Centre for Sustainable Energy

Renewable energy generation

Steve Cole, Robin Bell

Who are we?

- Energy charity based in Bristol
- Focused on ending the suffering caused by cold homes and combating the climate crisis
- We support people in fuel poverty through our advice line and retrofit team
- We support community organisations on energy, fuel poverty, retrofit and local and central government with decarbonisation and energy plans
- We are supporting the SiB ERF application process with technical buildings advice

Centre for Sustainable Energy

Subjects covered today

Solar photovoltaic (PV)

Battery storage

Solar thermal

Low energy lighting

Building Energy Management Systems

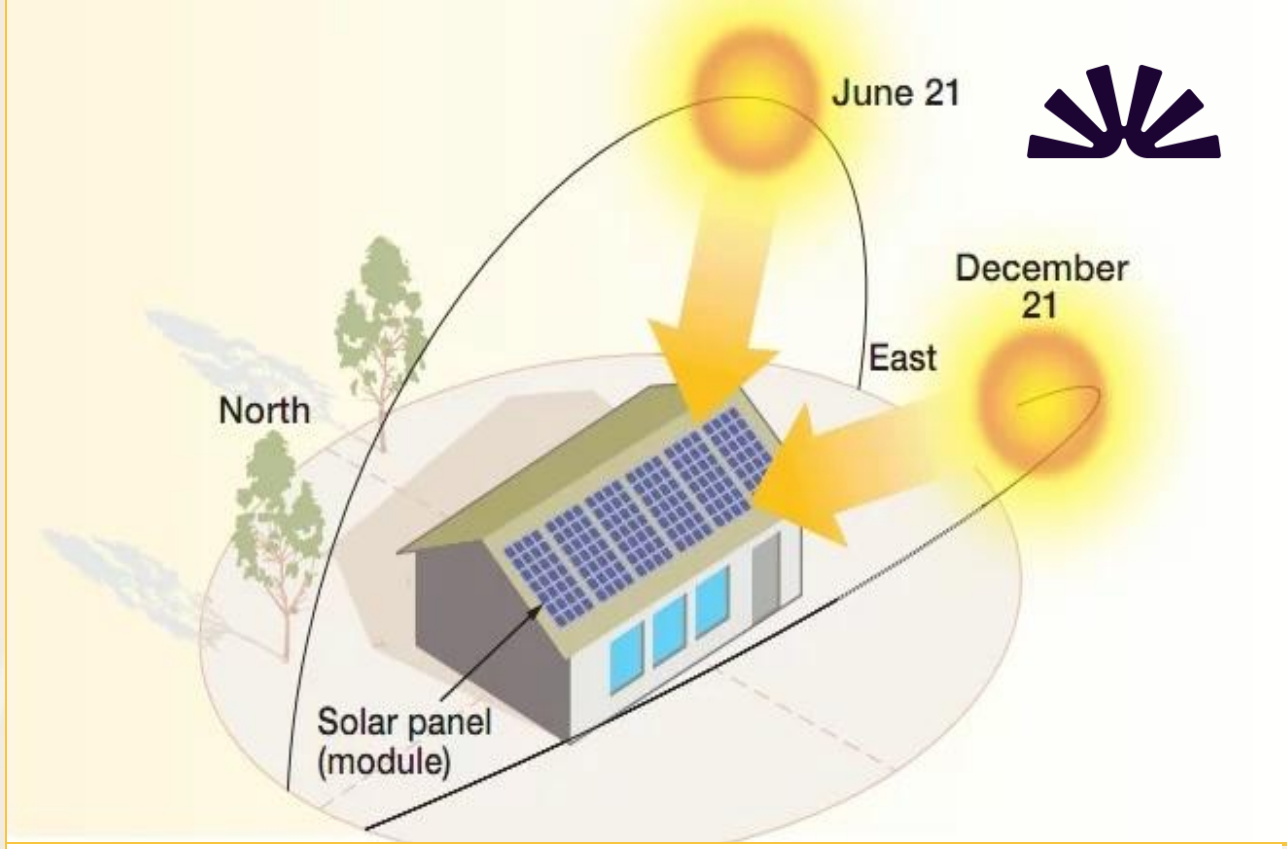
Solar PV

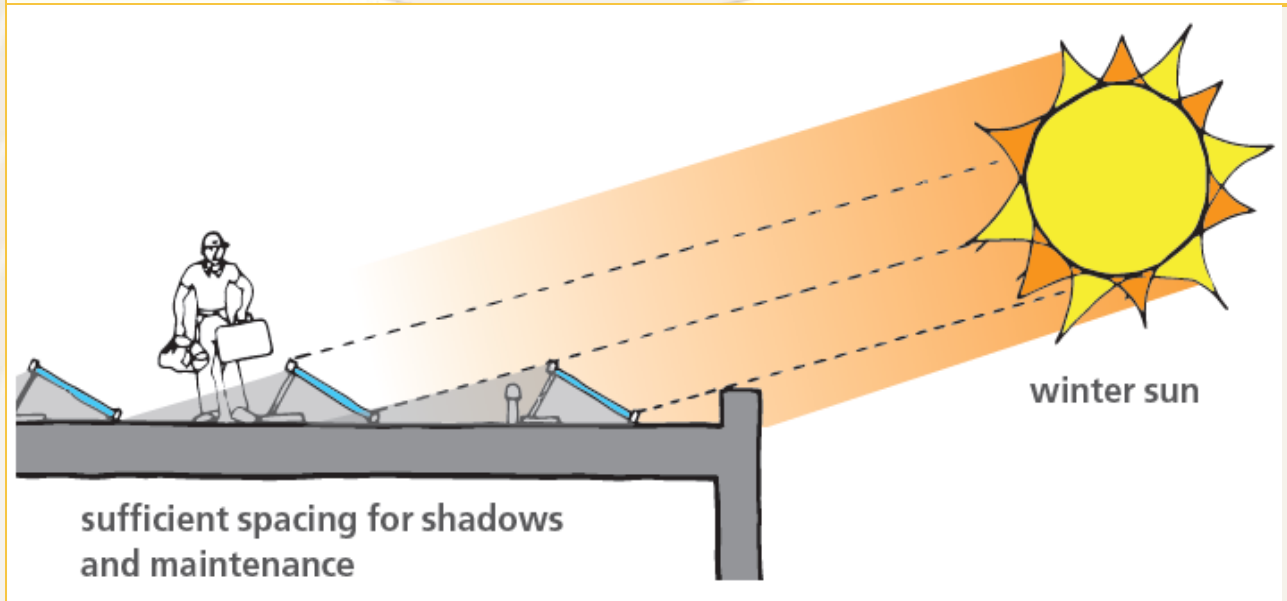
Solar photovoltaic (PV)

- Solar cells convert sunlight into electricity
