of the system need to be planned and included in costs. Solar PV should be considered whenever a roof is to be renewed, or needs major repairs. It is most viable to carry out these works at the same time, as scaffolding costs are saved by combining them in one project.

Any necessary repairs or upgrading to the roof or parapets should be done before or together with the solar PV installation. It's important to make sure the roof will not need major work soon after installing solar panels – which would mean disturbing the new panels.

In addition to the PV cells themselves, the inverters which convert DC to AC current may require to be renewed every 10-15 years – about half the lifetime of the panels themselves. This should be budgeted for.

Design

Solar PV systems are becoming less conspicuous. The panels tend to be flatter than they used to be, standing up less high above the roof surface. Black frames should be used, rather than a chrome or silvered finish. See 'Planning permission' below.

A space within the church for electrical equipment, including any battery storage, will need to be provided. Wiring routes, positions of the inverters, and connections to existing electrical system and to the grid, need to be carefully considered and illustrated in your application to the Diocesan Advisory Committee (DAC – see 'DAC and faculty', below). The inverter(s) must match the voltage, frequency and phase relationship of the mains.

And make sure you have a real-time display of electricity generated publicly visible in the church!

Electrical safety, maintenance and fire

The church's building insurers should be informed of the new solar PV system, before installation. The church's fire risk assessment should be reviewed to take account of the new installation. Other points needing to be attended to are:

Maintenance

The system should not normally need to be switched off or disconnected for maintenance. If the panels are installed correctly, double insulated and earthed, they should be safe to handle. However older systems may cause issues. During daylight, there might be a risk of shock if the panels are disconnected.

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Maintenance should be specified by the installer. For panels mounted at a suitable pitch, frequent cleaning should not be needed. If cleaning is needed, it should be done by competent persons, using an approved method statement. Cleaning with water is usual, not solvents.

Roof maintenance workers need to be informed about the PV system and briefed about safety. Suitable protection, eg with a thick cloth, should guard against shock, and also against impact damage.

Fire fighting
The fire brigade should be informed about the PV system. Plans showing location and access, and a notice with contact details are essential.

- Special consideration should be given to the safety of any high roof intended to bear a PV system; roofs over 18 metres in height may not be accessible to the fire brigade's hoses, with the result it might not be possible to fight any fire; then the solar panels could make the situation even worse.
- If there is a building fire, firefighters will probably need to disconnect the mains. In some rare instances, the risk assessment may indicate that firefighter's switches should be positioned near the entrance; consideration should then be given to feasibility and cost.
- The method of firefighting may be constrained by the presence of the PV system, even if that wasn't the cause. In the unlikely event of an electrical fire, this must not be fought with water hoses.
- Decisions on what to do remain the responsibility of the fire service, so long as they can get answers to questions quickly on arrival.

The installer should be asked to advise on all the foregoing, and to specify any future tests and maintenance.

The above points apply to framed PV panels. Their applicability to PV tiles (see below) or thin film should be verified with the installer.

Solar PV tiles

Solar PV tiles, often referred to as imitation 'slates', carry out the same function as solar panels. The first such scheme for solar tiles was at St Silas Pentonville – and this has become iconic nationwide. Unlike solar panels, solar tiles are integrated flush with the roof covering they are intended to match.

In addition to matching the appearance of slates fairly closely, solar tiles may become available in the size, shape and colour of other roof coverings such as clay or concrete tiles. The manufacture of the tiles does itself carry a significant carbon footprint, which needs to be calculated when making the case.

Local authorities often encourage use of solar tiles when PV is to be added to a traditional slate roof. The DAC will give serious consideration to any proposal for their installation, especially if an existing roof covering is in needs replacing.

Cost however is a severe constraint. Solar tiles may cost at least 2 – 3 times the cost of PV panels. Also the type used has to be permitted under the Micro-generation Certification Scheme. The number of brands available is currently quite limited.

Solar hot water

Solar hot water systems are a different way to apply solar energy than solar PV. In some cases, both can be used on the same building – for electricity generation and hot water. Solar hot water is a well-developed technology, which uses heat from the sun's radiation to heat water directly. Usually they are designed to work alongside a conventional water heater. This can provide a large proportion of hot water needs all the year round.
Solar hot water systems are however usually domestic in scale. They work better for homes than churches, which generally need only a small amount of hot water.

Solar hot water may not be much help for a water-based heating system – since the heat is mainly needed when the sun isn't shining. Provision of a sufficiently sized thermal store may be unviable.

There are three main components to a solar water heating system:

- A solar collector (a pipe grid or flat plate collector) fitted to your roof to collect the sun's radiation
- A heat transfer system (using the collected heat to heat water)
- A hot water storage cylinder, to store the water that is heated during the day and supplying it for use later.

Some suppliers offer packages including the storage cylinder. Solar water heating generally comes with a 5-10 year guarantee and requires little maintenance.

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Finance

Government subsidies

The government's Feed-in Tariff (FiT) scheme (applicable to solar PV) was closed to new entrants at the end of March 2019. However, those who already received it then will continue to do so. Also those who had pre-registered were permitted to enter the scheme if their system was installed within one year.

The FiT was partly replaced by a new Smart Export Guarantee, introduced in January 2020. The Smart Export Guarantee is not actually a subsidy, but a guarantee of (supposedly) fair return for electricity exported to the grid.

Solar hot water does not benefit from the Feed-in Tariffs or the Smart Export Guarantee, but instead the Renewable Heat Incentive (RHI), for the time being at least.

