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ELECTRICAL SAFETY FIRST

KARTER KANE
AND
GIUSEPPE CAPPANA

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STAYING SAFE IN THE FUTURE

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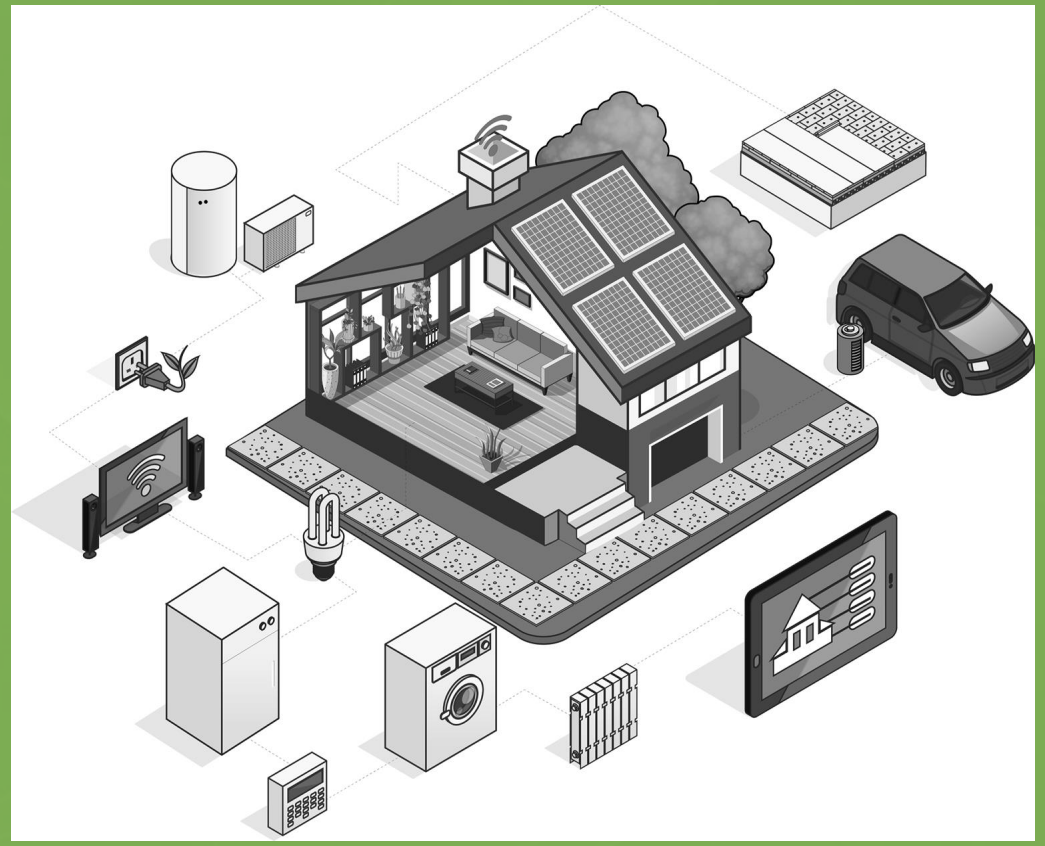


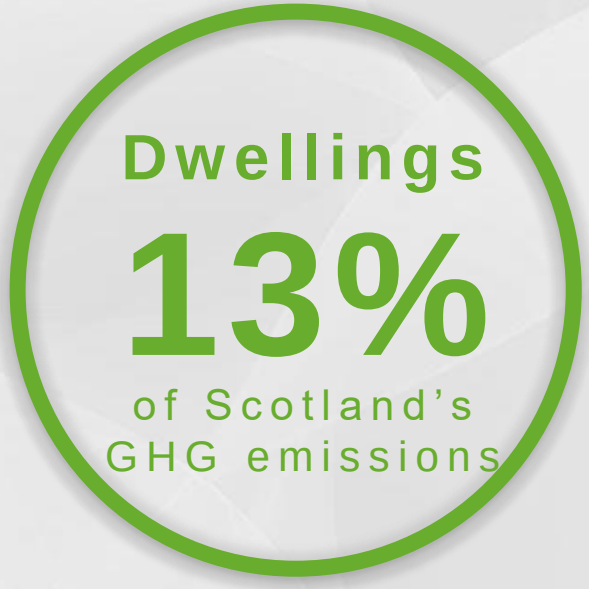
WHY DOES THIS MATTER?

- CLIMATE TARGETS
- POLICY BACKGROUND
- HOUSING INFRASTRUCTURE

BACKGROUND

SCOTLAND'S CARBON EMISSIONS

- Homes and vehicles are responsible for a large proportion of Scotland's GHG emissions
- These areas have been targeted by the Scottish Government for the move to net zero



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BACKGROUND

2045

SCOTLAND'S TARGET FOR NET ZERO CARBON EMISSIONS

2030

SCOTLAND'S TARGET TO PHASE OUT PETROL AND DIESEL CARS

SCOTTISH GOVERNMENT PLANS AND STRATEGIES

THE DRAFT HEAT IN BUILDINGS STRATEGY

- Sets out strategy to decarbonise homes and ensure energy efficiency
- Emissions for homes and non-domestic buildings combined will have to fall by 68% by 2030 as compared to 2020

THE CIRCULAR ECONOMY BILL

- Currently being consulted on by the Scottish Government
- Includes measures to reduce the consumption of problematic single-use items and promote reuse of products

BACKGROUND

SCOTLAND'S HOUSING INFRASTRUCTURE

- An older housing stock provides barriers to the deployment of low carbon heating
- Older properties are more difficult to retrofit and insulate
- They are also more likely to have poor electrical wiring
- Owner-occupied properties have no requirement to have electrical safety checks

