

Solar photovoltaics (PV): the debate

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The basics “Solar energy conversion consists of a large family of different technologies capable of meeting a variety of energy service needs. Solar technologies can deliver heat, cooling, natural lighting, electricity, and fuels for a host of applications.”¹

“Generation of electricity can be achieved in two ways. In the first, solar energy is converted directly into electricity in a device called a photovoltaic (PV) cell. In the second, solar thermal energy is used in a concentrating solar power (CSP) plant to produce high-temperature heat, which is then converted to electricity via a heat engine and generator.”¹ This factsheet focuses on solar PV, the solar generation method more widely used in the UK.

Photovoltaic technology

“The solar cell is the main component of Photovoltaic technology and Solar PV systems use these cells to convert solar radiation into electricity. These solar cells consist of one or two layers of a semi-conductor and the most common material used in these cells is silicon, an abundant element most commonly found in sand. Solar cells can be wired together to form a module (a solar panel) and these can then be connected together to form an array.”²

The debate

Sceptics often question the potential of solar power in the UK, due to the country’s climate. However, it is widely accepted by the industry, scientists and government that this technology does have potential to form part of a balanced low carbon energy portfolio. This factsheet looks at some of the key questions and potential issues for solar energy in the UK.

The issue	What the Government says	What the industry says	What the campaigners say	What the scientists say
<p>How much of our energy requirements could solar technology actually supply?</p>	<p>“Solar PV is one of the eight key renewable energy technologies that can help to create a clean, balanced UK energy mix.”³</p> <p>“The Government is committed to substantially increasing the deployment of renewable energy across the UK and recognises the potential role and contribution that solar PV can play in helping to meet the UK’s target of 15 per cent renewable energy from final consumption by 2020, and in supporting the decarbonisation of our economy in the longer term.”³</p>	<p>“Solar clearly works in Britain. Panels in London generate 65% as much energy as in Madrid, and the panels work more efficiently in cooler temperatures.”⁴</p> <p>The Solar Trade Association has developed a ‘Solar Independence Plan’. It claims the proposals in this plan could double solar capacity in the UK with little extra cost to government, and would eventually lead to the industry requiring no government subsidy⁵.</p>	<p>Solar energy generation in principle is fairly uncontroversial. Where there is objection it tends to be to specific projects.</p>	<p>“Solar energy is the most abundant of all energy resources. Indeed, the rate at which solar energy is intercepted by the Earth is about 10,000 times greater than the rate at which humankind consumes energy. Although not all countries are equally endowed with solar energy, a significant contribution to the energy mix from direct solar energy is possible for almost every country. Currently, there is no evidence indicating a substantial impact of climate change on regional solar resources.”¹</p> <p>“Potential deployment scenarios range widely—from a marginal role of direct solar energy in 2050 to one of the major sources of energy supply. The actual deployment achieved will depend on the degree of continued innovation, cost reductions and supportive public policies.”¹</p>
<p>Roof-mounted solar panels: local impacts and attitudes</p>	<p>“The extensive deployment of solar PV across the UK has become increasingly visible to the public at all scales and is among the most popular renewable energy technologies.”³</p> <p>In a 2013 survey conducted on behalf of DECC, solar received the highest public approval rating of all renewable energy</p>		<p>Some individuals can feel that the retro-fitting of houses with solar panels has a negative visual impact on their neighbourhood, but there a few organised campaigns against this form of power generation. In conservation areas certain restrictions apply⁸.</p>	

	<p>technologies at 85%⁶.</p> <p>In a speech to Solar Energy UK in October 2014 Amber Rudd MP, Parliamentary Under Secretary of State for Climate Change, also noted that half a million houses now benefit from permanently reduced energy bills due to generating their own energy⁷. However, it should be noted the cost of installing this technology means it is not accessible to all.</p>			
<p>Ground-mounted solar panels, or ‘solar farms’: local impacts and attitudes</p>	<p>The Government supports the expansion of rooftop solar energy generation, but generally opposes ground-mounted developments. Junior government minister, Amber Rudd, is reported as stating that “Solar farms are not particularly welcome because we believe that solar should be on the roofs of buildings and homes, not in the beautiful green countryside”⁹.</p>	<p>“Solar farms are given consent on the basis that they are temporary and reversible, and that the land can remain in and will be returned to agricultural use at the end of the 25 year period. The land remains as agricultural greenfield land and therefore is not available for housing development.”¹⁰</p> <p>“Solar farms go through a rigorous planning procedure to get approval. This takes into account the suitability of the site, any potential impact on the locality and relevant renewable energy targets.”¹¹</p> <p>“The UK needs solar power to meet the 15% EU renewable energy targets by 2020, but it also creates investment and local green jobs, whilst reducing the reliance on overseas fossil fuel imports. As this valuable and rapidly deployable sector grows, solar will help businesses to manage their electricity costs while reducing their carbon emissions, and will provide a choice about where you obtain your power”¹¹.</p>	<p>There has been opposition from some community and countryside conservation groups to plans to use greenbelt or farm land for the development of ‘solar farms’. For instance, the group Save South Shropshire Countryside has campaigned against numerous planned developments in the county on the grounds that they would spoil the landscape¹².</p> <p>Such groups have welcomed government moves to cease subsidy payments under the Common Agricultural Policy for fields used for solar panels.</p>	<p>“Some solar projects have faced public concerns regarding land requirements for centralized concentrated solar power (CSP) and PV plants, perceptions regarding visual impacts ... Land use impacts can be minimized by selecting areas with low population density and low environmental sensitivity.”¹¹</p>
<p>Are there environmental risks associated with solar PV?</p>		<p>Although there may be some concerns about material recyclability, the industry is keen to point out that</p>		<p>“Solar technologies offer opportunities for positive social impacts, and their environmental burden is small. Solar</p>

