Tall Buildings

fire safety network

PRESENTATION

May 2023

DC DANGER ZONE

SOLAR PANELS CANNOT BE SWITCHED OFF

PVSTOP


6:05
29°
2
@CBSNewYork
0:49 / 4:24

PVSTOP

MARKET OVERVIEW

1.2 million PV installations *in the UK*

Incidents involving solar panels have grown by ***>500% in the past 3 years***

**FRNSW Data*

First Responders have two options:

1. ***Risk their lives***

2. ***Let properties burn***

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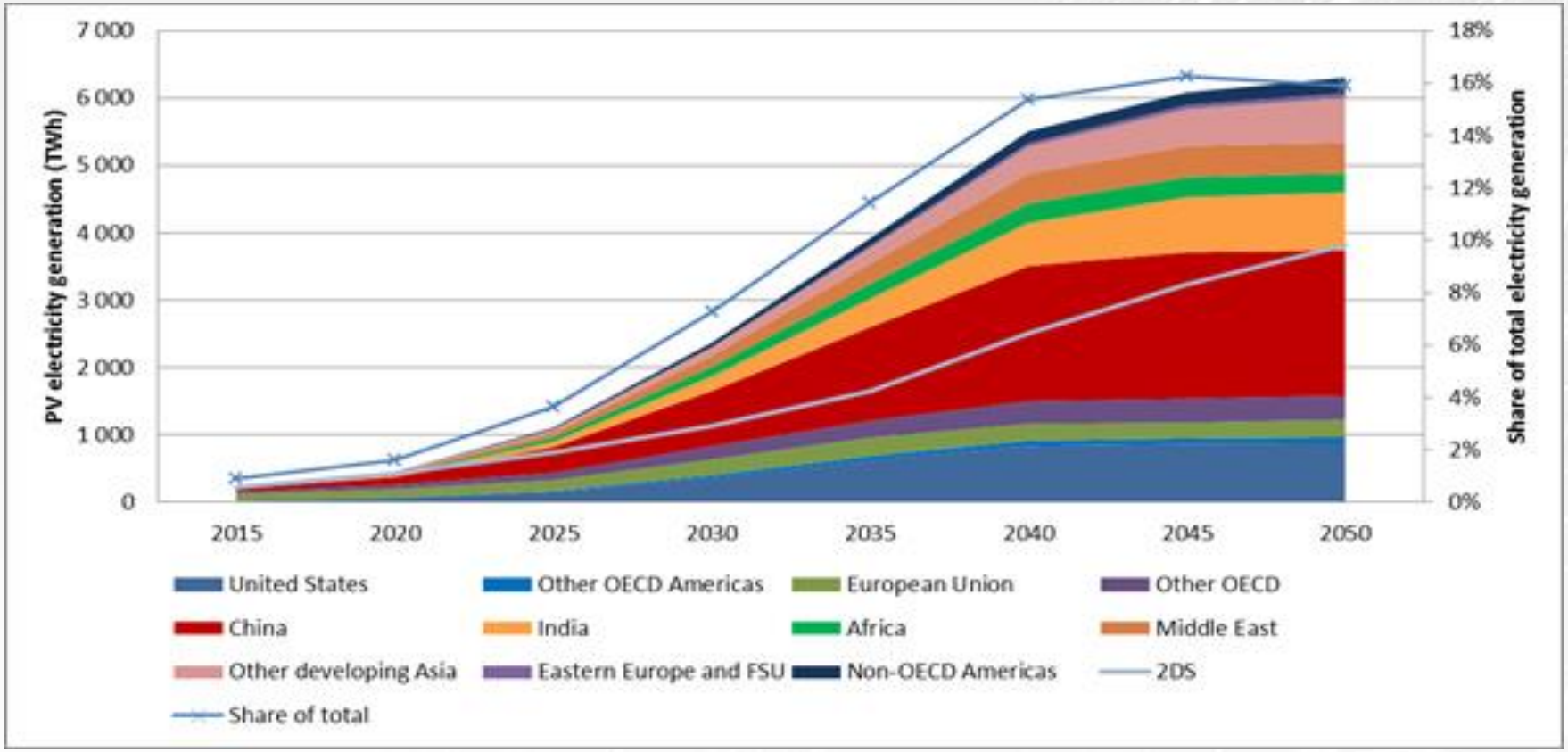
GROWING GLOBAL MARKET



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TODAYS OBJECTIVES

- Understand the nature of solar PV systems. How do they work?
- What goes wrong with them?
- Investigate the risks associated with the *"DC Danger Zone"*.
- Product benefits + Data + Statistics +Recommendations
- How does this impact your SOP's?