30%
Of dwellings in Scotland built before 1944

62%
Of dwellings in Scotland are owner-occupied

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BACKGROUND

ELECTRICAL SAFETY CONTEXT

- Many of the new technologies we will rely on to decarbonise homes will rely on electricity
- Most accidental house fires in Scotland are caused by electricity
- It is vital that as we make this move, consumers are aware of the safety risks and policy makers keep electrical safety at the forefront of decision making

72%

OF ACCIDENTAL DWELLING FIRES CAUSED BY ELECTRICITY

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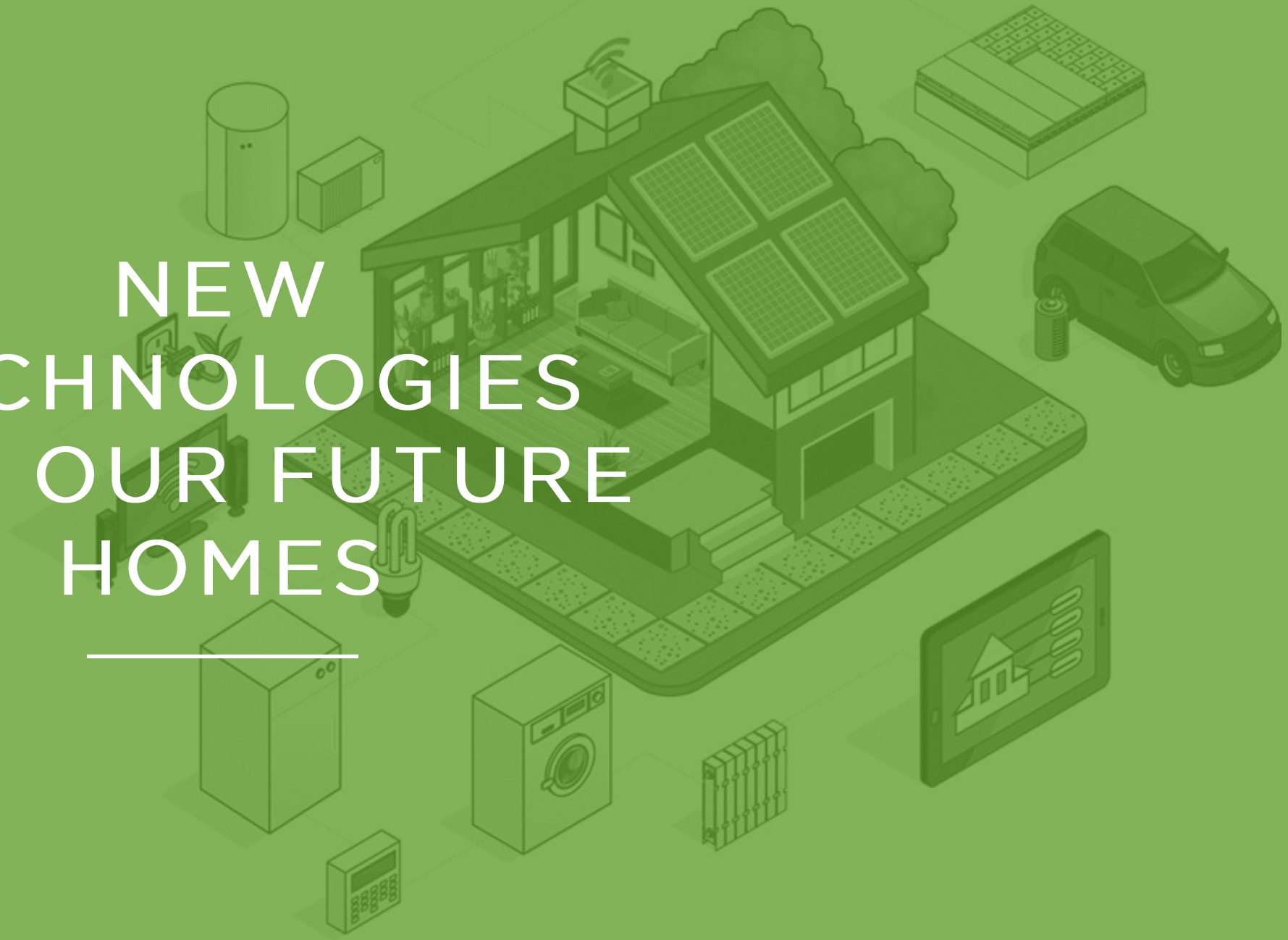
NEW TECHNOLOGIES FOR OUR FUTURE HOMES



