

Low and Zero Carbon Development

Supplementary Guidance SG15

November 2015



Falkirk Council
Development Services

Supplementary Guidance

A suite of supplementary guidance (SGs) is currently being produced by the Council. Most of these SGs are updated versions of previous Supplementary Planning Guidance (SPG) whilst others cover new topic areas (*denotes new SGs). There are 17 SGs in the series, all of which seek to provide more detailed guidance on how particular local development plan policies should be applied in practice.

These SGs form a statutory supplement to the Local Development Plan, and are intended to expand upon planning policies and proposals contained in the proposed plan.

A full list of the supplementary guidance available in this series is found below.

- SG01** **Development in the Countryside ***
- SG02** **Neighbourhood Design**
- SG03** **House Extensions and Alterations**
- SG04** **Shopfronts**
- SG05** **Biodiversity and Development**
- SG06** **Trees and Development**
- SG07** **Frontiers of the Roman Empire (Antonine Wall) World Heritage Site**
- SG08** **Local Nature Conservation and Geodiversity Sites ***
- SG09** **Landscape Character Assessment and Landscape Designations ***
- SG10** **Education and New Housing Development**
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- SG13** **Open Space and New Development**
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- SG15** **Low and Zero Carbon Development ***
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Low and Zero Carbon Development

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1. Introduction

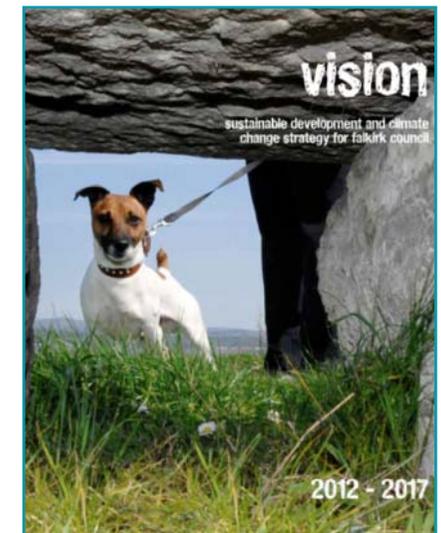
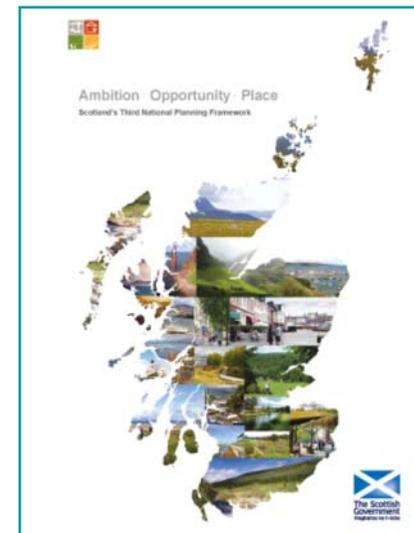
- 1.1 The purpose of this Supplementary Guidance is to expand on how Policy D04 'Low and Zero-Carbon Development' of the Falkirk Local Development Plan should be achieved. Policy D04 requires that all new buildings must achieve a minimum of 10% of the carbon dioxide emissions reduction standards (as set by the Scottish Building Standards) through the use of Low and Zero Carbon Generating Technologies (LZCGTs).
- 1.2 The document provides guidance on the type of development this relates to, how the reduction should be calculated, as well a general overview of the various renewable technologies which can be utilised in meeting the aims of Policy D04.