- Direct current (DC) electricity is converted to alternating current (AC) by an inverter for building use
- 3 basic types which differ in efficiency: monocrystalline; polycrystalline; thin-film
- Surplus electricity can be exported to the grid, stored in a battery or used to heat water via a diverter
- Whole life carbon – where and how made, how long will it last, how will they be disposed of?

Solar PV considerations

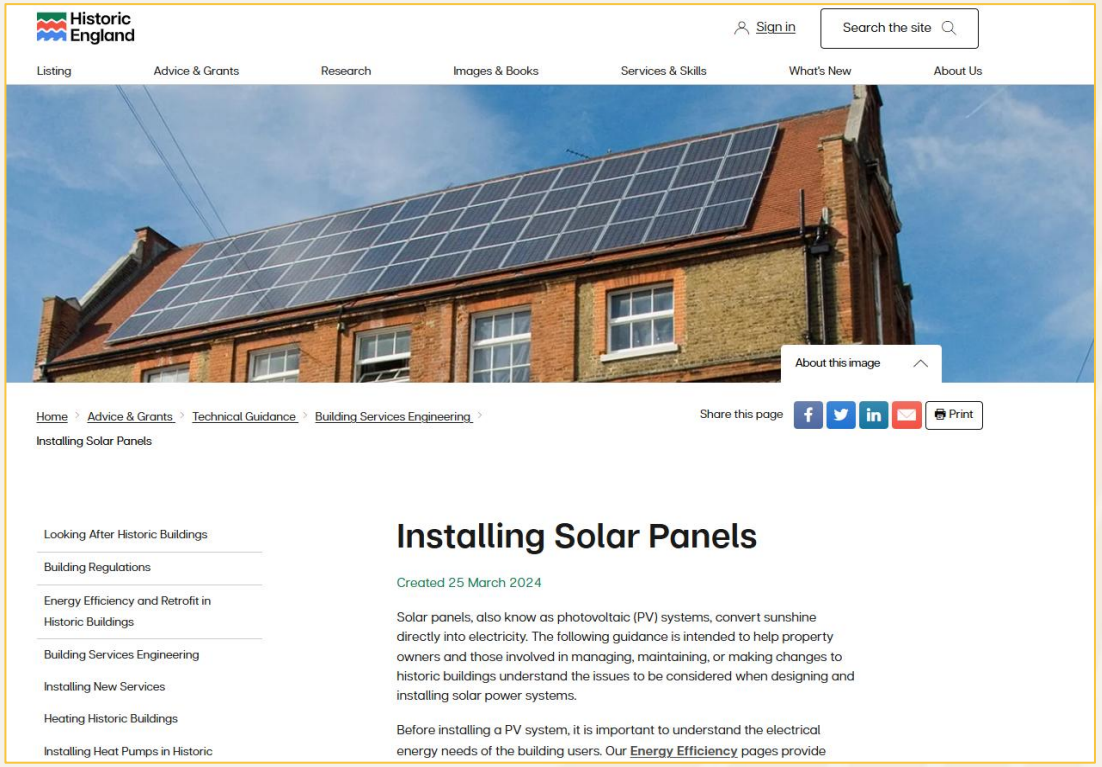
- Orientation and angle
- Shading
- Wind loading
- Structural stability – roofs not built to take additional load – check 1st
- Roof construction, condition (lifespan) and combustibility
- Heritage and consents – conservation area/listed building
- Safe access for installation and maintenance
- Fire safety and Insurance
- Connection and grid capacity
- Location of inverters