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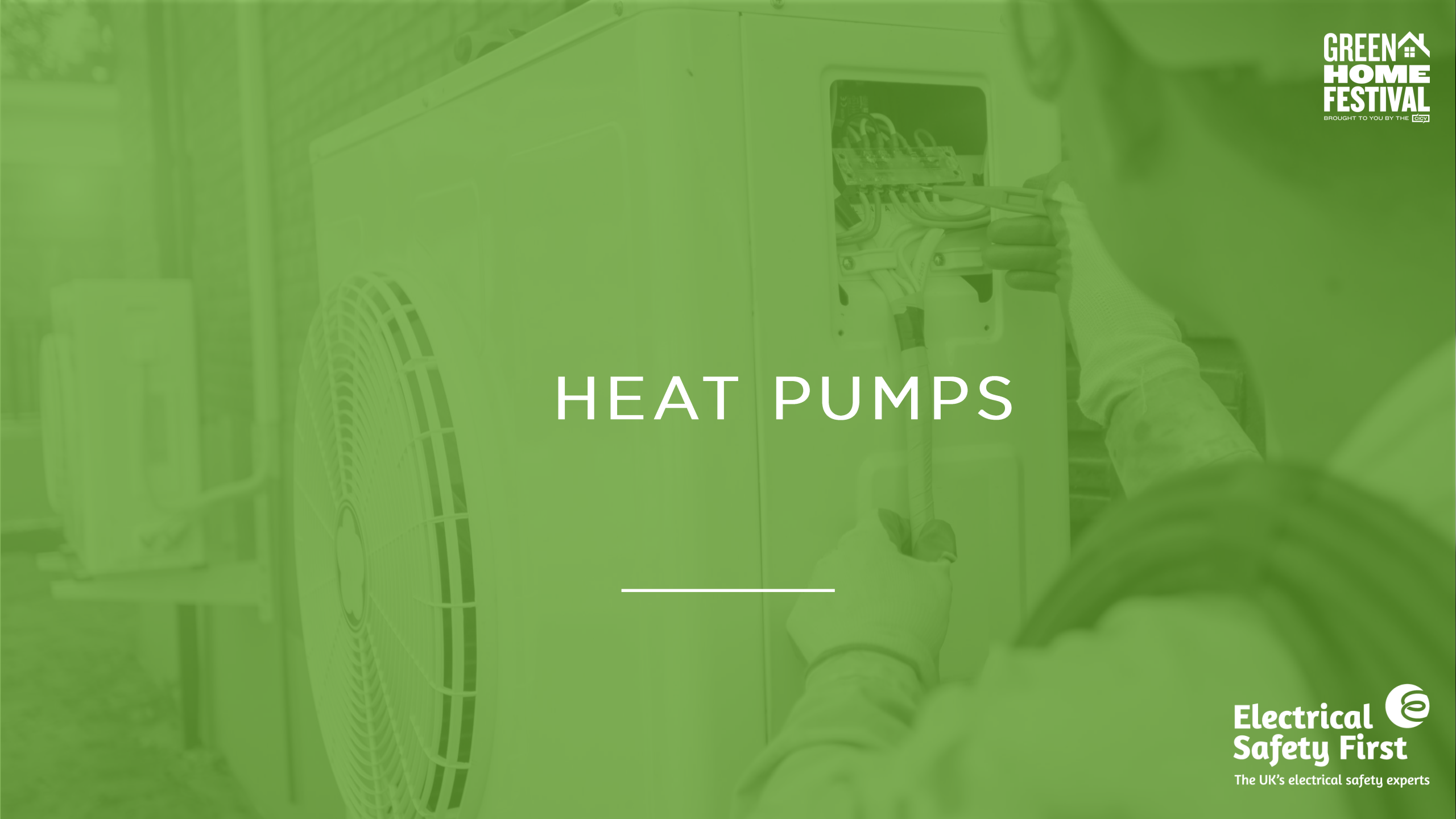

HEAT PUMPS

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TARGETS

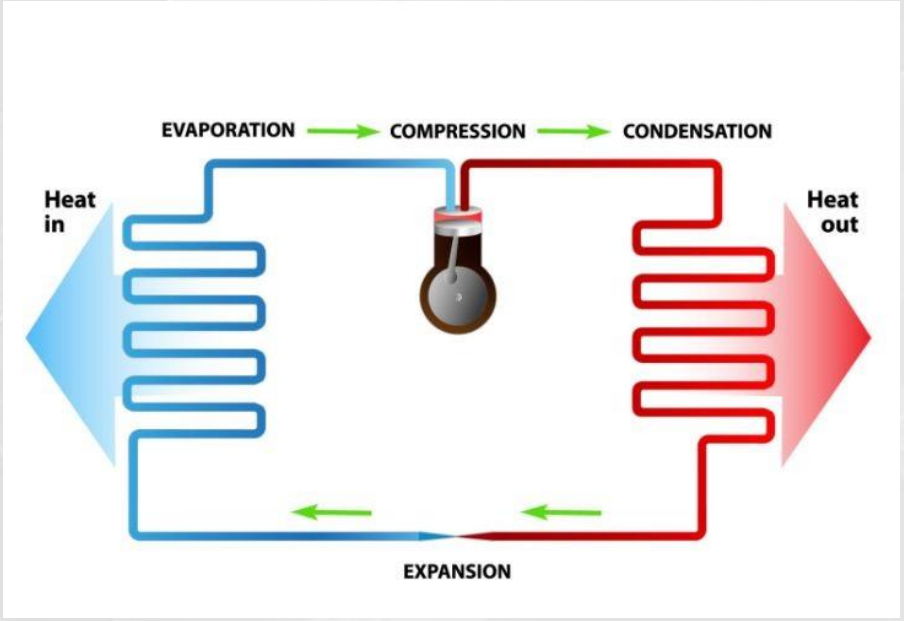
- In the Draft Heat and Building Strategy ambitious targets are set for installing zero emissions heating

- Aim for 1 million homes currently using mains gas to be converted by 2030 to stay on target