2. Background

National Policy and Legislation

- 2.1 The Scottish Government has set out ambitious targets in relation to energy. These are:
- 100% electricity demand equivalent from renewables by 2020;
 - Interim target of 50% electricity demand equivalent from renewables by 2015;
 - 11% heat demand from renewables by 2020
- 2.2 Both SPP and National Planning Framework 3 (NPF3) support Scotland's transition towards a low-carbon economy. NPF3 seeks to reduce final energy demand by 12% by maintaining security and further diversification of supply and improved energy efficiency.
- 2.3 Section 72 of the Climate Change (Scotland) Act 2009 introduced Section 3F into the Town and Country Planning (Scotland) Act 1997, which states that;
- “A planning authority, in any local development plan prepared by them, must include policies requiring all developments in the local development plan area to be designed so as to ensure that all new buildings avoid a specified and rising proportion of the projected greenhouse gas emissions from their use, calculated on the basis of the approved design and plans for the specific development, through the installation and operation of low and zero-carbon generating technologies.”***
- 2.4 While this guidance is aimed at addressing the requirements of the Act by reducing the overall carbon emissions arising from new buildings, it is also intended that the policy will encourage renewable energy technologies as an integral part of all new development to provide a long-term, sustainable alternative source of energy. This will ensure that not only are carbon emissions reduced, but that there is also a reduced reliance on finite fossil fuels. Energy-efficient new development will be attractive to prospective purchasers and will save residents and businesses money.
- 2.5 Falkirk Council has produced a Climate Change Strategy in 2012 and accompanying action plan. The Strategy sets out how Falkirk Council intends to tackle sustainability over the next 5 years. The Strategy commits Falkirk Council to placing Sustainable Development and Climate Change at the core of Council policy and practice. The subsequent action plan specifically commits the Council to producing a policy to ensure that a specified proportion of reduction in carbon emissions required by the new Building Standards regulations are achieved via renewable technologies.



2. Background

National Policy and Legislation

- 2.6 Policy D04 of the Falkirk Local Development Plan is intended to meet the requirements of Section 3F of the Town and Country Planning Act by requiring low and zero-carbon generating technologies to be installed on new buildings in order to deliver a percentage of the carbon dioxide emissions reduction required by Building Standards. The policy is designed to ensure that the percentage reduction to be achieved through low and zero-carbon generating technology correlates with the most up-to-date building standards sustainability labelling at the time. Policy D04 may also be reviewed as Building Standards Regulations evolve.



- 2.7 Policy D04 of the Falkirk Local Development Plan is as follows;

Policy D04 Low and Zero Carbon Development

1. All new buildings should incorporate on-site low and zero carbon-generating technologies (LZCGT) to meet a proportion of the overall energy requirements. Applicants must demonstrate that 10% of the overall reduction in CO2 emissions as required by Building Standards has been achieved via on-site LZCGT. This proportion will be increased as part of subsequent reviews of the LDP. All proposals must be accompanied by an Energy Statement which demonstrates compliance with this policy. Should proposals not include LZCGT, the Energy Statement must set out the technical or practical constraints which limit the application of LZCGT. Further guidance will be contained in Supplementary Guidance SG15 'Low and Zero Carbon Development'. Exclusions from the requirements of this policy are:
 - Proposals for change of use or conversion of buildings;
 - Alterations and extensions to buildings;
 - Stand-alone buildings that are ancillary and have an area less than 50 square metres;
 - Buildings which will not be heated or cooled other than by heating provided solely for the purpose of frost protection;
 - Temporary buildings with consent for 2 years or less; and
 - Where implementation of the requirement would have an adverse impact on the historic environment as detailed in the Energy Statement or accompanying Design Statement.
2. The design and layout of development should, as far as possible, seek to minimise energy requirements through harnessing solar gain and shelter;
3. Decentralised energy generation with heat recycling schemes (combined heat and power and district heating) will be encouraged in major new developments, subject to the satisfactory location and design of associated plant. Energy Statements for major developments should include an assessment of the potential for such schemes.

3. Which Developments does Policy D04 apply to?

3.1 Policy D04 applies to all new domestic and non-domestic buildings. All new buildings should incorporate on-site low and zero carbon-generating technologies (LZCGT) to meet a proportion of the overall energy requirements. Applicants must demonstrate that 10% of the overall reduction in CO2 emissions as required by Building Standards has been achieved via on-site LZCGT. This proportion will be increased as part of subsequent reviews of the LDP. All proposals must be accompanied by an Energy Statement which demonstrates compliance with this policy. Should proposals not include LZCGT, the Energy Statement must set out the technical or practical constraints which limit the application of LZCGT. Exceptions to the policies are;

Alterations and extensions	Including house extensions, and extensions to business/industrial premises. This should be an extension to an existing building, and used as an extension of the established use, or for uses ancillary to the primary building use such as storage of goods or ancillary workers facilities.
Stand-alone Buildings which are ancillary and which have an area of less than 50m²	Including garden storage shed/buildings, or an industrial storage building.
Buildings which will not be heated or cooled other than by heating provided solely for the purpose of frost protection	Including domestic garages or a stand-alone building used for agricultural purposes.
Temporary buildings with consent for 2 years or less	Including modular buildings and temporary construction accommodation.
Where implementation of the requirement would have an adverse impact on the historic environment	Section 3.2 provides more detailed guidance on how this should be addressed.