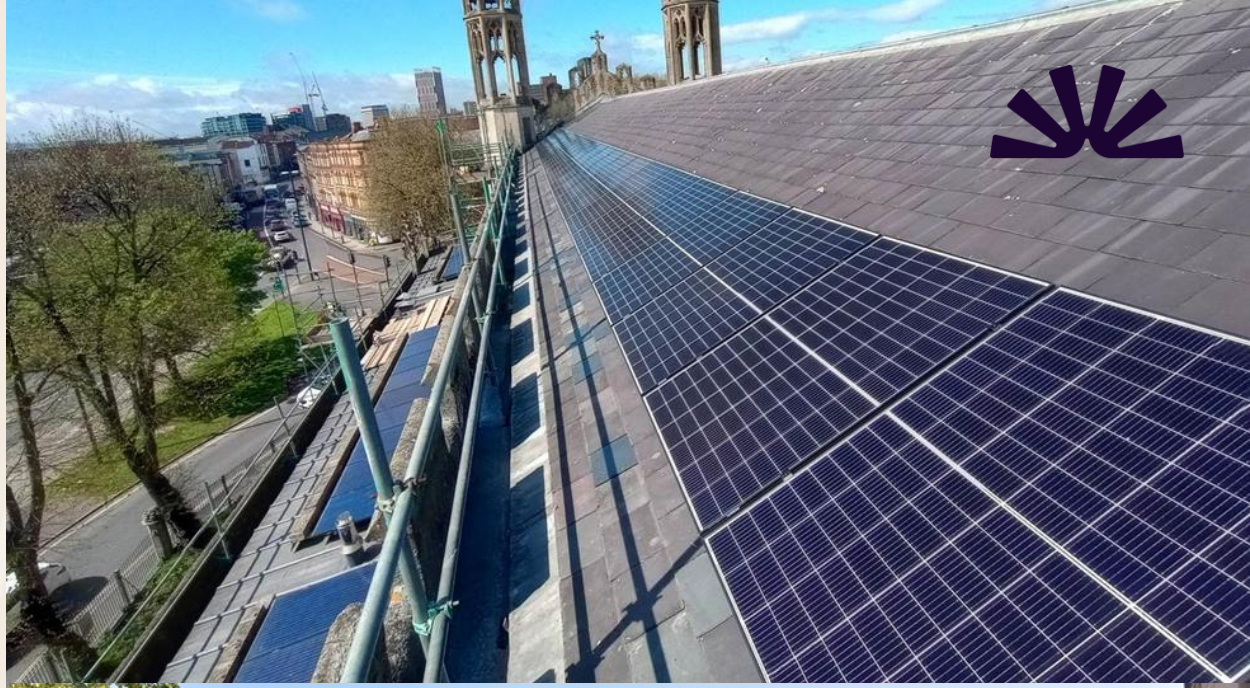




Protected buildings

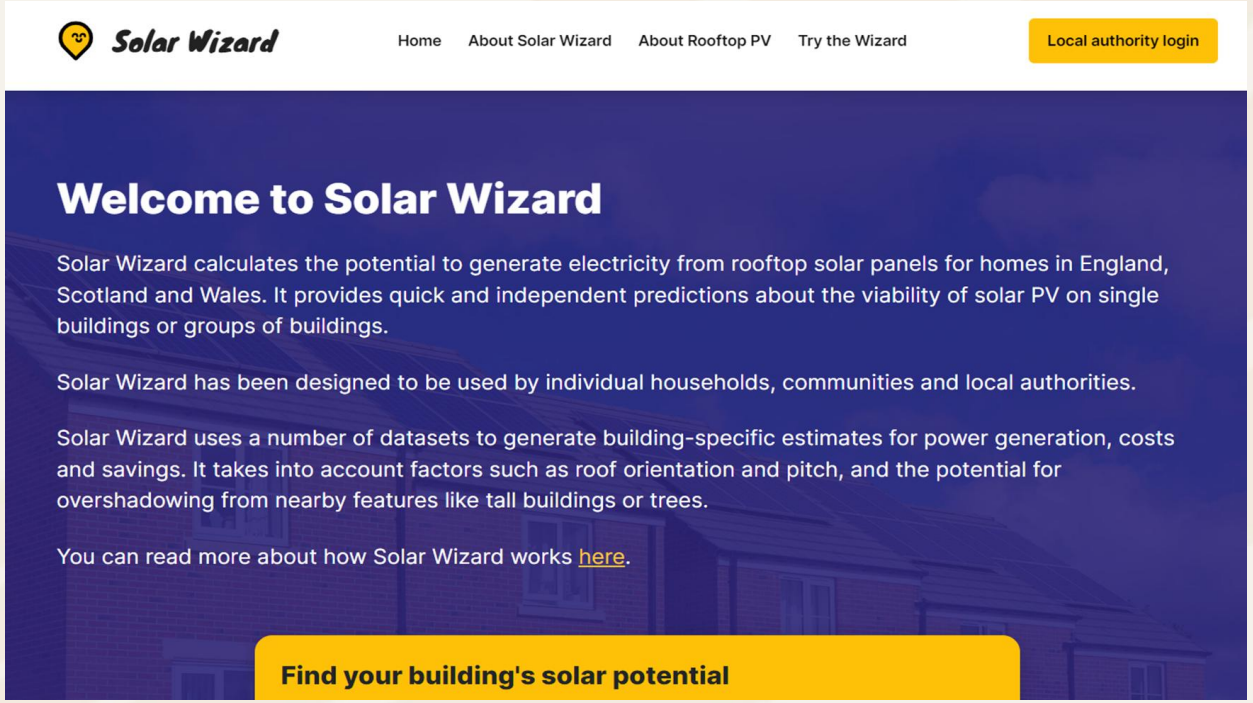
For listed buildings and conservation areas, planning constraints may mean that panels on the roof may need to be hidden from street view





Understanding suitability

- Online tools
- Obtain two or three quotes, requesting a technical survey, not a sales visit
- Structural survey (engineer)