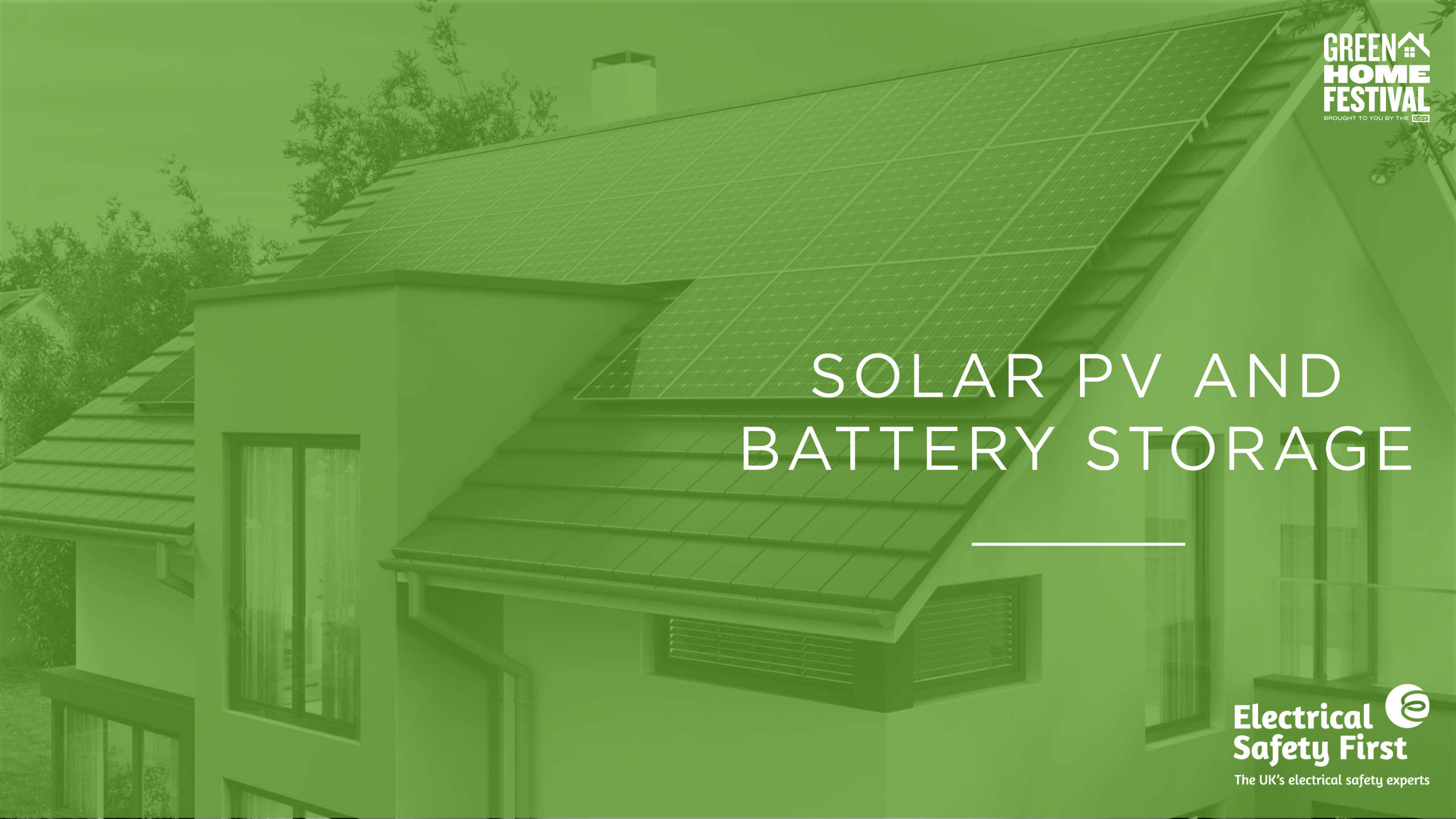
HEAT PUMPS

HOW HEAT PUMPS WORK

- It works in a similar manner to a fridge but in reverse
- Some types can cool as well as heat
- Requires a more efficient building to work effectively
- Combination of different technologies



- Additional load on the electricity supply
- 3 Main Types;
  (i) Water Source,
  (ii) Ground Source and
  (iii) Air Source
- Maintenance and periodic inspection essential



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SOLAR PV AND BATTERY STORAGE