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ELECTRICITY

WATTS = VOLTS x AMPS

A GPO (power outlet) puts out
230 volts @ 10 amps = 2300 watts
or 2.3kw.

Watts = the unit of power.

Remove either volts or amps and
you have no electricity.
230 volts x 0 amps = 0 watts.

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UNDERSTANDING THE PROBLEM

AC ELECTRICITY	AC (Alternating Current) flows or vibrates backwards and forward at what is called a frequency.	The frequency (or hertz) is 50 cycles per second.	Can be remotely detected, easily switched off and it is easier to disconnect (if electrocuted).	A GPO (power outlet) puts out 2.3kW of electricity.
DC ELECTRICITY	DC (Direct Current) flows in one direction only (from source to load).	DC has no frequency.	Cannot be remotely detected, arcs when switched and involuntary “lock-on” (if electrocuted).	A average domestic solar PV system put out 4-6kW of electricity.

SOLAR PANELS CANNOT BESWITCHED OFF AS LONG AS THEY ARE EXPOSED TO LIGHT

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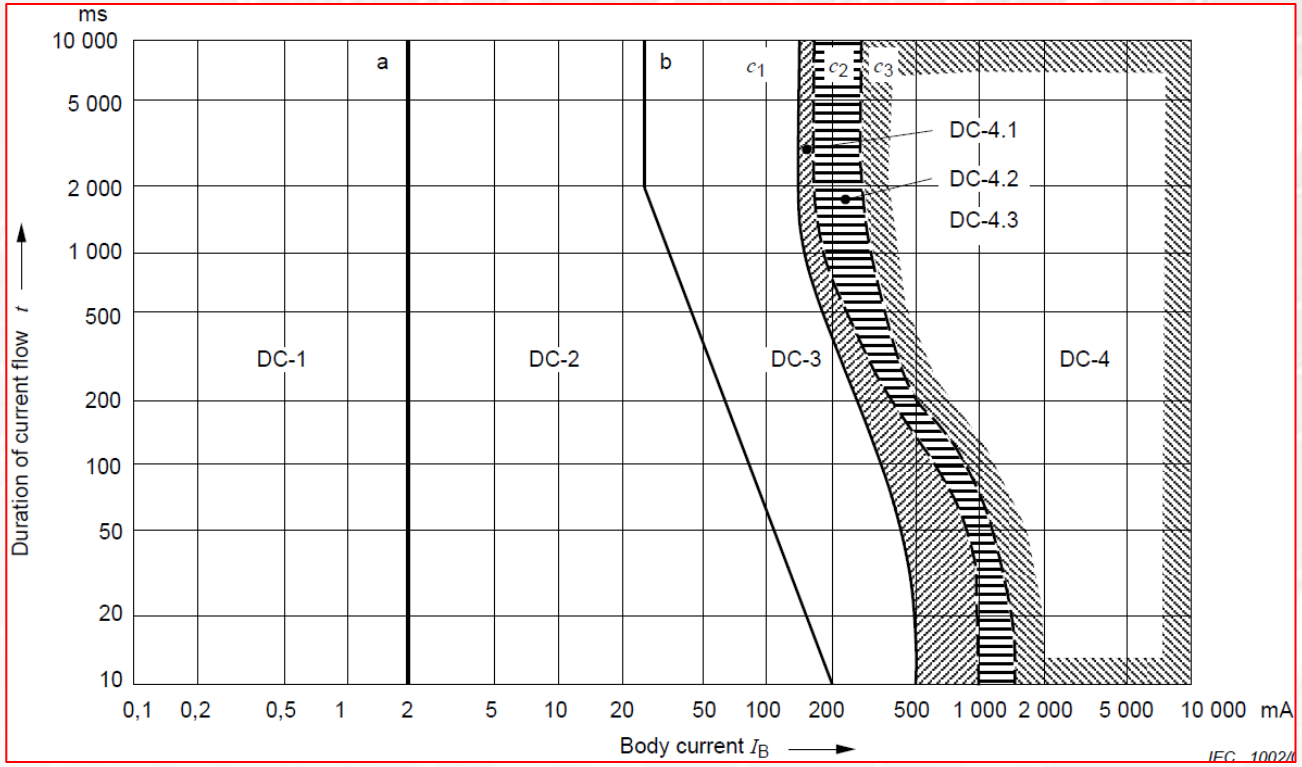
AS/NZ STANDARD – EFFECTS OF DC

