From:	Cleve Hill Solar Park
To:	Anderson-Rowe, Asha
Subject:	FW: Re: Solar Farm : Clevehill , Kent EMF danders of Solar Farms
Date:	02 July 2019 10:13:36
Attachments:	Telegraph article . Effect of EMF on Cows in Franceand Insect life.pdf Radiation dosage source WNA Reuters Radiologyinfo.org.pdf BRE Group Fire safety and solar electric photovoltaic systems.pdf BRE Interim report Feb 2017 page 9 of 20.docx attachment e - powerfromsunlight article July 2017 Fire Hazard through the Solar Panel System.pdf

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From: [redacted]
Sent: 24 May 2019 21:54
To: Cleve Hill Solar Park <CleveHillSolarPark@planninginspectorate.gov.uk>
Subject: RE: Re: Solar Farm : Clevehill , Kent EMF danders of Solar Farms

Dear Mr. Parker,

As you surmised I do not live anywhere near Clevehill. However, since Solar Farms are 'newish' : and experience of them are proving they are not as 'green' as they claim. The Daily Telegraph article also got caught up and hidden with BREXIT , and not e noticed the April 26th 2019 article. So yes, it is late according to the plan, but can you ignore facts that result from experience ?

I attach an article where the French farmers are suing the French State for the loss of their dairy herd. Following the 'green' energy hype of solar and wind, no one until the French farmers has actually recognised in particular Solar Farms have miles/kilometres of cables with electricity currents; these cause electromagnetic fields which in turn cause electromagnetic radiation.
The article is a copy and a bit amateurish, however, current world is full of climate change, pollution but the killer or hurt is hidden and is electromagnetic radiation (EMR). Why are mobile phone masts no longer allowed near schools? EMR 's effect is unknown as scientifically, no one can do laboratory tests on a pregnant woman – but the World Health Organisation is very concerned about instances of Childhood leukemia around any substation. The concern is around the placenta (unborn) and the young, I attach a table that says what people can stand on radiation – and as we all know it can cause cancer. The radiation dosage is not about just passing by once, it is about how many times you are exposed to it.

Particulate pollution is now becoming an issue in towns – may I just point out that the hidden killer even in the home is EMF from wifi, microwaves etc known as 'dirty' electricity' , and on top of that mobile phones masts are no longer allowed near schools, it is important that you consider the Telegraph articles. Fact and law of physics, cables carrying current cause an EMF, and the resultant is known as EMR or EMI .
So a 350Mwatt solar farm should be treated with a lot of caution and as a power station and a form of chenobyl in disguise – solar panel fires cannot be easily extinguished when the sun is shining, and arcing is a serious problem. Please read the word attachment of BRE interim report Feb 2017 . However, good the installation, the environment has an ecology of animals etc. If there are rodents or even badgers, the installation can be compromised.

EMR is a hidden killer, and scientists know it produces cancer but they do not know what it actually does to living tissues – ECLIPSE (EU body is not reporting until 2021), Buglife complains there is not enough research but they do know that migrating birds are affected.

I know not what inputs you have had, but may I suggest that the French farmers are not flying a kite and with the recent worry about biodiversity again post end Jan 2019, do you not take into consideration the current ***environment***?

I am only an interested party because I care for the environment, and EMR is an unrecognised danger to the placenta (the unborn), the young and the natural world. There aren't enough people who understand electromagnetic fields and only people wanting to make money at the expense of their fellow humans who end up with children with problems that are not normal. May I suggest that you ask what the EMF, EMR expected of a 350 Mwatt solar farm. If arcing occurs, how the fire is going to be put out? I don't think any fire brigade will do anything and like Grenfell towers, Clevehill will be allowed to burn see attachment e which is only about a domestic solar system!

Yours sincerely,
Chala Fiske

From: Cleve Hill Solar Park [mailto:CleveHillSolarPark@planninginspectorate.gov.uk]
Sent: 24 May 2019 19:00
To: [redacted]
Cc: Cleve Hill Solar Park
Subject: FW: Re: Solar Farm : Clevehill , Kent EMF danders of Solar Farms

Dear Sir / Madam,

I confirm receipt of your submission, which has been passed to the Planning Inspectorate as it relates to the Cleve Hill Solar Park Project.