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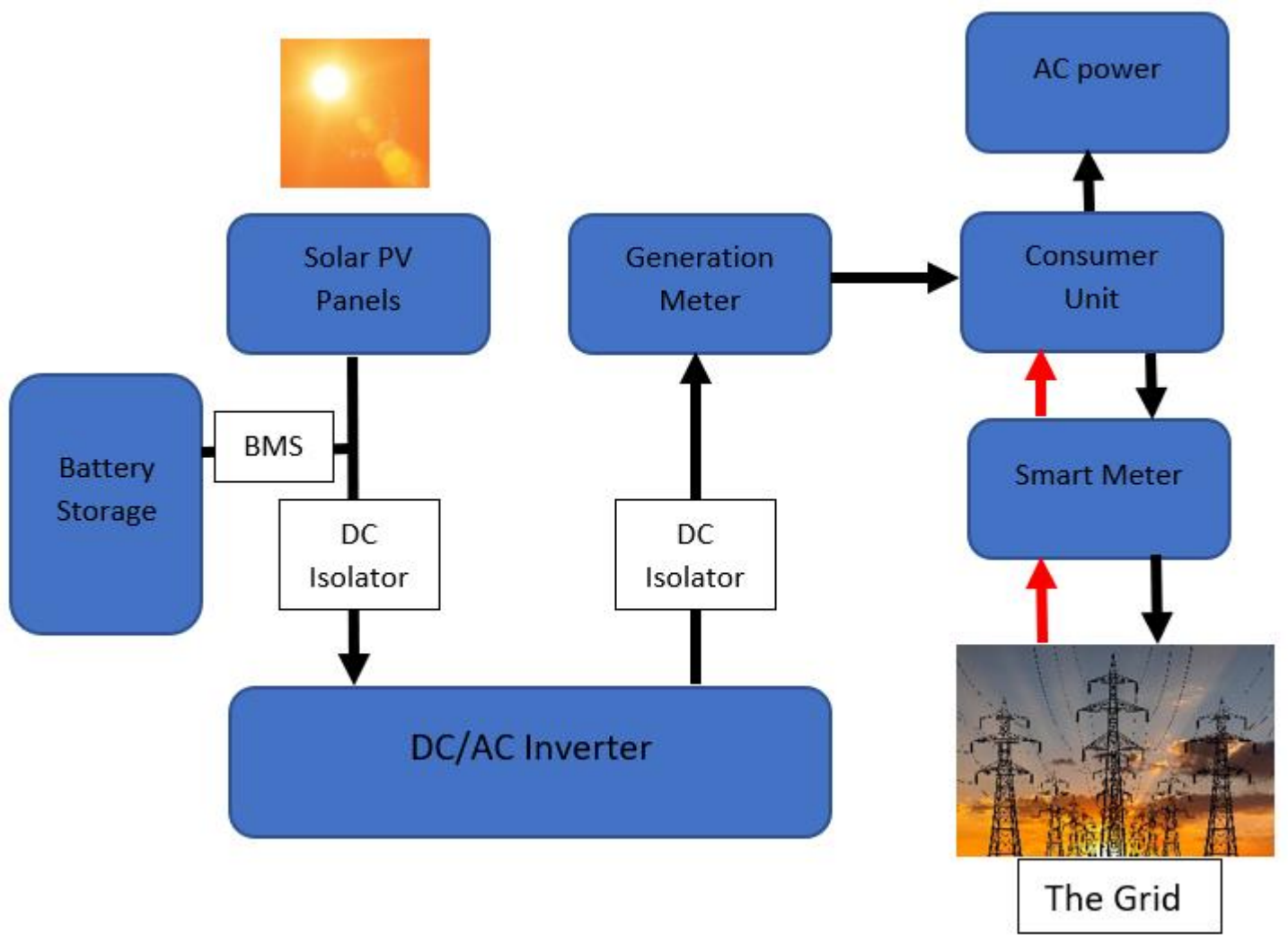
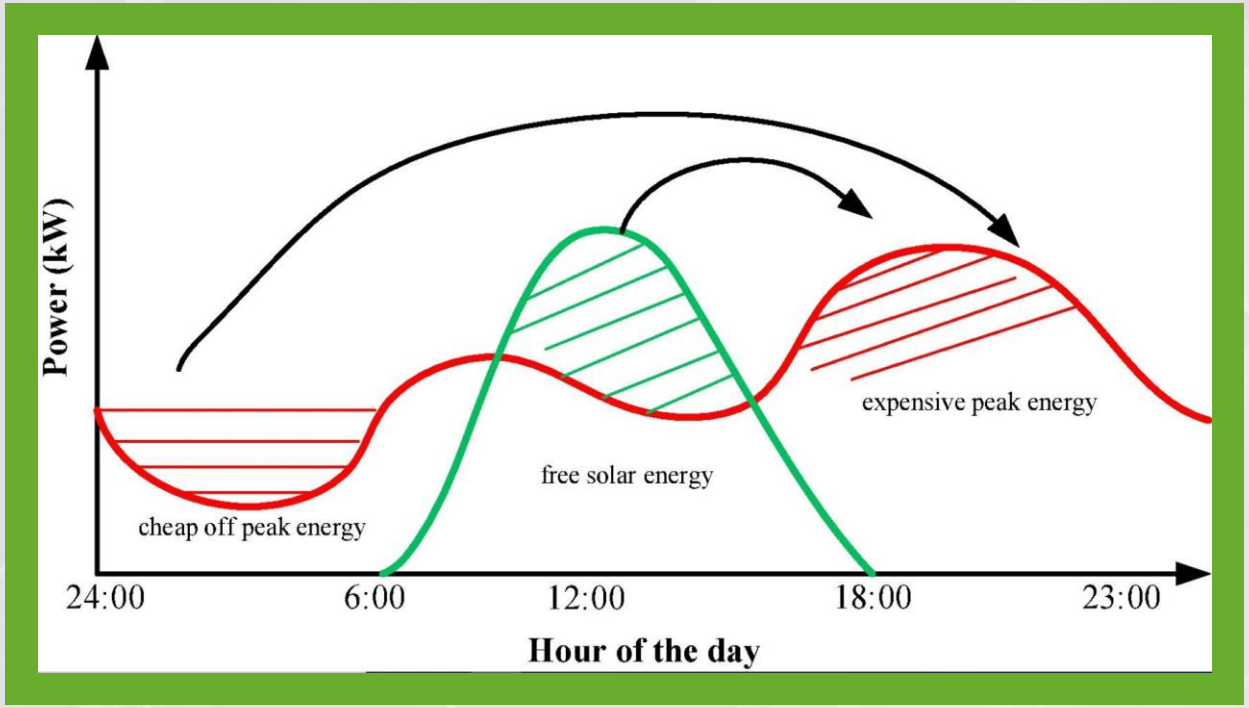
HOW SOLAR PV WORKS



USES AND CONCERNS

- On-site low carbon electricity generation
- Can be used by the household or exported to the grid
- Solar PV, battery storage and smart controls will be valuable in offsetting the additional electricity demand that will arise from increasing electrification and will be an important part of the route towards net zero
- Solar panel systems cannot be switched off
- Poor installation practices were found to be one of the key causes of fire, indicating the importance of installer competence
- Electrical faults can turn into significant hazards if left unidentified