6.5 Description of time/current zones (see Figure 22)

Table 13 – Time/current zones for d.c. for hand to feet pathway – Summary of zones of Figure 22

Zones	Boundaries	Physiological effects
DC-1	Up to 2 mA	Slight pricking sensation possible when making, breaking or rapidly altering current flow
DC-2	200mA	Involuntary muscular contractions likely especially when making, breaking or rapidly altering current flow but usually no harmful electrical physiological effects
DC-3	200MA 500MA	Strong involuntary muscular reactions and reversible disturbances of formation and conduction of impulses in the heart may occur, increasing with current magnitude and time. Usually no organic damage to be expected
DC-4 [1]	Above curve c_1 Above 500 MA	Patho-physiological effects may occur such as cardiac arrest, breathing arrest, and burns or other cellular damage. Probability of ventricular fibrillation increasing with current magnitude and time
	c_1-c_2	DC-4.1 Probability of ventricular fibrillation increasing up to about 5 %
	c_2-c_3	DC-4.2 Probability of ventricular fibrillation up to about 50 %
	Beyond curve c_3	DC-4.3 Probability of ventricular fibrillation above 50 %

[1] For durations of current flow below 200 ms, ventricular fibrillation is only initiated within the vulnerable period if the relevant thresholds are surpassed. As regards ventricular fibrillation this figure relates to the effects of current which flows in the path left hand to feet and for upward current. For other current paths the heart current factor has to be considered.



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- **PV = Photo Voltaic *(Light Electricity).***
- Each solar cell produces = 0.6 volts.
- Size of the solar cell dictates amps.
- Solar cells connected in series = solar panel (1w – 600w+).
- Solar panels connected in series = a string.
- A solar system can consist of multiple strings connected in parallel.

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3 TYPES OF SOLAR (PV) SYSTEMS

GRID INTERACTIVE

Most commonly seen on domestic homes, factories, commercial buildings and most solar farms.

OFF-GRID

Traditionally located in remote areas where grid power is not available or expensive.

HYBRID

Also called grid connected battery back up. The latest technology that is driving the battery storage revolution.