3. Pre-Planning Procedures and Survey Information

Technical and Practical Constraints to installation of LZCGT

3.2 On sites which are highly constrained or where there are environmental sensitivities in and around the site, it may be difficult to accommodate LZCGT. Financial constraints may only be a consideration in exceptional circumstances where a detailed financial appraisal is provided to demonstrate that application of the policy would result in a development becoming financially unviable. An example of this may be where a scheme such as redevelopment of a listed building and associated development within the curtilage is already subject to a high level of abnormalities in terms of overall development cost. Examples of technical constraints that may limit the installation and operation of such equipment are listed below;

Infill or small urban sites	Where there is no space to accommodate technologies such as turbines or heat pumps within the curtilage and where the resultant development itself would be overshadowed by other existing building or vegetation/trees protected by Tree Preservation Order (TPO) or outwith the applicant's control. Within small urban sites, there may also be limited space for pipework, storage of fuels and pellets. There may be problems with access for maintenance and delivery of fuel and materials.
Locations which restrict particular emissions (e.g. air quality management areas)	There are three AQMA's in the Falkirk Council area within Falkirk Town Centre, Banknock and Hags, and at Grangemouth. This may restrict the use and location of technologies such as Biomass. Other technologies should be fully explored in this instance.
Locations with an unsuitable type of ground or building for the location of the equipment	The site may be wholly or partly located on land where there are issues with ground stability, or where the gradient of the site and the resultant design solution would restrict the provision of LZCGT.
Environmentally sensitive locations	Where there are either local, national or international designations, or European Protected Species, some renewable technologies and their resultant infrastructure may result in damage to birds, mammals and their habitat. Disturbance of peat soil through installations of cabling/piping in peaty soil may also offset any carbon savings resulting from the installation of LZCGT.
Developments in close proximity to sensitive built heritage receptors	The applicant should consider the setting of sensitive built heritage receptors such as Listed Buildings and Scheduled Monuments by assessing how the surroundings contribute to the ways in which it is understood, appreciated and experienced. Development should seek to avoid adverse impacts through careful choice of technology and careful siting. Historic Scotland has produced specific guidance in relation to assessing impacts on setting: http://www.historic-scotland.gov.uk/setting-2.pdf The applicant should also consider any potential direct impacts on archaeology, Scheduled Monuments and listed buildings arising from damage to the fabric of the building or archaeology through additional pipework/ cabling, of installing technologies on to any sensitive structure as part of the development. Historic Scotland have produced specific guidance on micro-renewables within the historic environment: http://www.historic-scotland.gov.uk/managing-change-consultation-micro-renewables.pdf

4. Relationship between Policy D04 and Building Standards

4.1 The Sullivan Report, published in 2007, made recommendations to the Scottish Government as to the most effective way to improve the energy performance of houses and buildings in Scotland, and thereby reduce carbon dioxide emissions. One of the most significant recommendations was to aim to achieve net zero-carbon buildings (in relation to emissions for space and water heating, lighting and ventilation) by 2016, if practical. A series of staged improvements in energy efficiency standards beyond the 2007 Building Standards was recommended, the first of which was implemented in 2010 resulting in a 30% improvement on the 2007 standard. This is reflected in the current 2013 Building Standards Technical Handbooks. Revised Section 6: Energy of the handbooks will come into force in October 2015 which will again result in a required reduction in carbon emissions equivalent to a saving of 45% from 2007 standards.

Bronze level

This is the baseline level for sustainability achieved where the dwelling meets the functional standards set out in sections 1 - 6 of this Handbook.

Bronze Active level

This is the baseline level where the dwelling meets the functional standards set out in sections 1 - 6 of the Handbook, but in addition the dwelling includes the use of a low and zero carbon generating technology (LZCGT) in respect of meeting standard 6.1 within section 6 Energy. This level was introduced primarily to assist local authorities to meet their obligations under Section 72 of the Climate Change (Scotland) Act 2009 by identifying the use of LZCGT. In this respect, LZCGTs include: wind turbines, water turbines, heat pumps (all varieties), solar thermal panels, photovoltaic panels, combined heat and power units (fired by low emission sources), fuel cells, biomass boilers/stoves and biogas.