Viability and payback

Payback is achieved through:

- Receipts from the tariff and/or other subsidies, and/or the Smart Export Guarantee
- Savings in purchased electricity.

Recently installed systems in the Diocese are expected to pay back comfortably. Continuing reductions in capital costs may still make a project viable. Better insulated buildings, and installations forming part of a community scheme, may be likely to pay back faster.

Grant aid may assist, but it will forfeit any public subsidy, or the Smart Export Guarantee, if the grant comes from public funds.

For PV systems, there is also the possibility of installing battery storage, to enable electricity generated during the day to be stored for use on site during the hours of darkness. This is expected to become cost beneficial.

With changes in costs, it is common to obtain a re-quote just before placing a firm order.

VAT

Bear in mind that VAT at 20% will be added to installations costs of most projects, although this may be reclaimable under the Listed Places of Worship Grants Scheme (at least until March 2025).

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Currently some domestic PV projects have benefited from a 5% rate of VAT. This is subject to resolving a dispute with the EU; controversially, the government is currently proposing to withdraw this concession.

Planning permission

Most solar panel installations do not now need planning permission. Solar panels on domestic buildings were already classed as 'permitted development'. Since 2012, this concession has been extended to non-domestic buildings including churches – and this concession was further improved in 2015. This is subject to significant restrictions:

- Planning permission is still required for listed buildings – which includes about three quarters of churches.
- For any unlisted building in a conservation area, planning permission is required if the installation is on a roof slope which fronts the highway.
- There are general requirements to minimise the visual impact, on how high or wide the installation projects from the roof or walls, and how close to the edge of the roof or to other buildings.
- The installation must be removed as soon as possible, ie after the end of its life.

It is therefore advisable to consult your local Council at the outset, if planning permission may be needed, or you are not sure. The Council may charge for such consultation. A Certificate of Lawful Development should be applied for.

To gain permission, solar panels do not always need to be hidden from view; this is considered on a site-by-site basis. Some of the installations already made (see further up this page) are visible from the street, even on a listed building. Whether seen or not seen, they should be well designed and appropriate to the situation.

The installation needs to be in accordance with the planning authority's Local Plan, and any conservation area statement. On the other hand, the local authority may also have declared a climate emergency, and set a carbon reduction strategy – which will often include promoting solar panels. This may assist the applicant in making the case for planning permission.

Nevertheless, in recent years it has become more difficult to gain permission for solar panels on a listed building. The National Planning Policy Framework has established an over-arching objective of promoting sustainable development. However it also requires 'considerable weight' to be given to preserving the special character of a listed building or its setting.

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In the light of judicial reviews on past planning cases, the case needs to be rigorously argued and illustrated. It is necessary to demonstrate 'public benefit' – including generating energy and reducing emissions. This needs to be quantified. Due regard should be given to any harm which may be caused to the building's special character, when assessing whether the public benefit is sufficient to justify it. The applicant's case is also strengthened if it can be shown that other energy-saving measures have been, or are going to be, introduced.

Building regulations

Your solar PV installation may be subject to the national Building Regulations, including for electrical work covered by Part P. Check your installation company is taking responsibility for this.

CDM regulations

A project to install a large array of solar panels may occasionally be subject to the Construction Design and Management Regulations 2007 (CDM), which concern health and safety of building contracts. For solar panels, this usually means the client must ensure health and safety during operations. However, it is reasonable to rely on the competence and responsibility of the contractor, so long as the client takes steps to appoint a competent contractor. MCS certification should cover this.

DAC and faculty

If your solar panel system is for a church building it will need a faculty. This applies whether or not the installation requires planning permission. Gaining a faculty is preceded by an application to the Diocesan Advisory Committee (DAC). If a system is subject to any legal agreement, eg under a community energy scheme, the terms of the agreement need a faculty, as well as the installation itself. It is essential to apply in good time to get permission before proceeding.

Consultants

It is usually essential for a church to employ an experienced architect or qualified building surveyor to support any planning application, as well as any associated works to the roof or other parts of the building. The advice of a structural engineer may also be needed on the suitability of the roof structure. Occasionally, an electrical engineer may be needed to advise on the effect on the church's electrical system.

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Projects completed in Diocese of London

Churches

St James Piccadilly
St Paul Rossmore Road, Marylebone
St John at Hackney
St John the Evangelist, Brownswood Park
St Mary Islington
St Augustine Highbury New Park
St David Holloway (solar 'slates')
Emmanuel Hornsey Road
St Silas Pentonville (solar 'slates')
St Stephen Canonbury
St Thomas Finsbury Park
St James Clerkenwell
Christ Church Chelsea
St Hilda Ashford
All Hallows Gospel Oak
St Anne Brookfield, Highgate
St John at Hampstead
St John the Baptist, Great Cambridge Road, Tottenham
St Alban Acton Green (solar 'slates')
St George Southall.

Church Halls

St Etheldreda Fulham
St Mary Spring Grove (integrated with roof of new church hall)
St Aldhelm Edmonton
St Michael Wood Green
St John Wembley (part of development including house).

Parsonages

St Mary of Eton Hackney Wick (part of redevelopment)
St John Wembley (part of zero-carbon house)
St Nicholas Perivale (part of redevelopment)
Ten other parsonage houses.
Parish almshouses
Edgware Parish
St Mary Ealing.

Schools

All Saints Primary, Fulham
Kentish Town Primary
St Mary Finchley Primary.

This document was researched and produced by the Diocese of London, and is used with thanks.

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