The opportunity to register as an Interested Party in the Examination and submit a Relevant Representation ran between 19 December 2018 and 28 January 2019. As this submission was submitted after the close of the registration period it will be presented to the Examining Authority who will decide whether to exercise its discretion and accept your submissions into the Examination as an Additional Submission.

It is unclear at this time if you may have a legal interest in the land required for the development.

You can search for your property in the applicant's Book of Reference (https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/EN010085/EN010085-000200-4.3%20Book%20of%20Reference.pdf). If you are an owner, lessee, tenant (whatever the tenancy period) or occupier of the land affected by the proposed development, then you will be considered to have a legal interest in the land.

Only those with a legal interest in land affected by a Nationally Significant

Infrastructure Project and:

•have not been identified by the Applicant; and
•did not register to become an Interested Party

can make a request to the Examining Authority to become an Interested Party under s102A of the Planning Act 2008.

Becoming an Interested Party gives you the right to make representations about the application, attend meetings and hearings, stay informed of the progress of the Examination and be given notification of the final Decision.

If, having read the Book of Reference, you consider that you have a legal interest in the land, you should submit a request to become an Interested Party by **Friday 31 May**.

We will advise you on whether your submission is accepted as an Additional Submission.

Yours faithfully,

Steven Parker (Case Officer) – Cleve Hill Solar Park Project Team

From: "Chala Fiske" <chala.fiske@uwclub.net>
Address: Little Woodington, East Wellow, Woodington Road, Romsey, SO51 6DQ, England Date Sent: 04 May 19 15:31
Subject: Solar Farm : Clevehill , Kent EMF danders of Solar Farms

Whilst assessing the Clevehill NSIP application, is the Planning Inspectorate aware of the dangers of Electromagnetic Field radiation of Solar Farms, for example the French farmer s Telegraph article 26th April 2019 on French Farmers suing on the EMF effects of Solar and Wind farms on their dairy cattly, WHO also know that childhood Luekemia incidences occur around substaions (EMF again) , and Buglife is absolutely sure that birds 'radar' and therefore bats are affected by EMF. What is not certain because laboratory tests are deemed unprovable is the effects of EMF on insects, bees etc. Climate Change is deemed as a visible answer to everything, but the effects of EMF on the human body is unknown - except the public including the problems of phone masts round schools, are aware by familyexperiences rather than scientific testing that EMF causes cancer - who is brave enough to stand in front of a microwave oven in operation. What IS the EMF of a large solar farm?

French farmers sue the state over mystery cow deaths they blame on electromagnetic fields

Several studies have shown that livestock, particularly cattle, are affected by even low level electromagnetic fields CREDIT: SEBASTIAN GOLLNOW/AFP

- Henry Samuel, PARIS

26 APRIL 2019 • 5:28PM

A group of French cattle farmers is suing the state over the mysterious death of hundreds of cows, which they believe are the victims of harmful electromagnetic fields.

Local vets are at a loss to explain the deaths.

Stéphane Le Béchec, 51, a Breton farmer in Allneuc, has lost 200 cows who died of unknown causes in the past three years and is closing his business.

He has identified several potentially harmful sources, including a transformer, mobile transmission towers and wind farms whose electric currents he says blight his land. “I noted that the voltmetre reacted strongly when I stuck it in the ground or in water,” he told Le Parisien.`

He has filed a legal complaint against “persons unknown” with the local prosecutor.

Patrick Le Néchet, another farmer in nearby Prénessaye, has lost 120 cows in similarly mysterious circumstances in the past five years.

“This week, he found a dead calf by its mother. Sometimes we find three in one go. We never know what we'll find,” he said.

“We also have had blind calves with holes in their heads and deformed limbs that end up going round in circles and banging their heads on the walls,” he added. Others can no longer walk or refuse to be milked and produce very little, as well as bullocks that are stunted.

French farmers are suing the state over a spate of mysterious deaths of their cows CREDIT: REGIS DUVIGNAU/REUTERS

The local agricultural chamber referred him to a geobiologist who noted that the water on his property carried a high amount of electricity, potentially linked to a neighbour’s photovoltaic station.

These are far from isolated cases, with ten registered in Brittany alone in the past two years. In two, the deaths started after the installation of wind farms. Others have been registered in Normandy and the Sarthe.