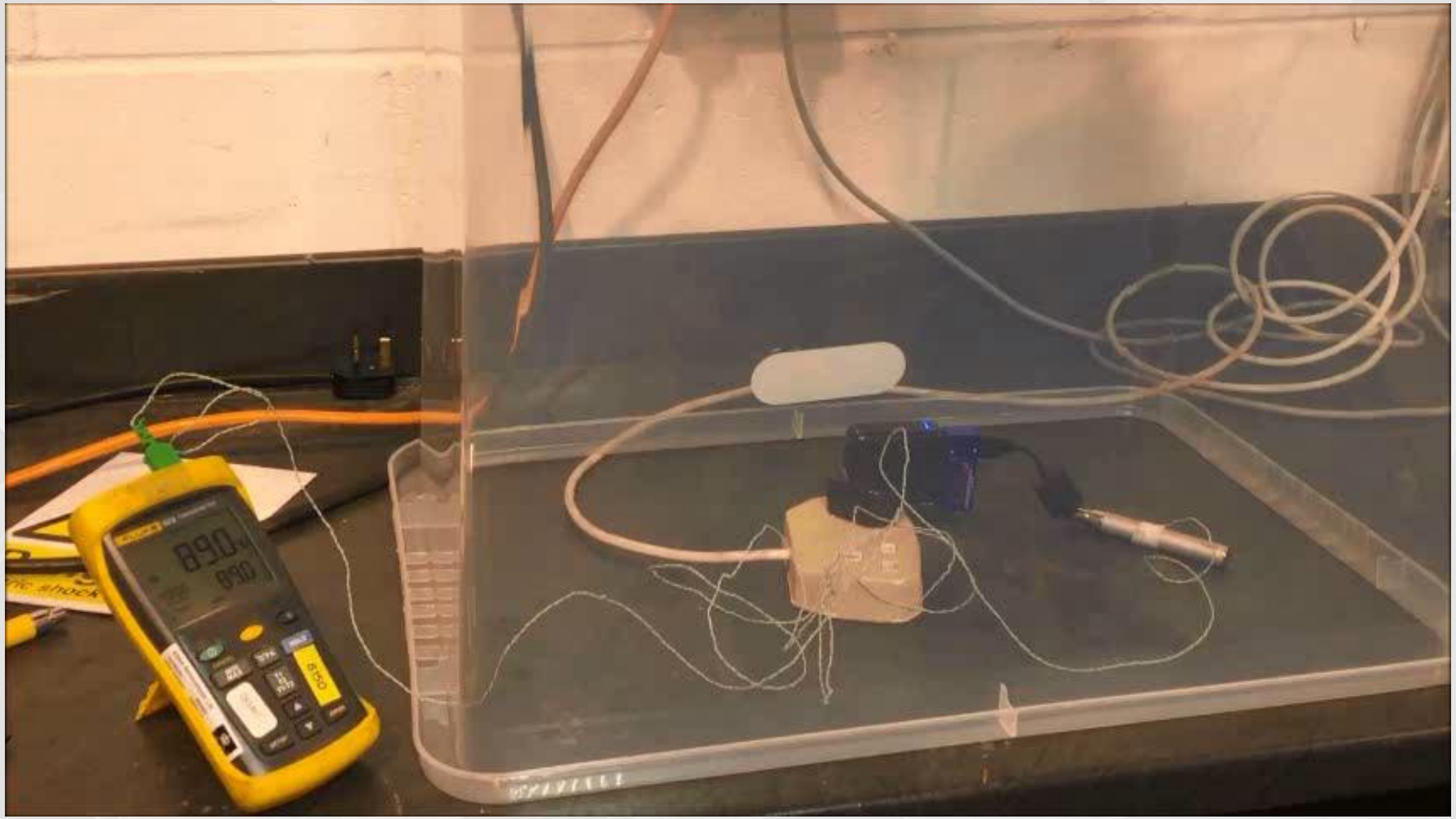
BATTERY STORAGE



- Battery storage will play a critical role in storing surplus generation when it is not required, and releasing it when generation is insufficient to match demand
- Enormous amount of energy stored in a compact area
- Cannot be switched off and difficult to extinguish fires if things go wrong
- Importance of Inspections, maintenance and early warning systems

AbubakarSani, HassanLiana, CipciganNickJenkins, Institute of Energy, Cardiff University, Cardiff, United Kingdom

LITHIUM BATTERIES (A SMALL ONE)



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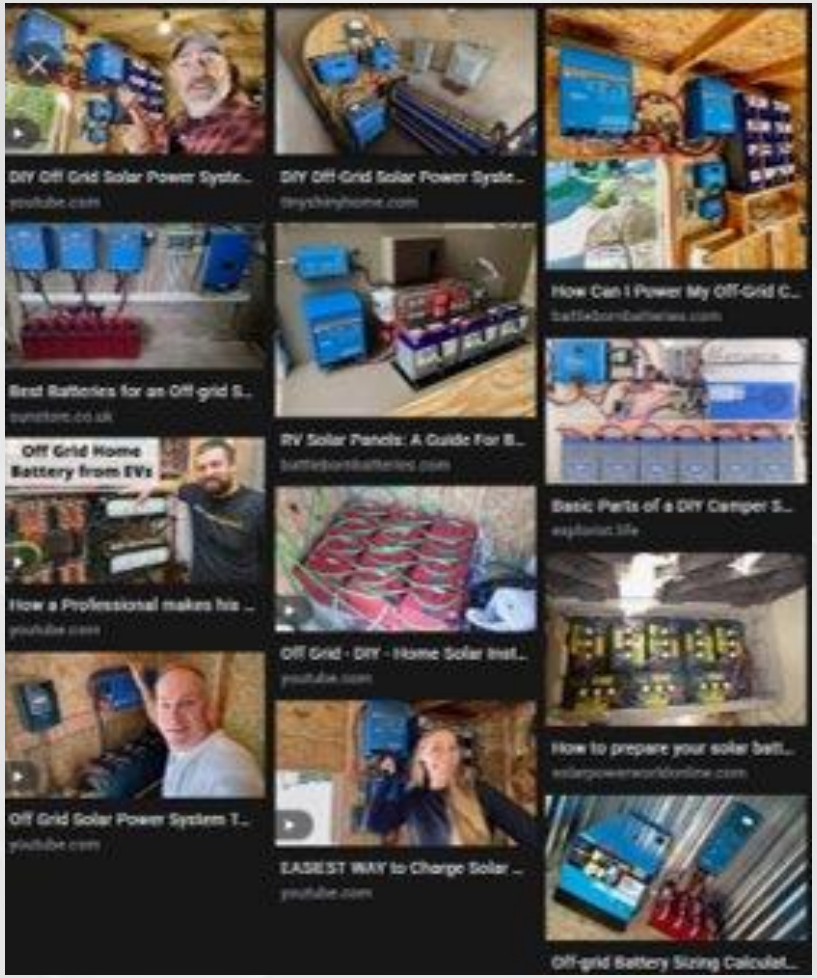
DIY PRACTICES (SLIGHTLY LARGER BATTERIES)