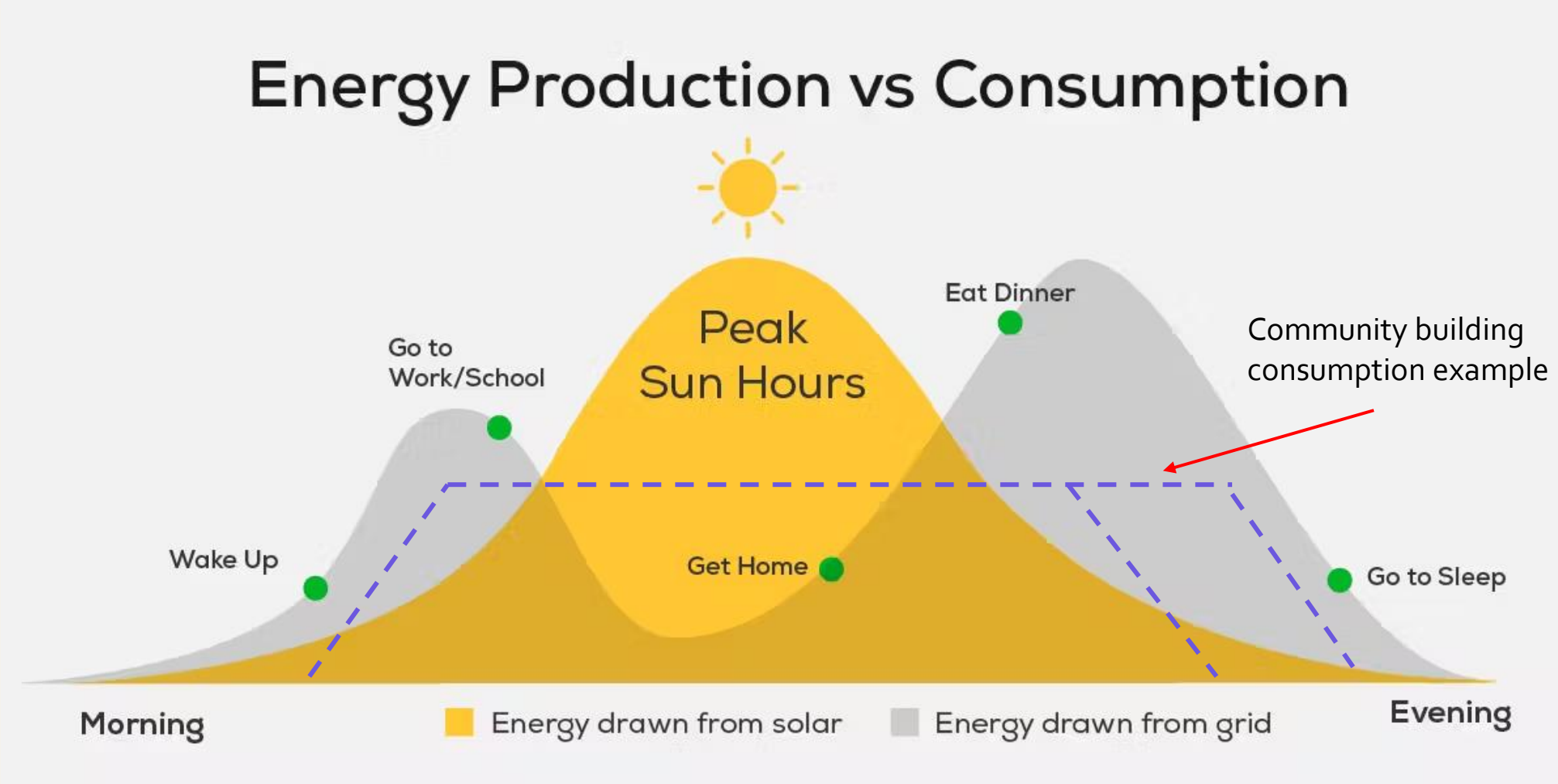
Weight loading calculations

Roof South	
Dead load from roof covering	0.45 kN/m²
Imposed load	0.75 kN/m²
Total loading without solar array	**1.2 kN/m²**
Weight of solar panels and mounting	940.6 kg
Area covered by solar array	75.5 m²
Loading imposed by solar array	0.12 kN/m²
Total loading with solar array	**1.3 kN/m²**

Increase in loading due to solar array: 10%

An increase of less than 15% in the load imposed on a roof is not considered to be a significant change (The Building Regulations 2010, Approved Document A).

Demand and generation patterns



Heat pumps and solar PV

- A heat pump can work with the electricity supplied by a solar panel
- The supply and demand of the two technologies are not ideally matched, due to time of use.
- The contribution will depend on the size of the PV system and the heat pump.
- Any excess solar generation could be used for water heating

Installer questions

- Accreditation
- Content of quote - payback
- Time in business
- Type of panels recommended
- Application for SEG
- DNO permission
- Length of warranties
- Maintenance required
- Certification and handover documents

Installer accreditation

- **MCS (Microgeneration Certification Scheme):** Assesses both the products and the installation company to ensure high standards. It is essential for grid connection and warranty assurance. MCS Certified Installer Database.
- **TrustMark:** A government-endorsed quality scheme that ensures installers meet recognised standards for home improvements.
- **RECC (Renewable Energy Consumer Code):** Ensures compliance with high consumer protection standards, covering the purchasing process.
- **NICEIC / NAPIT:** Technical certifications indicating high standards of electrical work, relevant for solar PV installations.