“They let farmers die when they have known there is a problem for the past 25 years and it’s getting worse,” said retired farmer Serge Provost, who told Le Parisien that the geology of the local soil and its conductivity is not sufficiently taken into account when installing high-tension pylons and other electrical devices.

A group of concerned farmers met on Friday in Le Mans to launch legal action demanding state compensation.

French cows under threat from electromagnetic waves says group of farmers CREDIT: DANITA DELIMONT/GALLO IMAGES

The French government first ordered a study into the potentially harmful effects of electromagnetic fields on livestock in 1998, which proved inconclusive.

Several recent scientific studies in other countries suggest that dairy cows are sensitive to earth currents, which can have negative health effects on them.

Last year, an analysis of 97 studies by the EU-funded review body EKLIPSE concluded that electromagnetic radiation from power lines, wi-fi, phone masts and broadcast transmitters poses a 'credible' threat to wildlife - in particular to insect and bird orientation and plant health.

However the charity Buglife warned that despite good evidence of the harms there was little research ongoing to assess the impact, or apply pollution limits.

"There is a real problem that we need to deal with," said Claude Allo, president of a French working group tasked by agricultural chambers to look into the issue.

Event	Radiation reading, millisievert (mSv)
Single dose, fatal within weeks	10,000
Typical doseage recorded in those Chernobyl workers who died within a month	6,000
Single does which would kill half of those exposed to it within a month	5,000
Single doseage which would cause radiation sickness, including nausea, lower white blood cell count. Not fatal	1,000
Accumulated doseage estimated to cause a fatal cancer many years later in 5% of people	1,000
Max radiation levels recorded at Fukushima plant yesterday, per hour	400
Exposure of Chernobyl residents who were relocated after the blast in 1986	350
Recommended limit for radiation workers every five years	100
Lowest annual dose at which any increase in cancer is clearly evident	100
CT scan: heart	16
CT scan: abdomen & pelvis	15
Dose in full-body CT scan	10
Airline crew flying New York to Tokyo polar route, annual exposure	9
Natural radiation we're all exposed to, per year	2
CT scan: head	2
Spine x-ray	1.5
Radiation per hour detected at Fukushimia site, 12 March	1.015
Mammogram breast x-ray	0.4
Chest x-ray	0.1
Dental x-ray	0.005

The building types involved break down as follows:

- Domestic buildings 27 incidents
- Non-domestic buildings 26 incidents
- Solar farms 5 incidents

However, we strongly suspect a degree of under-reporting, especially amongst solar farms.

The review of international literature conducted under this project in 2015 [5], concluded that:

Where PV systems have been the cause of fires, some themes emerge. Much attention is paid to the phenomenon of electrical arcing, where a current flows across an air gap by ionising the air. High voltage arcs are extremely hot and can cause combustion of surrounding materials in less than a second. Arcing can occur where conducting parts become physically separated by mechanical movement or mis-alignment. Also, a buildup of contaminants (e.g. oxide) on electrical contacts can cause resistive heating, resulting in the breakdown of materials and subsequent arcing

Fire safety and solar electric/photovoltaic systems

By Martin Shipp, Ciara Holland, David Crowder, Steve Pester and John Holden

Introduction

BRE Global has been awarded a contract by the Department for Communities and Local Government (DCLG) to continue fire investigation activities on behalf of DCLG until 2015.

An important element of this contract is to ensure that findings from fire investigations are made available to the fire community, and other stakeholders.

Background

Along with many other countries in the world, the UK is seeking to increase the proportion of energy that is obtained from “renewable” sources, such as those that exploit wind, biomass or solar energy.

One of the most popular, in particular in the domestic market, is production of electricity from solar energy using photovoltaic panels, and, encouraged by government incentives, the numbers of these systems in use has rapidly grown in recent years.

All new technologies can introduce new risks, and all new energy-handling systems can introduce new fire risks. Evidence is emerging from Europe and North America of the potential for fire hazards associated, directly or indirectly, with renewable energy power generating systems such as photovoltaics and wind turbines. Fires involving these systems can present some unique challenges for the fire service, building occupiers and insurers. See, for example, references [ref. 1] and [ref. 2].

Objective

The aim of this article is to provide a summary of the known or potential safety hazards from fires due to, or involving photovoltaic (PV) systems. Also explained are the issues fires in such systems can present in terms of fire-fighting and the impact on the building occupants.