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GRID INTERACTIVE SYSTEM

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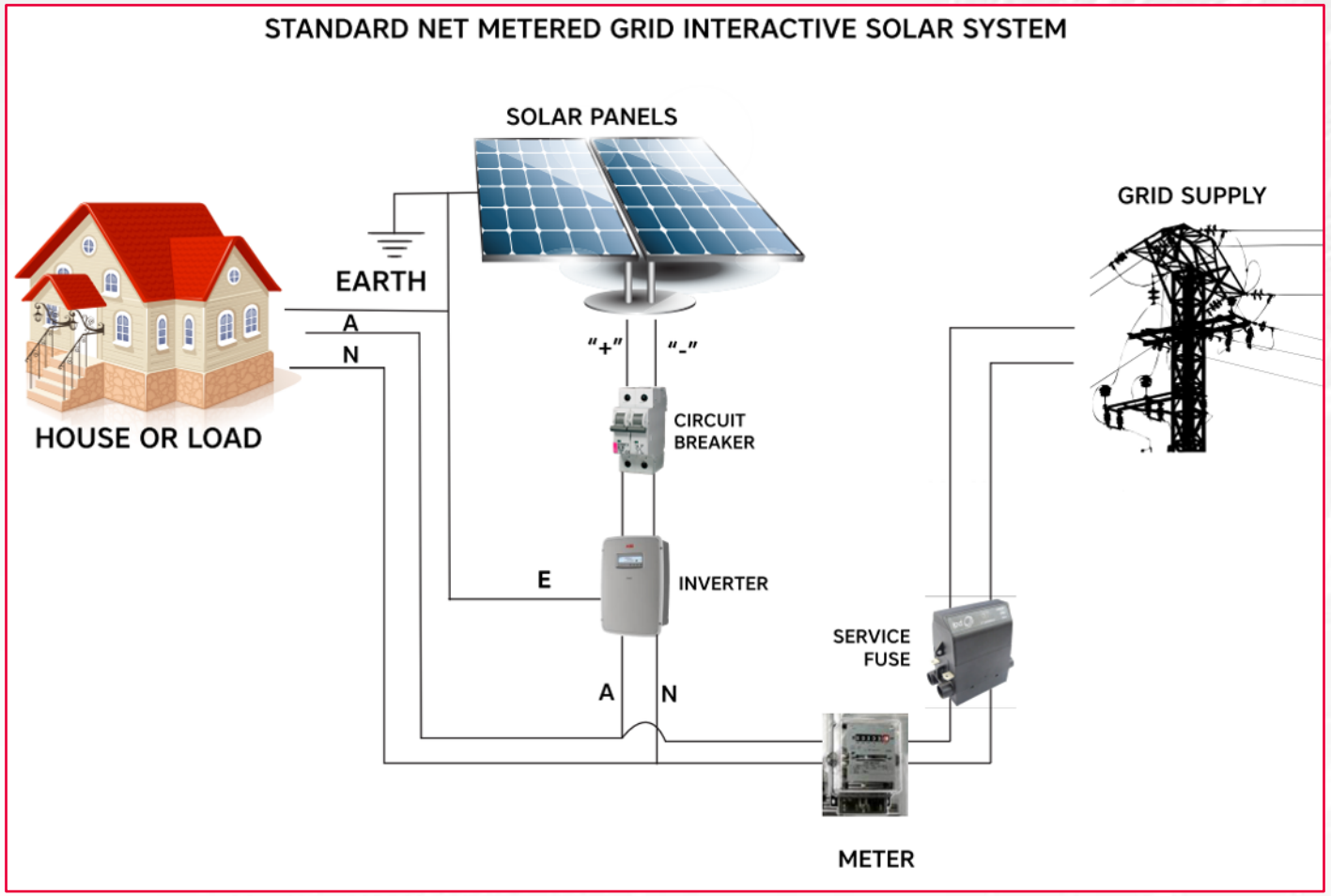
GRID INTERACTIVE SCHEMATIC



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REASONS FOR SYSTEM FAILURE

- Physical Damage
- Vermin Damage
- Weather events such as lightning, hail & water ingression
- **Poor workmanship - installation**
- **Component failure - degradation**

A solar panel will still produce power (at a reduced rate) even if the panel is damaged

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BURNT ISOLATION SWITCH

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WATER INGRESSION & FLOODING

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HAIL DAMAGE

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EXPOSED WIRING & RE-IGNITION

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RECENT INCIDENTS

Commercial Warehouse, East Farmingdale Long Island

Apple Data Centre, Mesa Arizona

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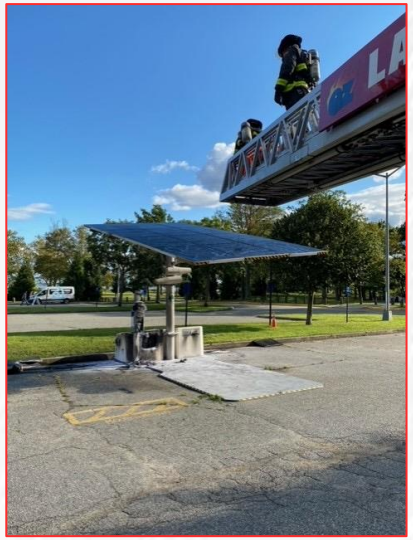
RECENT INCIDENTS