Battery storage

Battery storage

- Potential to store generated or low-cost energy on site
- Backup power during grid outages
- Grid balancing role
- Considerations:
  - High embodied carbon + mineral extraction
  - Ensure sufficient electricity usage to warrant a battery
  - Fire safety – indoors or out

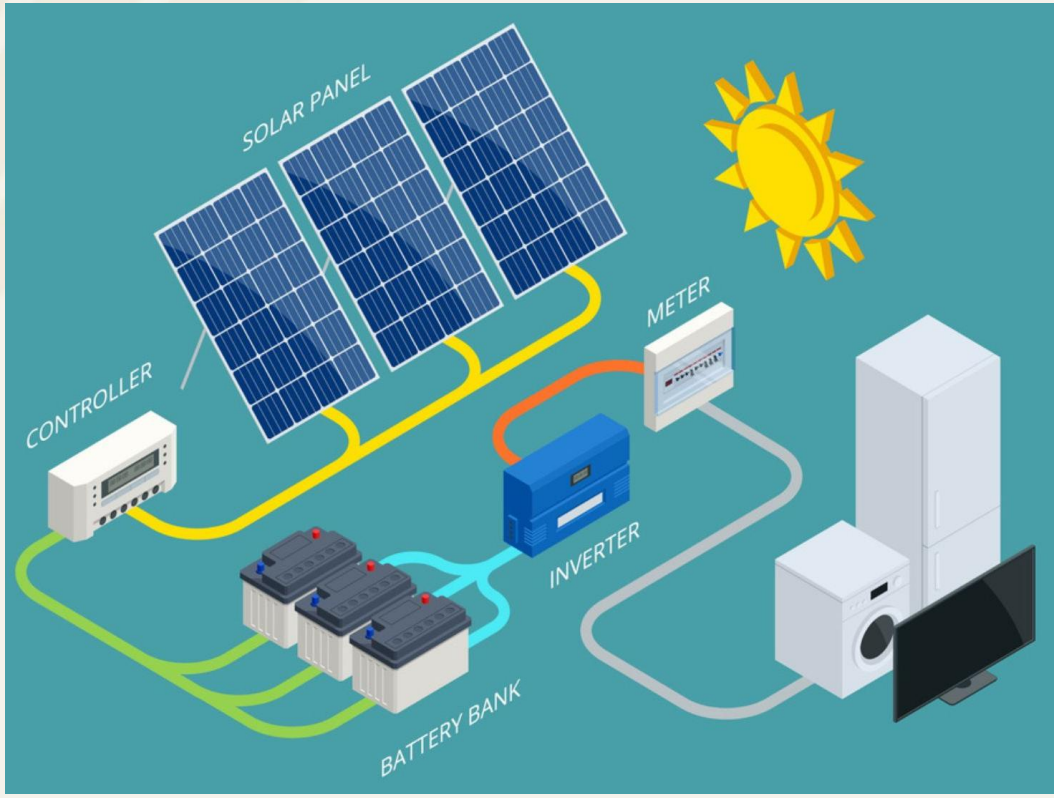
guide-to-battery-storage-for-village-halls-1.pdf

Battery storage - fire safety

- Batteries must go through standard safety tests prior to sale
- They must also meet standards on wiring, electrical installation and product safety.

Installers should reduce risk by considering:

- The location the battery will be installed
- How multiple units should be separated
- Extra fire safety measures needed, such as detectors and measures for tackling a fire
- Ventilation