This article is intended to raise awareness of the emerging issues and thereby be of assistance to the fire and rescue services, insurers, planners, architects, designers, building owners and fire risk assessors, as well as interested parties within the PV industry; designers, manufacturers, installers and maintainers.

Scope

At the present time there is no reason to believe that the fire risks associated with PVs are any greater than those associated with other electrical equipment. Nevertheless these systems are now more common – recently, there has been rapid growth in the market – hence it is important that any risks associated with such installations are more widely appreciated.

In contrast to the power used by conventional mains electrical equipment, the power that PV systems generate is DC (direct current) and parts of the systems cannot be switched off. DC installations have a continuous current, making them more hazardous (volt for volt) than normal AC (alternating current) electrical installations where the voltage and current oscillate. This can affect the muscles of the human body differently; DC current will continuously contract the affected muscles making it difficult to break contact with live components; AC current provides an opportunity for release as the current reverses its direction.

Fires involving renewable energy technologies are quite rare but incidents involving PV systems are being reported. Although actual numbers of fire incidents involving PV systems are not known, in the last two years BRE has been notified of eight incidents which were of concern to local Fire and Rescue Services.

This article only discusses the identified fire risks during operation; it does not cover any fire risks that may be present during the PV system installation although there may be some overlap.

Renewable energy technologies generally, and PV systems in particular, are rapidly developing and innovative systems are continually being introduced so this article provides only a very brief and simplified “snap-shot” of the situation at the time of writing.

What is a PV system?

Photovoltaic (PV) panels (also called solar electric panels) convert energy from the sun into electricity. PV panels (or modules as they are sometimes called) are composed of a number of PV cells (or solar cells) containing a photovoltaic material [ref. 3], and these can be in a variety of shapes and sizes. There are a number of photovoltaic materials currently in use, and the technology is rapidly evolving. For building applications, a number of PV panels are normally connected together to form a PV array, and most panels are currently being fitted to existing roofs using external framework. However, there is a variety of more specialised panels designed to form part of the building covering, for example building integrated panels, solar tiles and glass facade components are available. These products are collectively known as Building-Integrated PV – BIPV [ref. 4].

Photovoltaic panels generate electrical power by converting solar radiation into direct current (DC) electricity by utilising the photovoltaic effect within specialist semiconductor materials. PVs will work, to some extent, in any weather as long as there is daylight and so can still generate some electricity on a cloudy day.

The power, which is measured in watts (W), can be used on site or routed back into the electrical grid. PV panels are rated in watts-peak (Wp) and arrays in kilowatts-peak (kWp). A typical domestic system would be rated at 2 – 4 kilowatts-peak (kWp), whereas commercial roof-mounted systems can be from domestic size up to 1000 kWp for very large area roofs. Large ground-mounted PV arrays (solar farms) can generate many megawatts (MW), and sizes are increasing all the time.

In general, a building-mounted PV installation comprises the following:

The PV panels, affixed to the roof of the building or integral with the roof or facade.
DC cables, connectors and junction boxes which take the power produced to an inverter. Sometimes junction boxes can also contain fuses, diodes and surge-arrestors.
One or more inverters which convert the DC power to AC. These are often termed 'string inverters' or 'central inverters'. The majority of installations in the UK use string inverters. 'Micro-inverters' involve an inverter, usually mounted on the roof under each panel, or small group of panels, which reduces the length of DC cabling and avoids high DC voltages, which are a potential source of electrical arcs. The remaining cabling on the roof and down to the distribution board can then be standard AC cable (exterior grade on the roof). The use of micro-inverters is becoming more popular as more systems come onto the market.
One or more DC isolation switches provided to isolate the PV array from the inverter. Note: DC isolation switches are **not** interchangeable with AC isolation switches.
AC cables which take the AC output from the inverter to the building's main electrical supply. There will be a meter to record the energy generated and an AC isolation switch on this line.
A connection to the main AC supply via suitable protection devices, such as circuit breakers and residual current detectors (MCBs and RCDs)..
Alternatively, for off-grid premises or installations, the DC power may be stored in batteries and/or converted to a local AC supply.

Standards and Codes

PV installations should be installed in accordance with national guidance [ref. 5] and any specific guidance issued by manufacturers. There are a number of standards that PV products should comply with [refs. 6, 7, 8 and 9] which include (amongst other factors) requirements that address fire hazards.