		these are insignificant in comparison to the benefits gained from increasing low carbon, renewable electricity generation.		technologies have low lifecycle greenhouse gas emissions, and quantification of external costs has yielded favourable values compared to fossil fuel-based energy. Potential areas of concern include recycling and use of toxic materials in manufacturing for PV, water usage for CSP, and energy payback and land requirements for both... Studies to date suggest that none of these issues presents a barrier against the widespread use of solar technologies.” ¹¹
Is solar energy generation too expensive?	“The UK has seen a significant level of solar PV deployment together with significant cost reduction over recent years with installed costs estimated to have fallen around 50 per cent between 2010 and 2012. The ability to deliver further reductions in the installed costs of solar PV will determine the level of sector growth and the ability for the levelised cost of solar PV to become competitive with other low-carbon electricity sources.” ³	<p>Homeowners: The Energy Saving Trust estimates that the average domestic 4 kilowatts peak (kWp) solar PV system, costs £5000-8000. This is a significant initial investment, but such a system can generate around 3,800 kilowatt hours of electricity a year, roughly equivalent to a typical household’s electricity needs¹³. If a system is eligible for the Feed-in-Tariff scheme, homeowners can be paid for both the electricity they generate and use and any excess exported to the grid.</p> <p>“The cost of installation PV systems, in particular the cost of the panels is falling and is expected to continue to do so. The cost of PV equipment doesn’t vary much as there are only a few wholesalers in the UK, and variability in installation costs tends to be smaller than for other technologies”¹⁴</p> <p>Industry: Paul Barwell of the Solar Trade Association argues that “Solar could by 2020 be cost competitive</p>		“Over the last 30 years, solar technologies have seen very substantial cost reductions. The current levelised costs of energy (electricity and heat) from solar technologies vary widely depending on the upfront technology cost, available solar irradiation as well as the applied discount rates.” ¹¹

		with gas and no longer need any kind of Government support at all on homes and commercial roofs. But we will only reach that point if the next Government provides a stable policy framework and a level playing field with other technologies" ⁴ .		
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¹ IPCC (2011) *Renewable Energy Sources and Climate Change Mitigation: Special Report of the IPCC*. Prepared by Working Group III of the IPCC [O. Edenhofer, R. Pichs-Madruga, Y. Sokona, K. Seyboth, P. Matschoss, S. Kadner, T. Zwickel, P. Eickemeier, G. Hansen, S. Schlömer, C. von Stechow (eds)]. Cambridge: Cambridge University Press. Available at: <http://srren.ipcc-wg3.de/report> [accessed February 2015]

² Solar Trade Association. 'Solar Energy (Photovoltaics)' [online] www.solar-trade.org.uk/solarHeating/photovoltaics.cfm [accessed February 2015].

³ DECC (2013) *UK Solar PV Strategy Part 1: Roadmap to a brighter future*. www.gov.uk/government/uploads/system/uploads/attachment_data/file/249277/UK_Solar_PV_Strategy_Part_1_Roadmap_to_a_Brighter_Future_08.10.pdf [accessed February 2015].

⁴ Solar Trade Association (2015) Solar electricity almost doubled last year [Press release] January 2015. Available at: www.solar-trade.org.uk/news.cfm?id=299 [accessed February 2015]

⁵ Barwell, P. (2015) 'The path to zero subsidy.' *Solar Power Portal*, 20 January 2015. Available at: www.solarpowerportal.co.uk/guest_blog/the_path_to_zero_subsidy_3425 [accessed February 2015]

⁶ DECC (2013) *Public Attitudes Tracker Wave 5*. Available at: www.gov.uk/government/uploads/system/uploads/attachment_data/file/198722/Summary_of_Wave_5_findings_of_Public_Attitudes_Tracker.pdf [accessed February 2015].

⁷ Rudd, A. (2014) Speech to Solar Energy UK. Available at: www.gov.uk/government/speeches/solar-energy-uk [accessed February 2015]

⁸ Planning Portal. 'Solar Panels' [online] www.planningportal.gov.uk/permission/commonprojects/solarpanels [accessed February 2015]

⁹ Bennett, P. (2014) 'DECC minister joins Tory anti-solar farm bandwagon'. *Solar Power Portal*, 6 November 2014. www.solarpowerportal.co.uk/news/DECC_minister_joins_Tory_anti_solar_bandwagon_214 [accessed February 2014].

¹⁰ Solar Trade Association. 'Myths and misconceptions about solar PV'. [online] www.solar-trade.org.uk/solarHeating/mythBusting.cfm [accessed February 2015]

¹¹ Solar Trade Association. 'Solar farms'. [online] www.solar-trade.org.uk/solarFarms.cfm [accessed February 2015]

¹² Atkinson, P. (2014) 'Help us save south Shropshire countryside' *Save South Shropshire Countryside*. Available at: www.savesouthshropshirecountryside.org.uk/home/news/helpussavesouthshropshirecountryside [accessed February 2015]

¹³ Energy Saving Trust. 'Solar panels' [online] www.energysavingtrust.org.uk/domestic/content/solar-panels [accessed February 2015]

¹⁴ Solar Trade Association. 'Information for home owners - PV'. [online] www.solar-trade.org.uk/pv-homeowners.cfm [accessed February 2015]