Solar thermal
Low energy lighting
BEMS

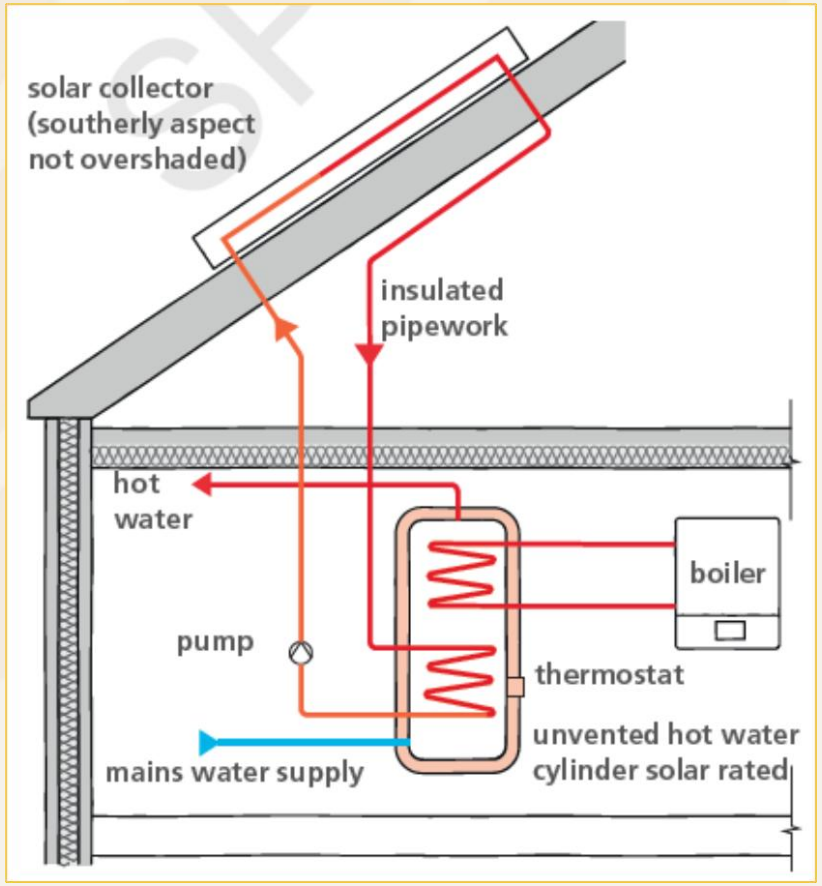
Solar thermal

Absorbs sunlight and transfers heat to water

Two main collector types: flat plate collectors and evacuated tube systems.

Considerations:

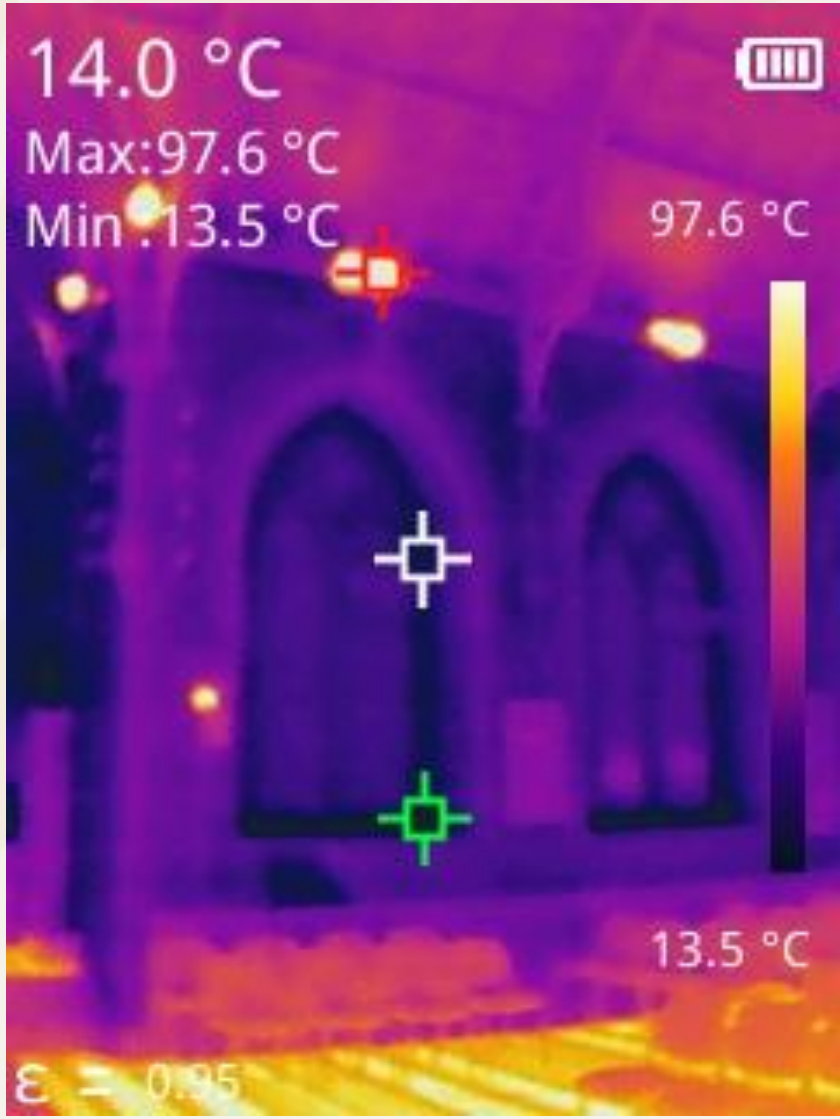
- Suitable for buildings with significant hot water usage
- Requires hot water cylinder
- Planning considerations for conservation areas and listed buildings
- Higher maintenance than solar PV



Low energy lighting

There have been three generations of low-energy light bulbs: halogen bulbs, compact fluorescent light bulbs (CFLs) and light emitting diodes (LEDs).