Silver level

A dwelling at this first optional upper level should meet all the standards in sections 1 - 6 that apply to the building for the bronze level and, in addition, the dwelling should comply with the silver level in each of the eight aspects below.

These are;

- Aspect 1: Carbon dioxide emissions
- Aspect 2: Energy for space heating
- Aspect 3: Energy for water heating
- Aspect 4: Water use efficiency
- Aspect 5: Optimising performance
- Aspect 6: Flexibility and adaptability
- Aspect 7: Well-being and security
- Aspect 8: Material use and waste

Silver Active

This is the same as the silver level but, in addition, the dwelling includes the use of a low and zero carbon generating technology (LZCGT) in respect of meeting at least one of the aspects: Silver 1, Silver 2 or Silver 3.

Gold

A dwelling at this second optional upper level should meet all the standards in Sections 1 - 6 that apply to the building for the bronze level and in addition the dwelling should comply with the gold level in each of the eight aspects above.

Platinum

All the standards in Sections 1 - 6 that apply to the building for Bronze level, and in addition the building should be net zero carbon. That is equivalent to a 100% improvement on the 2007 Standards).

4. Relationship between Policy D04 and Building Standards

Sample Sustainability Labelling



5. How should applicants meet the requirement for LZCGT?

5.1 Criteria 1 relates to the demonstration of how 10% of the required 30% reduction in CO2 emissions (45% after October 2015) as required by Building Standards has been achieved via on-site LZCGT. The low and zero-carbon generating equipment may be attached to the building or located within the red line boundary associated with the application. Where a technology requires planning permission in its own right (ie does not benefit from permitted development rights) this should be shown in the plans, within the red line boundary of the application. Where a technology does not require consent in its own right, this should be shown within the blue line land ownership boundary. Falkirk Council seeks to encourage early discussion with both Development Management and Building Standards prior to the submission of an application with regard to how LZCGT could be incorporated within a scheme. The scale or location of technologies may need planning consent in their own right or could influence the overall layout and design of a development, particularly for sites which are already subject to constraint or which are located within an environmentally sensitive area such as a conservation area, or close to a site designated for its ecological value.

The energy statement should contain the following information to meet the terms of D04(1):

- Types of technology to be used;
- Location of the LZCGT in relation to other buildings on-site;
- The location of any other sensitive receptors (such as listed buildings, or ecologically sensitive sites) in or around the site;
- Calculations which demonstrate compliance with Policy D04.

5.2 In relation to Planning Permission in Principle (PPP) applications, a condition will be attached to the decision notice that will require further details of LZCGT to be applied at the detailed consent stage. However, it would be helpful to address the issue of how LZCGT could be incorporated within the scheme at the PPP stage so as to identify any constraints at the earliest opportunity.

5.3 In relation to an application for detailed consent/matters specified in condition, applications must be accompanied by an Energy Statement. Following on from detailed assessment, an appropriate condition will be attached to the decision notice. A sample condition is as follows;

The development hereby approved will not be occupied or brought into use until the following documents have been submitted to and approved in writing by the Planning Authority:

- i) a copy of the appropriate sustainability label (i.e. at least Bronze Active);**
- ii) a Statement of Conformity which confirms that 10%, of the required CO2 emissions reduction is achieved through the installation of low and zero carbon generating technologies.**

Details and a timetable of how this is to be achieved, including details of physical works on site, shall be submitted to and approved in writing Falkirk Council. The approved details shall be implemented in accordance with the approved timetable and retained as operational thereafter, unless otherwise agreed in writing by the Local Planning Authority.



5. How should applicants meet the requirement for LZCGT?

5.4 Before the development can be occupied, applicants must submit a copy of the appropriate sustainability label to the planning authority along with the notification of completion of development as required upon completion of a consented development. This ties in with Building Standards which require applicants to submit the SAP calculations for a Building Standards completion certificate. The condition can then be considered to be discharged. The Statement should set out how the appropriate reduction in carbon dioxide emissions is to be achieved as a result of low and zero-carbon generating technologies using the Standard Assessment Procedure Energy Rating (SAP) for dwellings and the Simplified Building Energy Model (SBEM) for all other developments. The stages in the calculations which must be carried out are set out below.