IKEA, Conshohocken, Philadelphia

Walmart, Beaver Creek, Colorado

PVSTOP

RECENT INCIDENTS



FDNY - Staten Island, Off-Grid EV Charging Station

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THE DC DANGER ZONE

- Wiring from the solar panel to the inverter.
- Potential for fire, electric shock and fall from height.
- No safe reliable means of isolation (unlike typical electricity).
- Standard emergency response procedure is to cover with tarps or treat defensively (don’t engage).

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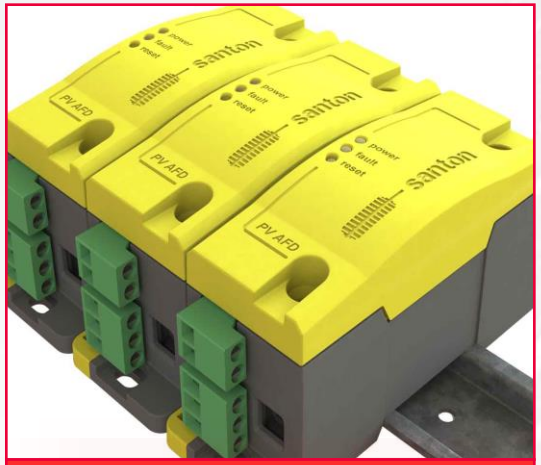
EXISTING PV SAFETY TECHNOLOGIES

Isolation Switches



Anti-Arcing Equipment

Rapid Shutdown (Micro-inverters) & DC Optimisers

NONE SOLVE THE CURRENT PROBLEM!

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So how do you turn off solar panels?

Light is the source of the power.

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THE SOLUTION

- State-of-the-art polymer film technology.
- It is sprayed on like a “liquid tarp”
- Non flammable & fire retardant
- Non-conductive & anti-arcing

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THE SOLUTION

- Encases toxic nanoparticles
- Peels off / no damage
- Environmentally friendly

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www.pvstop.com.au

SOLUTION DELIVERY

PORTABLE PRESSURE VESSEL & BULK

Hand-held extinguisher supplied as filled canisters or bulk product for self-fill