Each produce more light for every unit of electricity than their predecessor and each generation lasts for longer.



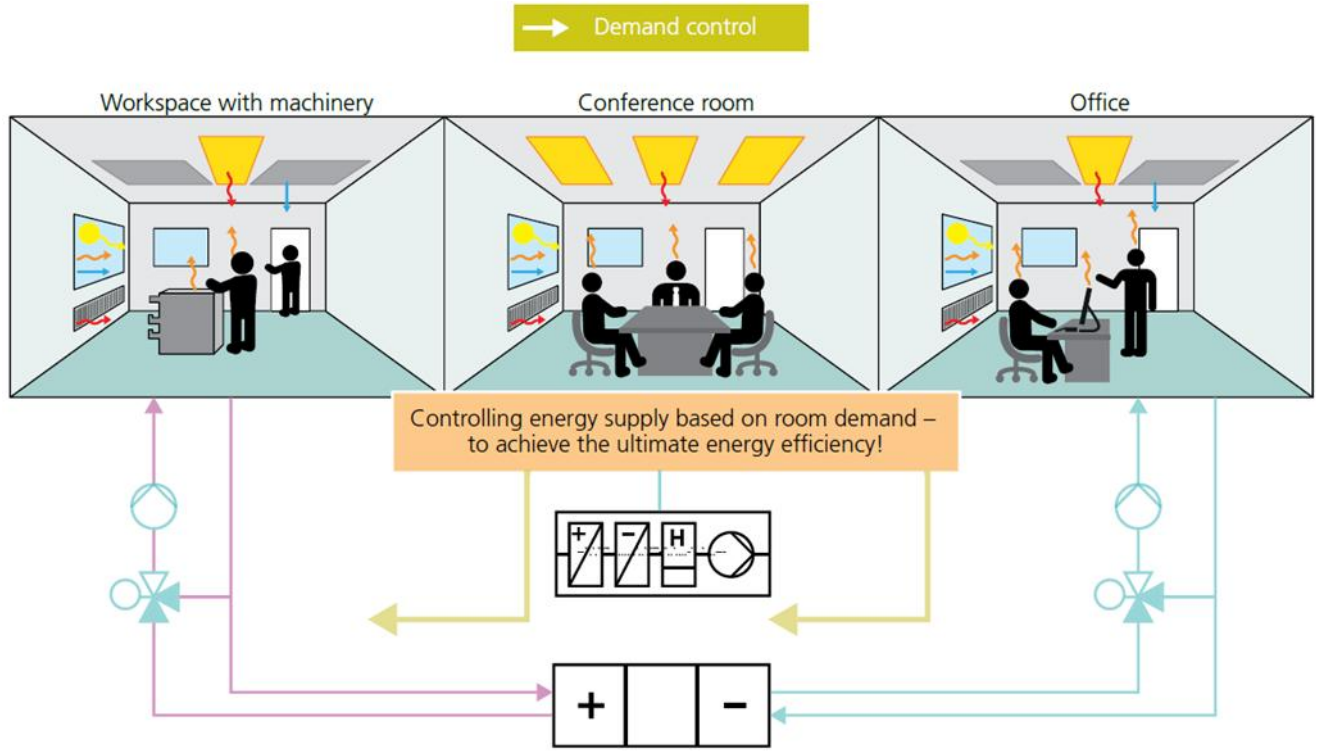
Building energy management systems

Designed to provide a comfortable climate for building occupants at the lowest possible energy consumption.

Can be an effective tool for managing energy for two reasons –

1. Save money
2. Manage risk

Energy can account for about 40% of the running costs of a building over its life.



Demand-based control is the most energy-efficient approach

Centre for Sustainable Energy

We're a charity supporting people and organisations across the UK to tackle the climate emergency and end the suffering caused by cold homes.

cse.org.uk