1. The appropriate software program (SAP/SBEM) is used to calculate the 2007 Building Regulations CO2 Emissions Standard. This will provide a Target Emissions Rate (TER), which is the predicted CO2 emissions for a building of the specified size.

Note: It is important for the purposes of this calculation that it is the 2007 TER that is used as a baseline.

2. The appropriate software program (SAP/SBEM) is used to calculate the actual emissions rate for the proposed development, which includes the low and zero carbon generating technology (LZCGT). This is the Dwelling or Building Emissions Rate (DER/BER), which is the predicted CO2 emissions for the actual proposal.
3. Calculate the reduction from Step 1 to Step 2: **Step 1 – Step 2**
4. Calculate the reduction in Step 3 as a % reduction on the 2007 TER:
(Step 3 ÷ Step 1) x 100
5. The appropriate software program (SAP/SBEM) is used to calculate the actual emissions rate for the development without the low and zero carbon generating technologies. This is a repeat of stage 2 and provides a re-calculation of the DER/BER without the low and zero carbon-generating technologies.
6. Calculate the reduction, beyond the 2007 standard, due to the low zero carbon equipment: **(Step 5 – Step 2)**
7. Calculate the percentage reduction beyond the 2007 standard as a result of low and zero carbon equipment: **(Step 6 ÷ Step 3) x Step 4**

Note: The calculation methodology may require to be updated when revised building standards come into force.

Design and Layout Considerations

5.5 The design and layout of new developments and buildings can help to minimise their overall energy demand. Criteria 2 of Policy D04 states that “The design and layout of development should, as far as possible, seek to minimise energy requirements through harnessing solar gain and shelter.” The overall orientation, design and layout should be considered at the initial feasibility stages of a proposal. For technologies such as photovoltaics and solar, the orientation of the buildings within the development will be crucial to their effectiveness. Supplementary Guidance on Neighbourhood Design (SG02) provides more detailed guidance on the layout and design of development.

Decentralised Heating Schemes

5.6 Criteria 3 of Policy D04 states that “Decentralised energy generation with heat recycling schemes (combined heat and power and district heating) will be encouraged in major new developments, subject to the satisfactory location and design of associated plant. Energy Statements for major developments should include an assessment of the potential for such schemes.”

5.7 Large developments may also be able to make use of decentralised and local renewable or low-carbon sources of heat and power, and developers should explore the potential for this in the preparation of masterplans. This may result in greater savings than just those achieved through the use of low and zero-carbon generating technologies.

5.8 Decentralised energy is produced close to where it will be used and results in a reduction in transmission losses and lowers carbon emissions. Security of supply is increased and it can be a cost-effective solution for developers and subsequent owners and tenants.

6. Overview of Potential Eligible Technologies?

- 6.1 Smaller developments are likely to benefit from technologies which can be easily applied to the fabric of the building such as solar and photovoltaics, or heat pumps. Larger developments may also be able to make use of decentralised and local renewable or low-carbon sources of heat and power, and developers should explore the potential for this in the preparation of masterplans, as this may result in greater savings than just those achieved through the use of low and zero-carbon generating technologies. Examples of some of the technologies eligible to meet the requirements of the policy are set out below.

Technology	Overview	Key Considerations	Type of location where technology most applicable
Heat pumps (General)	A heat pump is a device that provides heat energy from a source of heat to a destination called a "heat sink". Heat pumps are designed to move thermal energy opposite to the direction of spontaneous heat flow by absorbing heat from a cold space and releasing it to a warmer one. A heat pump uses some amount of external power to accomplish the work of transferring energy from the heat source to the heat sink. The heat pump can also be used for cooling purposes by reversing the process resulting in a flexible and adaptable environment.		Single dwellings or groups of dwellings, or business/industrial locations where there is sufficient curtilage to accommodate the pipework and infrastructure.
Air Source Heat Pumps	ASHPs are based on components similar to those found in air-conditioning units, but provide heating instead of cooling. A fan draws air into the unit, where heat is absorbed, increased to a higher temperature, and transferred into the home.	Air temperatures vary more than ground temperatures throughout the year, so the performance of ASHPs is more variable than GSHPs. However, installation can be more straightforward than other pumps as ASHP do not generally require extensive underground pipework or ground excavation.	
Ground Source Heat Pumps	GSHPs capture heat by passing a cool liquid through a system of pipes installed under the ground. These pipes can be oriented horizontally, or vertically, in a borehole. Heat from solar radiation is naturally stored under the ground at 10- 15°C all year round, and is absorbed by the cool liquid as it flows around the piping. A GSHP unit increases this heat to a higher temperature and transfers it into the home.	Ground source heat pumps require a sufficient curtilage associated with the development to accommodate pipework and cabling. This can have an impact on sensitive environmental receptors such as protected trees, protected species and sites.	