Where the system owner wishes to register to receive the government's feed-in tariff incentive, PV installations of less than 50kWp must comply with the MCS (microgeneration certification scheme) installation standard MIS 3002 [ref. 10]. To comply with MIS 3002, installers must use MCS [ref. 9 and 11] or equivalent certificated PV modules. MCS certification of PV modules requires testing of products to international standards and assessment of manufacturing processes, materials, procedures and staff training. It therefore provides building owners with a measure of confidence in the installers and products used. Furthermore, PV systems that form part of the roof structure should satisfy a fire exposure test, e.g. DD CEN/TS 1187 test 4 or BS 476 Part 3 [ref.12 and 13]. This test seeks to ensure that fire will not spread between buildings via the roofs. From April 2014, all systems mounted on pitched roofs must also comply with MCS 012 in order to be accepted under the MCS. MCS 012 [ref. 14] includes wind uplift and weather tightness testing of pitched roof installation kits and, for roof integrated products, the fire exposure tests described above.

Fire safety issues

All electrical installations, by their nature, will carry some degree of fire risk. Although fires caused by PV panels are rare, any fire involving a building with a PV array can present an increased risk to occupants and fire-fighters.

PV arrays with string or central inverters involve DC at elevated voltages and it is not normally possible to completely isolate the DC electrics between the PV array and the DC isolation switch. Additionally, PV modules are current-limiting devices meaning fuses are not likely to operate under short-circuit conditions which could mean a fault in the system goes undetected. This scenario can present fire and/or electric shock risks, although these can be minimised by good system design, product selection and installation practices.

In fires that BRE has been informed of where the PV systems have been the cause of the fire, these fires have generally resulted from poor installation or the use of wrongly specified, incorrect or faulty equipment. Specifically, there have been reports of installations of AC isolator switches being used mistakenly in DC circuits resulting in a build-up of heat within the switch enclosure and leading to a fire. Other incidents have resulted from the use of faulty inverters or faulty DC switches or the absence of isolator switches. Any switching or connection faults on the DC side of a system can result in the generation of a high temperature arc or high resistance fault which could start a fire. DC arcs can be difficult to extinguish and pose a risk to fire-fighters attempting to suppress the fire.

Current MCS guidance [ref. 5] for the installation of PV systems recognises the potential risks from fire and includes some recommendations for prevention/mitigation of these risks, although further guidance is a topic still under discussion within MCS. Clearly good design and proper routine testing, servicing and maintenance are essential for risk management.

In the event of a failure of the AC supply to a building, (for example due to a local power cut, or a fire) the inverters are designed to shut down automatically. However, the solar DC supply (from panels to the DC isolator) will still be live during daylight. It may therefore still be necessary to manually isolate the DC cables and components from the PV panels which will otherwise remain live.

If a fire damages the DC cables from the PV array, for example by burning off insulation, then there will be risk of electric shock from the exposed DC conductors, in particular to fire-fighters.

Poorly installed panels may obstruct or restrict use of roof windows as means of escape.

Concernshave been raised regarding the presence of heavy metals within some specific types of PV cells, and whether such metals can be or are released during a fire [e.g. ref. 15]. Therefore, while such

risks are considered to be low, caution is needed, as with any fire involving electronic elements, in dealing with fire damaged components and residues since a variety of heavy metals and other toxins may be present.

Many PV systems feed energy into the electricity grid at times when it is not required by the building. Reports are now indicating that, where such a feed in is occurring from a number of distributed sources, this can cause voltage fluctuations in the grid. Fluctuations are known to have the potential to cause fires in sensitive equipment, such as television sets [e.g. refs. 16, 17 and 18].