- Don’t Do it Yourself
- How to burn your House Down in 5 Easy Steps
- Use A Registered Electrician
- Ensure it’s inspected at regular intervals
- Ensure it is suitably enclosed (preferably outside)
- Install appropriate early warning systems



CAUSES OF ELECTRICAL INCIDENTS

Common causes of shocks and fires:

- Faults
- Misuse
- Deterioration over time
- Inadequate maintenance
- Items placed too close to heat sources
- Damage – accidental or deliberate

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PURPOSE OF THE INSPECTION AND TEST

- The inspection and test will find out if:
  - the electrical installation is overloaded
  - there are any potential electric shock and fire risks
  - there is any defective electrical work
  - there is a lack of earthing and/or bonding

BUILDING FABRIC EFFICIENCY MEASURES

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TARGETS AND SAFETY CONCERNS

- The Draft Heat in Building Strategy set out aims for all homes to reach a higher energy rating
- The aim is for as many homes as possible to be EPC Band C by 2030, 55% currently do not meet this standard
- A significant retrofit is needed to bring homes up to standard
- Fabric efficiency measures can interact with electrical wiring and appliances leading to unintended consequences
- Contact between fabric efficiency measures and electrical cables can be unavoidable, but should be minimised
- Risk that consumers could seek to install energy efficiency measures themselves, without consideration for electrical safety implications e.g. loft insulation

Building Fabric Efficiency Measures

Important step in the route towards net zero

However, applying insulation can present an electrical safety risk

Important that installations are undertaken by specialised and certified Installers

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Effects of thermal insulation on electrical connections

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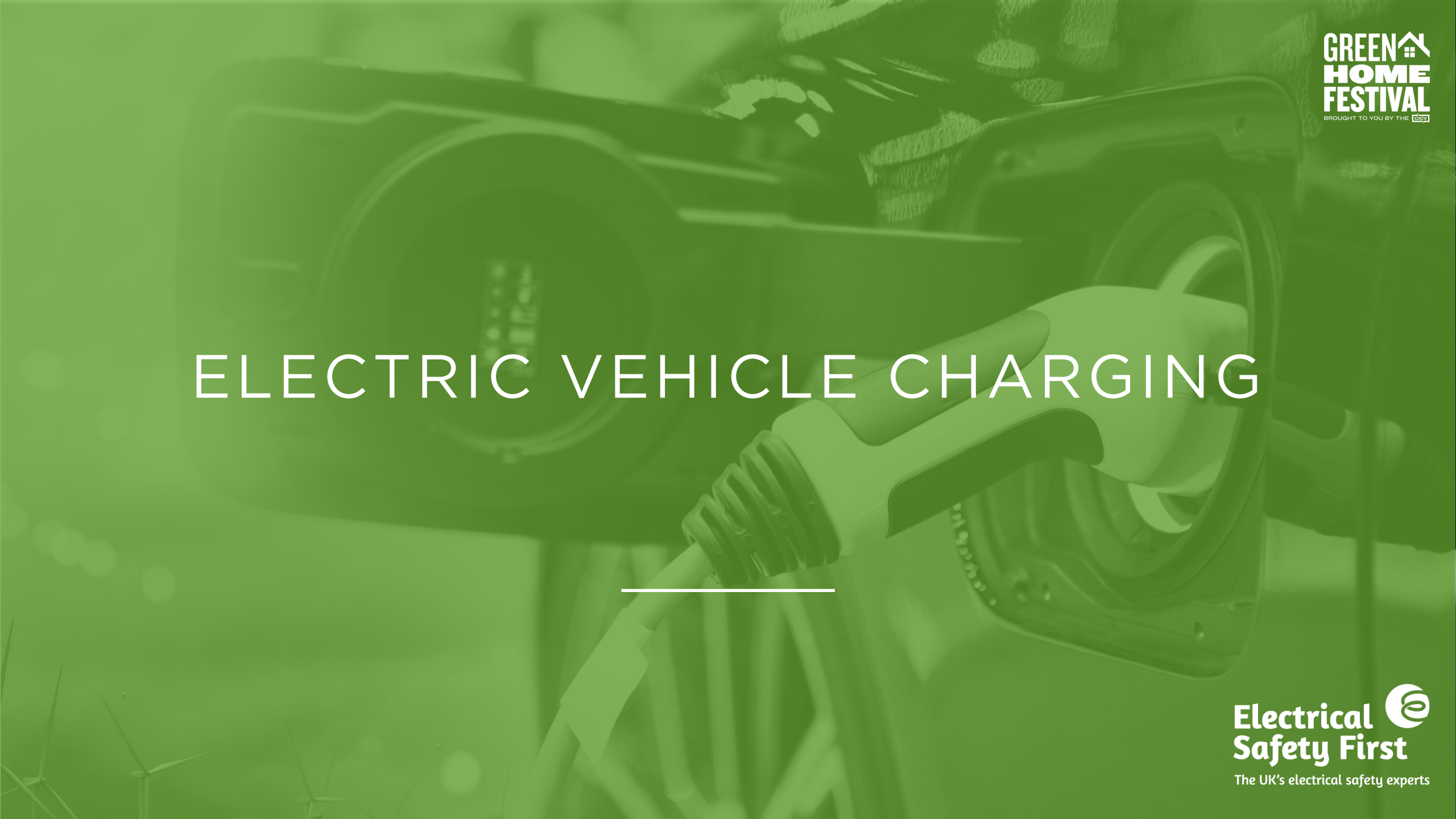