6. Overview of Potential Eligible Technologies?

Technology	Overview	Key Considerations	Type of location where technology most applicable
Biomass	Bio-fuelled boilers burn biomass (such as woodchip, wood pellets or straw), bio-diesels (such as rapeseed oil, vegetable oil), or bio-gasses (such as bio-methane) to provide heat in a similar way to coal, oil or gas fired boilers or alternatively in a stand-alone more traditional stove. Bio-fuelled boilers are typically as efficient as or less efficient than gas-fired boilers. However, bio-fuelled heating is considered low carbon or near carbon neutral as the bio-fuel absorbs similar levels of carbon dioxide emissions in its growth as it gives off in its combustion.	There will need to be sufficient space to store fuel to avoid frequent transport deliveries. The site should also be relatively accessible. Domestic biomass boilers can be larger than the standard gas boilers so this should be factored into the design of the development. There should also be arrangements in place for maintenance.	Suitable for small scale domestic application or for larger schemes domestic or non-domestic schemes. It can provide a fuel source for CHP/district heating systems.
Combined heat and power (CHP)	These systems work by generating electricity on or near to a site, avoiding the heat loss that normally occurs from energy generation in power stations. Any heat that is lost can also be captured for space and water heating on the site. The terms of policy D04 would only be met if the fuel source for the CHP came from a renewable source.	These systems work by generating electricity on or near to a site, avoiding the heat loss that normally occurs from energy generation in power stations. Any heat that is lost can also be captured for space and water heating on the site. The terms of policy D04 would only be met if the fuel source for the CHP came from a renewable source.	More suitable for larger residential or business/industrial schemes.



6. Overview of Potential Eligible Technologies?

Technology	Overview	Key Considerations	Type of location where technology most applicable
Hydro	This type of technology uses running water, such as a small stream, to turn a small turbine to generate electricity.	Micro-hydro schemes may require authorisation from SEPA under the Water Environment (Controlled Activities) (Scotland) Regulations 2005. Many watercourses are environmentally sensitive and support a range of ecosystems. Indeed many locally/nationally designated sites where minor changes to flow of disturbance can affect the integrity of the site.	Requires a watercourse within proximity of the development so more suited to rural/semi-rural locations.
Micro-wind	The most common design of a wind turbine is blades mounted on a tall shaft which is free to rotate into the wind driving a generator to produce electricity. These will either be free-standing or attached to the roof of a building. The resultant power can be either distributed to the grid, or to a specified property or development.	Micro-wind may be of limited effectiveness in the wrong location. There can be impacts arising including visual impact, noise and shadow flicker meaning that this type of technology will be largely restricted to rural sites with sufficient curtilage to accommodate the turbine and its infrastructure. There may also be impacts on ecological sites through ground disturbance, and on birds.	Impacts on nearby receptors means that this technology is more suited to rural locations. Larger rural businesses or development sites in the right location could benefit from this technology given the right scale/type of turbine in an area of good wind speed.
Photovoltaics and solar thermal	<p>Photovoltaic panels consist of semi-conducting cells that convert sunlight into electricity. They can produce electricity even in cloudy conditions, but the power output increases with the intensity of the sun.</p> <p>Solar water heating systems comprise solar collectors (tubes or flat plates), a heat transfer system and a hot water storage cylinder. They use heat from the sun to heat water for domestic hot water use.</p>	<p>Photovoltaic panels consist of semi-conducting cells that convert sunlight into electricity. They can produce electricity even in cloudy conditions, but the power output increases with the intensity of the sun.</p> <p>Solar water heating systems comprise solar collectors (tubes or flat plates), a heat transfer system and a hot water storage cylinder. They use heat from the sun to heat water for domestic hot water use.</p>	Widely applicable to a variety of settings from individual domestic to larger industrial sites.

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