Fire-fighting issues

There is currently no national UK guidance specific to fighting fires involving PV systems. In most respects, fires involving photovoltaics are little different from any fire involving live electrics, however, PV systems do present some new risks to fire-fighters:

- Fire-fighters may not recognise a PV system and few know what to expect; there are a large number of different types of PV systems available and, in commercial buildings, these may be hidden on flat roofs. The new MCS installation guide [ref. 5] requires that a fire-fighter's label be affixed in a prominent place close to the electrical shut-off point.
- Fire-fighters are not used to dealing with DC in buildings, although they have considerable experience in dealing with vehicle electrics (which are DC). There are potentially very high DC voltages (up to 1000 volts DC in large installations) which are more dangerous than car electrics and normal (AC) electrical installations.
- Parts of the system are always live while light falls on the panels (artificial lighting may generate small currents). Unless micro-inverters, or remotely controlled safety devices are used at panel level, it is only possible to shut off the building's AC system, not the supply to the DC isolator.
    - It is reported that fire-fighters in the USA are using portable covers for the PV panels in order to shut off the light supply and so prevent the generation of electricity by the panels. Heavy, densely woven fabric and dark plastic films can be effective in reducing the power to near zero, but care must be taken to ensure no light can get through the cover [ref. 19].
- If the structure is metal, or steel frame, then an accidental short may result in parts of the building being "live".
- There is the risk of electric shock if cables are cut or become damaged by fire. This includes cables from battery banks where these are used to store generated electricity.
- Should the roof of the building be affected by fire, then the additional mechanical loading due to the weight of PV panels, or additional wind-loading caused by the panels, may cause early collapse of the roof.
- It is also possible that arrays which are stood off from the roof may cause a channelling effect, thus exacerbating a fire affecting the roof.
- There is the risk that panels, or glass from the panels, may break and fall onto personnel below.
- The panels can get hot (from the sun) with a (minor) risk of burns.

Noting that large building-mounted PV arrays may generate up to 1000 volts DC, a particular risk to fire-fighters, and identified overseas but without verified evidence, is the limited potential for electric shock from current being conducted down a fire-fighting water jet or if they cut through PV panels as part of their strategy to vent the fire.

It is the case that the presence of panels on a roof will limit the opportunities for venting smoke and fire, should it be required. Fire crews have also reported difficulties in fighting fires from aerial platforms with PV panels on the roof. During one particular incident, the PV panels remained in place on the roof when the rest of the roof underneath had collapsed and the panels deflected the water being applied from the aerial platform [ref. 20]. Since panels may be slippery, this will be a hazard for fire-fighters working on the roof of a building and may limit access to and the use of a roof. In general, panels should not be used as walkways, unless there is confirmation that they have been designed to take the mechanical load.

All MCS and best practice-compliant building-mounted PV installations with string or central inverters include at least one DC isolation switch, capable of breaking both positive and negative connections under full load, mounted close to the inverter. Often, where there is a long run of cable between the array and the inverter, a second isolator may be used. Where micro-inverters are fitted, there may be no DC isolation switches as the majority of the cabling is AC.

Inverters (and DC isolation switches) are often installed on the top floor of the building, or on/under the roof. This is not likely to be readily accessible to fire-fighters tackling a fire in the building. New products are becoming available which allow the DC switch to be operated remotely, for example from the main electrical unit at ground floor level. These are sometimes known as 'fire-fighter's switches'.

Sources of guidance

Current UK guidance for fire-fighters is included within general guidance on fighting building fires although, and while PVs are explicitly mentioned, there is currently no specific advice provided [ref. 21].

A guidance document by the British Photovoltaic Association [ref. 22] is available, but this document appears to be under development.

Two useful guidance documents have been produced in the USA [refs. 1 and 19]; the latter describes some experimental research primarily regarding fire-fighting concerns, including distances from PV systems when applying water; the former guide identifies a number of causes of fire similar to those described within this article.

The German Fire Service Association has produced guidance for fire-fighters [e.g. ref. 23] which provides advice on how to approach a building with PVs and guidance on how far away fire-fighters should stay from electrical installations when applying water onto a fire.

The German guidance regarding distances is not specific to PV installations but is for all electrical installations. It recommends distances of between 1 and 5 metres depending upon the type of water jet being used and likely voltages present. The guidance from the USA, however, specifically addresses distances from PV systems and recommends similar distances to those of the German guidance, i.e. between 1.5 and 6 metres, again dependent upon the type of jet used and likely voltages encountered.

Conclusions

At the present time there is no reason to believe that the fire risks associated with PVs are any greater than those associated with any other electrical equipment. But, as with all electrical equipment, it is important that these systems are correctly designed, consist of properly tested components, are competently installed and are regularly maintained.