DRONE APPLICATION

For application on high-rise hard-to-reach, or large scale locations

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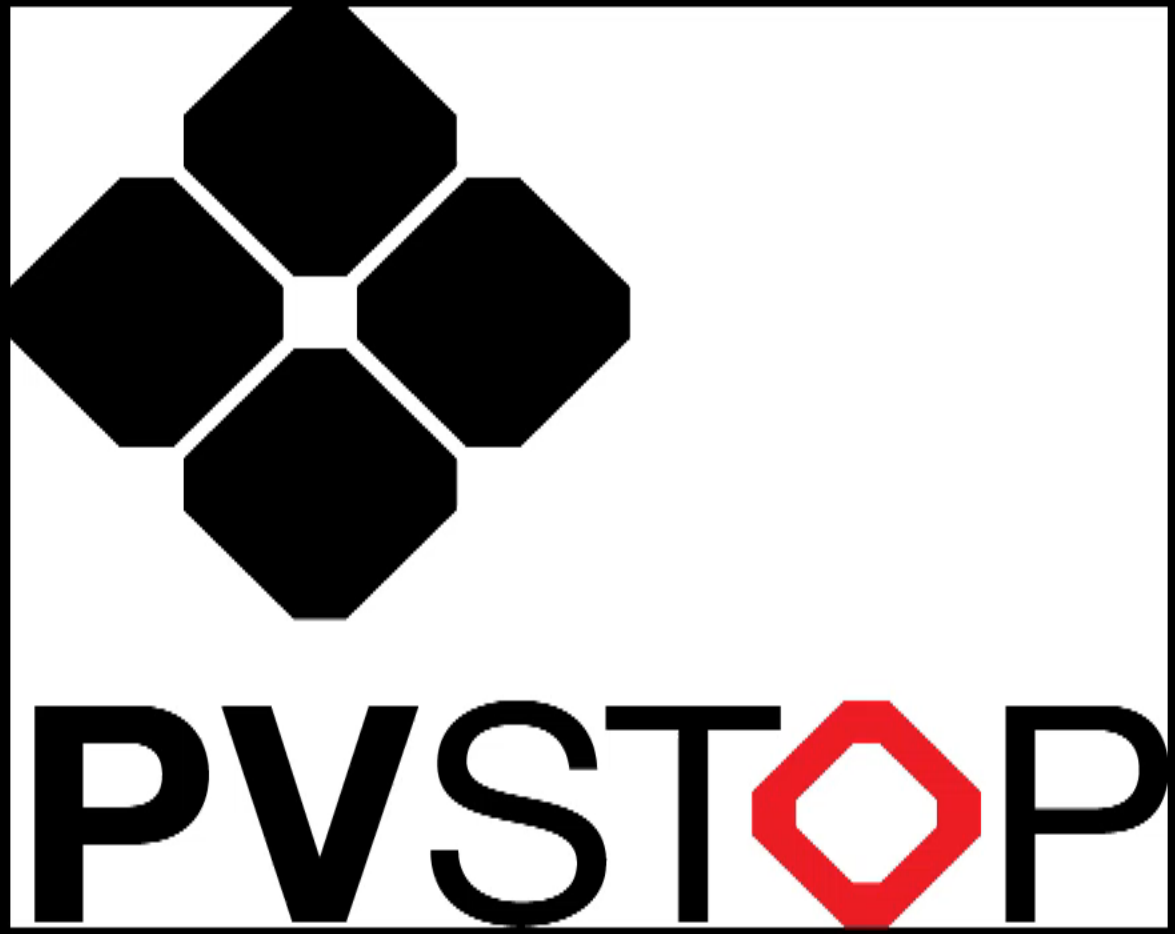

Drone
Testing
August 13

TESTING & COMPLIANCE

BRE Global Verified
ETV
Environmental Technology Verification
pilot programme version 1.2
Ref No. VN20170024

- *ETV Statement of Verification Issued and published 2017. Upgraded to **ISO 14034:2016** in 2019*
- *TUV Laboratory testing completed, reconfirming the results achieved by BRE Global*
- *Fire Propagation Test (BS476-6)*
  Surface Spread of Flame Test (BS476-7)
  (Both test completed by BRE Global)
- *BRE Global issue a Class 0 Rating.*
  The Highest product performance classification for lining materials.
- *Smoke & Toxicity Tests (EN 45545-2 2013)*
  Test result 9 x lower than required "pass" result.
  Safe to utilize on underground trains.
- *PFAS/PFOS/PFOA testing completed by Envirolabs Australia.*
- *Environmental testing completed by EPA NSW*

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DATA & STATISTICS

- *Firefighter injuries directly related to solar panels recorded in Switzerland, the UK and the US.*
- *Research conducted by BRE Global in the UK shows that here have been 9 injuries recorded across 58 logged incidents involving solar panels.*
- *2 Firefighters were injured by solar panels in San Francisco in December 2015 (news report available).*
- *The first fatality directly attributed to solar panels occurred in Dubai in July 2018.*

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LATEST NEWS – UK

- The London Fire Brigade (LFB) were the first Top 5 Global Fire Brigade to roll-out PVSTOP.
- 21 of 40 UK Fire Brigades now using PVSTOP.
- LFB recently added PVSTOP to the organisation's automatic replenishment system which will see recurring orders increase across the entire organisation.
- Learnings from PVSTOP operational case studies have been accepted by the UK Fire Brigade National Operational Learning Group (NOL) and will be intergrated into the National Operational Guidance (NOG) Program.

