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Horizon scanning SR022

HSE Horizon Scanning Short Report

Solar energy

Status: Active Monitoring

Issue

The health and safety implications of the growing use of solar energy in the UK.

Background

Two types of technology are in common use for the exploitation of solar energy:

Solar photovoltaic (PV): uses the sun's energy to generate electricity. A solar cell consists of one or two layers of semi-conducting material, often silicon. Light hitting the cells causes an electric field across the layers, with more light giving a stronger electric field.¹

Solar thermal power (STP): uses the sun's energy to heat air or water

Large-scale electricity generation in 'solar farms' such as are found in for example the US and Australia is not appropriate for the UK. However solar energy can make a useful contribution of the UK's energy needs, despite the diffuse and intermittent nature of our sunlight. Building integrated PV could significantly contribute to electricity production in the UK. For example if 10 m² of 20% efficient PV was installed on 3 million homes then 1.5% of UK electricity at 2006 levels would be generated. Additionally STP could replace a significant amount of fossil fuels in domestic water heating and space heating/cooling in the future.²

The challenges of solar energy in the UK include the seasonal/diurnal variation of sunlight and issues around the storage of the electrical energy generated. Other issues include the current high costs and long payback time, relatively low efficiency, material shortages (silicon) and some use of rare materials.²

The efficiency of PV ranges from 8-20%; concentrator cell prototypes have reached 26.8-40.7%, but are very expensive. The future will bring greater efficiencies at cheaper cost;³ it is thought that next (3rd) generation systems will reach 60% efficiency.²

The solar industry is growing by 30% a year and world PV capacity is predicted to rise from 100MW to 40000MW by 2020. There have been recent rises in the installation of solar PV systems on new and existing domestic and commercial buildings in the UK, e.g. Manchester's CIS tower, which has one of the largest PV facades in the world.⁴ Over 100,000 solar thermal systems are installed in the UK, with about 10,000 more being installed each year.⁵

Subsidies for solar energy under the recent Department of Energy and Climate Change (DECC) Low Carbon Buildings Programme have proved very popular, and the grants were quickly oversubscribed. From the start of April 2009 DECC planned to allow householders

to claim double the financial support through the Renewables Obligation, followed by guaranteed cash payments the year after.⁶

The market for solar energy has been shown to increase with 'feed-in-tariff'* support; such a scheme has been successful in Germany. A feed-in-tariff for solar is also available in the UK with energy producer Scottish and Southern.⁷

UK solar manufacturing companies include Sharp who make PV panels in Wales and G24 Innovations who have expanded production. The UK also has the largest building integrated PV line in Europe. Other new solar companies spun out of UK universities include QuantaSol, SolarStructure and Whitfield Solar. There is an active research environment focused on next generation solar technologies in the UK including the Sustainable Power Generation and Supply Initiative (SUPERGEN), and the New and Renewable Energy Centre.⁵ Additionally in late 2007 the Carbon Trust launched a £5 million research and development programme which aims to produce 1GW of thin organic PV that can be sited on a variety of different surfaces by 2017.⁸

Health and Safety Implications and Discussion

The health and safety risks associated with solar energy will be from the manufacture, installation and maintenance of solar devices.

There is an increasing number of STP and PV installers in the UK⁹ and with the rise in solar installations there may be training and competency issues for the sector, for example working at height. Competency may be particularly relevant with STP where plumbing skills and 'Gas Safe' registration¹⁰ may be required to allow integration with gas central heating. There may be potential domestic electrical safety issues associated with PV panel installation and integration with the National Grid maintenance e.g. working at height.

The next generation of highly efficient solar PV is being developed in the UK, and uses chemicals such as cadmium telluride, copper indium diselenide and copper indium gallium selenide in their manufacture, which are known to be highly toxic.^{2 5} Additionally new and emerging chemicals and processes will be used in future solar panels, which may well also be harmful to human health.¹¹ There is a potential health risk from exposure to these chemicals during the manufacture of solar panels and also from their disposal and recycling. There may also be hazards associated with the transportation of these chemicals. Additionally there may be land use planning issues associated with the establishment of PV panel manufacturing sites.

The Department for Business Enterprise and Regulatory Reform (BERR) states that the UK has a small but established market for solar thermal energy,⁵ but there are signs of growth evidenced by a major double-glazing provider now offering solar thermal heating installation.¹² Although recent market research states that the world solar demand growth will stay roughly flat in 2009 and 2010,¹³ over the longer term, with increasing energy prices solar power is likely to play a significant role in the UK's future energy mix. According to BERR estimates solar PV could be cost competitive with other forms of electricity production between 2020 and 2030.⁵ The government's ambition that all new homes to be

* People are paid above market rates for selling electricity from solar PV back to the Grid

carbon neutral by 2016 may further stimulate the solar energy market,⁴ and there is a real possibility that the Government's proposed 'feed in tariff' for solar energy in 2010 will cause a rapid expansion in home installations, resulting in a significant number of jobs in solar being created.¹⁴

Recommendation

HSE needs to consider the resource implications and skills requirement of an expansion in solar energy over the next 10 years.

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¹ <http://www.energysavingtrust.org.uk/Generate-your-own-energy/Solar-electricity>

² <http://royalsociety.org/downloaddoc.asp?id=5988>

³ <http://www.guardian.co.uk/environment/2008/jun/16/renewableenergy.energy>

⁴ <http://www.ukrenewables.com/news-1/january-2008/bright-future-for-uk-solar-pv>

⁵ <http://www.berr.gov.uk/energy/sources/renewables/explained/solar/current-use/page16374.html>

⁶ <http://www.guardian.co.uk/environment/2009/mar/12/renewableenergy-carbonfootprints>

⁷ <http://www.southern-electric.co.uk/Help/ForYourHome/Microgeneration/SolarPVTariff.aspx>

⁸ http://www.carbontrust.co.uk/News/presscentre/2007/041007_PV.htm

⁹ <http://www.solar-trade.org.uk/STAmembers/memberlist.asp>

¹⁰ from 1 April 2009

¹¹ http://www.svtc.org/site/DocServer/Silicon_Valley_Toxics_Coalition_-_Toward_a_Just_and_Sust.pdf

¹² <http://www.everest.co.uk/solar-panels.asp>

¹³ http://www.py-tech.org/news/ a/pv_market_to_contract_by_15_in_worst_growth_year_since_94_says_greentech_me/

¹⁴ <http://www.guardian.co.uk/environment/2009/may/14/feed-in-tariff-solar-power>