For the fire and rescue services, there is a need to formulate appropriate and sound operational guidance. [See, for example, refs. 24, 25, 26, and 27]. In recognition of the need for the PV industry to work with UK fire and rescue services to develop better guidance, on 1st May 2013, MCS (administered by Gemserv on behalf of the Department of Energy and Climate Change (DECC)) organised a workshop with representatives of a number of fire and rescue services and private fire investigators which focussed on fire safety and solar photovoltaic (PV) installations [Ref. 28]. It is intended that the findings from this workshop will form a contribution to the next generation of guidance.

It is intended that this article will raise awareness of the emerging issues and, without causing undue concerns, put the risks into perspective by providing useful information to help avoid or minimise the likelihood of an incident, or in the event of an incident, the information presented here may contribute to the fast and effective management of the situation.

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BRE staff have carried out fire investigations in support of building regulations (and its precursors) on an ad hoc basis since 1948, and with a dedicated team since 1974. BRE has been wholly owned by the BRE Trust since its privatisation in 1997. BRE's fire investigation team is independent and provides world class fire investigation services to a wide range of clients, including insurers, legal firms, fire and rescue services, police and government departments.

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The Fire Hazard Through The Solar Panel System?

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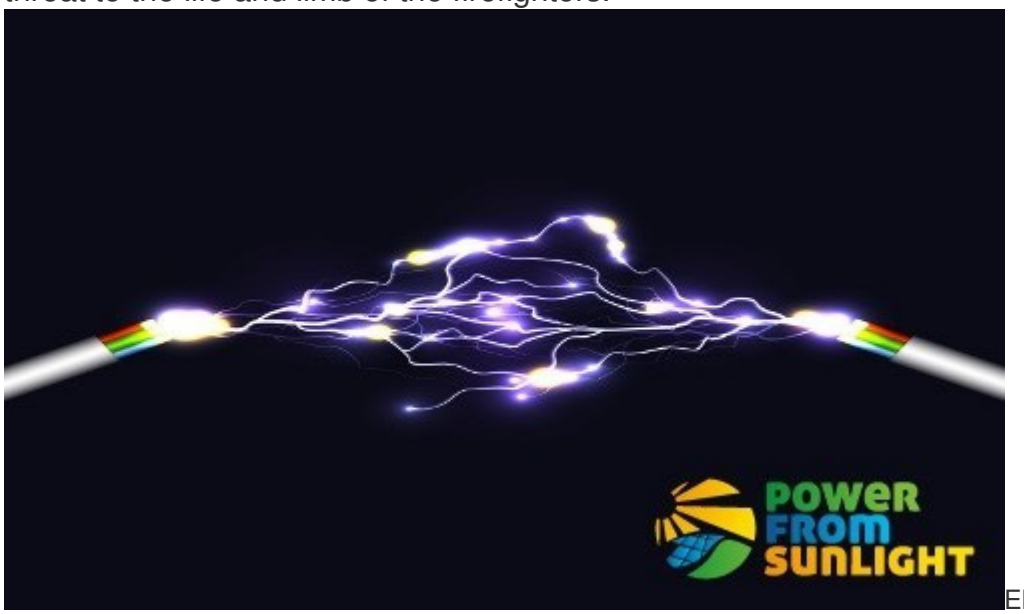
The Fire Hazard Through The Solar Panel System?

At this point, it can be said that a **standard-compliant** solar panel system does not increase the **Fire hazard** in a building. However, in some cases, the fire is not caused by the solar PV system.
In this case, it is not just a case of whether the **solar PV system** will be destroyed or not. The **decisive** question here is whether the firefighters can extinguish the fire in the house, on whose roof or façade a solar panel system has been installed.

1. In the event of fire: Dangerous electricity with an existing solar panel system

This danger is caused by **current-carrying** components of the solar PV system.
In most cases, a solar panel system cannot be switched off **completely**. Even if the AC-side is turned off with the help of an appropriate switch in the solar power inverter, this is not the case for the DC-side.
The voltage **remains** between the solar array and the disconnector. However, In the event of a direct current, a voltage of 120 Volts is **fatal** to humans.
An **additional** danger for the firefighters is when the connectors or plant components are incorrectly disconnected. This can cause **electric arcs**, which pose a significant threat to the life and limb of the firefighters.