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LATEST NEWS – SINGAPORE

- Singapore Civil Defence Force (SCDF) are the most influential Fire & Emergency Services agency in Asia. PVSTOP is now standard equipment on all Fire Trucks in Singapore.
- PVSTOP has been tested & evaluated by PUB – Singapore's National Water Agency and approved for use on the 60KW Tengeh Drinking water reservoir.
- SCDF have facilitated amendments to the Singapore National Fire Code to mandate "an isolating coating medium" for all PV installations in Singapore.
- The Fire Code amendments will be implemented in late 2023.

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LATEST NEWS – US

- The New York Fire Department (FDNY) have adopted PVSTOP as standard equipment on all HAZMAT appliances.
- The first operational use by FDNY was at a new incident type, an off-grid electric vehicle charging station fire on Staton Island, New York.
- PVSTOP are now taking orders from hundreds of Fire Departments across the US.
- PVSTOP have been invited by FDNY to be the key solar safety partner at the inaugural Alternative Energy Safety Symposium at the Javits Centre NY in 2024 (14,000 attendees).

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ASK YOURSELF

Do properties have the right resources and a safe system of work?

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UTRECHT INCIDENT NETHERLANDS –

PRE-EMPTIVE APPLICATION

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LONDON FIRE BRIGADE—

PVSTOP DEPLOYED TO SAVE SCHOOL

PVSTOP

LONDON FIRE BRIGADE –
PVSTOP DEPLOYED TO TERRACED HOUSE

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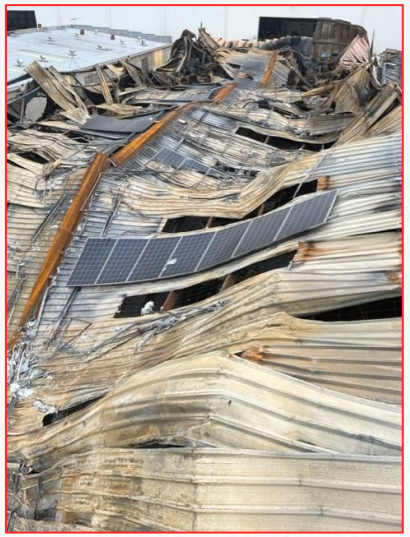
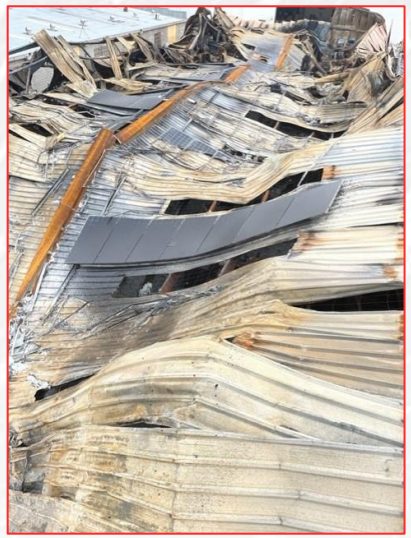
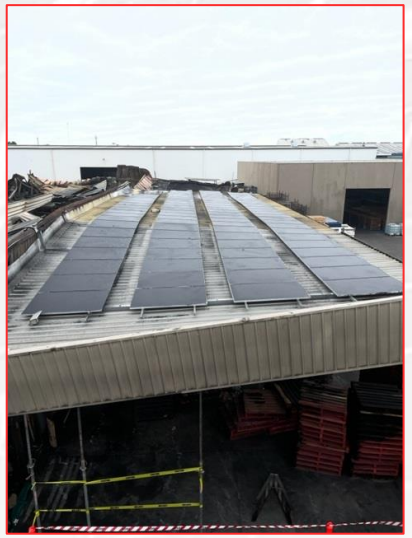
ORIGIN ENERGY AUSTRALIA –
POST INCIDENT APPLICATION

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STANDARD OPERATING PROCEDURES
WHEN TO DEPLOY PVSTOP?

- Pre-emptive application
- During incident operations.
- Post incident application
- PV system owner responsibilities? - Commercial, Industrial and Utility scale PV system owners.

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