Electric arch

After the firefighters extinguish a house fire, **water** can accumulate in certain rooms. If the firefighters enter the home, and current-carrying components of the solar PV system are present, then there is a significant danger of **electrical shock**.

Man holding bared wires and screaming of pain

Naturally, by the risks mentioned above **not only** the firefighters are in danger, but also other people, inhabitants, rescue teams, for example.

2. Other Fire Hazards

Among the dangers from electricity, there are **further points**, which make extinguishing the fire at least more complicated and costly.

Solar PV panels and cables contain materials, from which **toxic substances** can be released in the event of a fire.

This can come not only from the cable sheaths but also from other plastic materials that are used in the production of solar PV modules. These can **endanger** the people as well as the local environment.

A particularly great source of danger represents the so-called **chimney effect** in the solar panel systems. They are usually mounted with a distance of about 10 cm to the roof. In the case of fire, the **resulting draft** can fan the fire, making the fire spread rapidly.
Just as dangerous is a fire which has perhaps just started and
is **overlooked**because the roof is covered largely by the solar panel system!

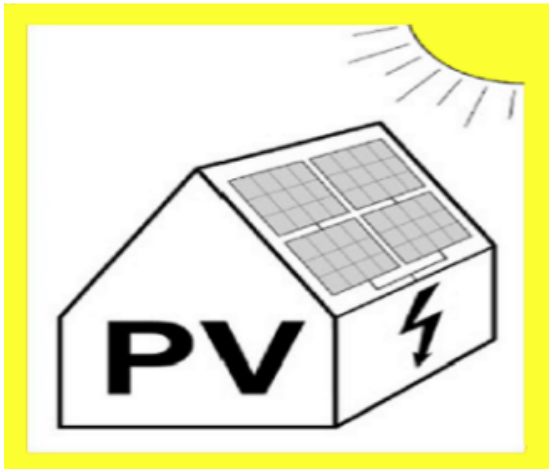
3. Important protective measures

Here are the most important protective measures, which are **recommended** by the fire department:

A) PV fireman's switch

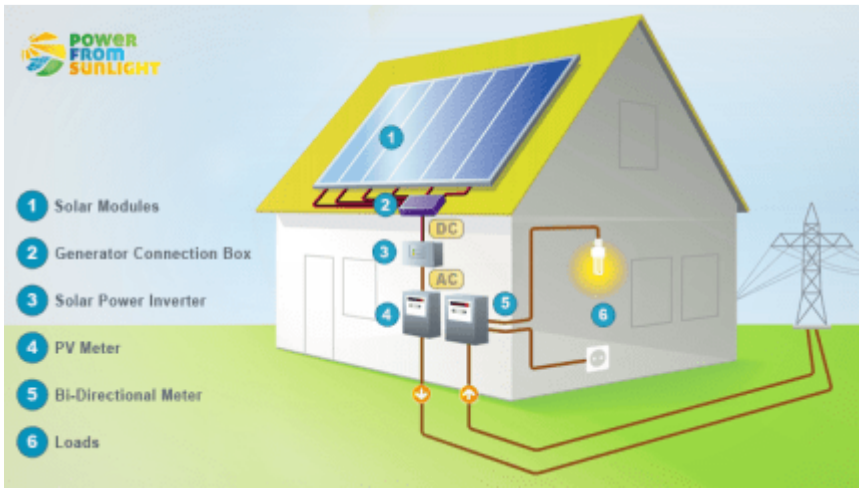
The **best** protective measure, which is recommended by the fire department, is the so-called PV fireman's switch. It offers the possibility to **disconnect** the solar PV system.

B) Indicating sticker for the solar PV system



It is **helpful** to place an indicating sticker at the house, which **calls attention** to the existing solar PV system.

C) General plan for the solar panel system



Because the fire brigade is unaware that a solar panel system has been mounted on the roof of a house, they recommend the plant operators to establish a **general plan** for the solar panel system, which should be readily available from outside. The general plan should contain **all information**, which enables the fire brigade an orientation and an adequate response.

D) Respiratory protection

A rescue worker wears a respirator in a smokey, toxic atmosphere. Image show the importance of protection readiness and safety.

The fire department also recommends, in the case of unknown fire protection class to wear **breathing masks**.

This allows protection from toxic substances, which can be released in the case of fire. Also, **switching off** the ventilation systems is a preventive measure. This ensures that the fire does not spread easily.