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ELECTRIC VEHICLE CHARGING

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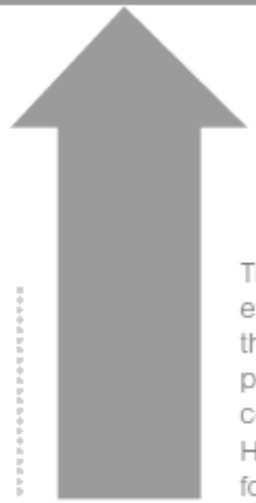
EV CHARGING

Transport was responsible for over a quarter of UK greenhouse gas emissions in 2018, of which road transport was the largest source of emissions, largely due to the impact of passenger cars.

The UK has set a target to end the sale of new petrol and diesel cars and vans by **2030**, with the sale of certain hybrid vehicles permitted until **2035**.



There has been an estimated **220%** growth in the number of accessible public chargepoints compared to 2016 levels. However, there is a need for further expansion.

As of 2nd June 2021, there were **15,384** publicly accessible charging locations, with **24,104** individual charging devices, and an estimated 246,701 BEVs (battery electric vehicles) on the road.

A survey of **2,000** people found that **76%** of UK drivers were concerned about the need for more EV charging infrastructure.

The Government's Office for Zero Emission Vehicles (OZEV) provides a list of authorised installers and, as of May 2021, there were **4,482** home chargepoint installers in the UK.

75%

The UK Government's Electric Vehicle Homecharge Scheme (EVHS) provides grant funding of up to 75% towards the cost of installing EV chargepoints at domestic properties in the UK.

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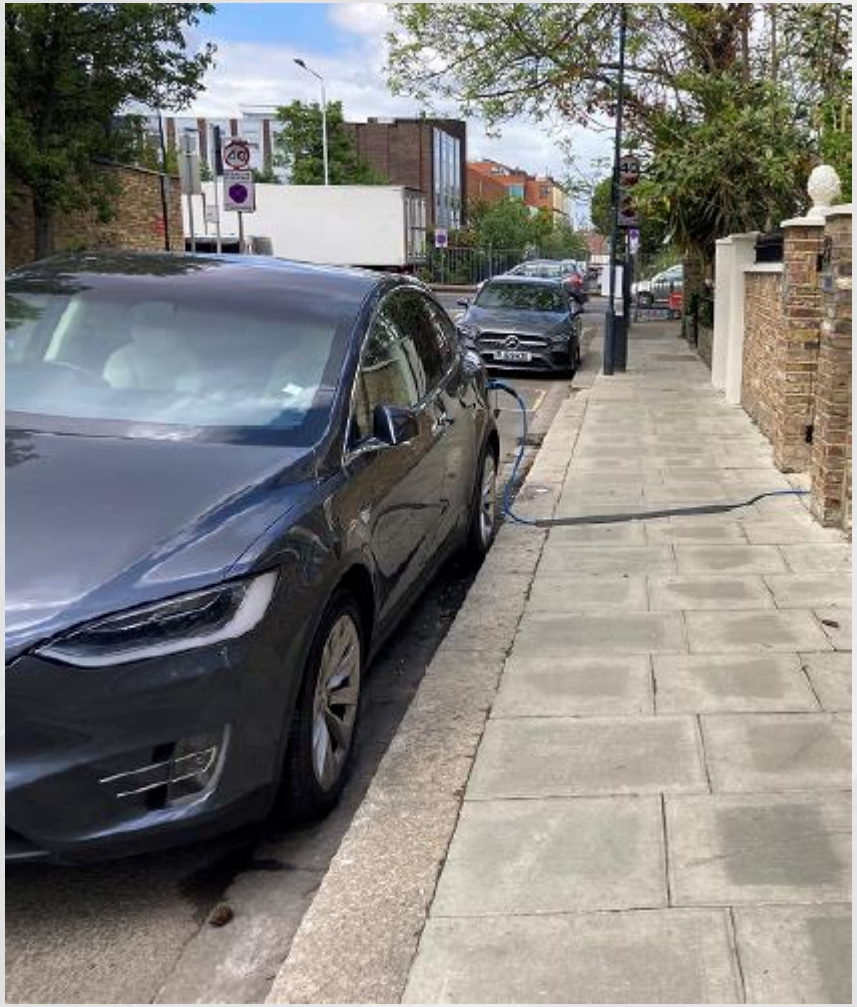
EV CHARGING

ELECTRIC VEHICLE RISKY CHARGING PRACTICES



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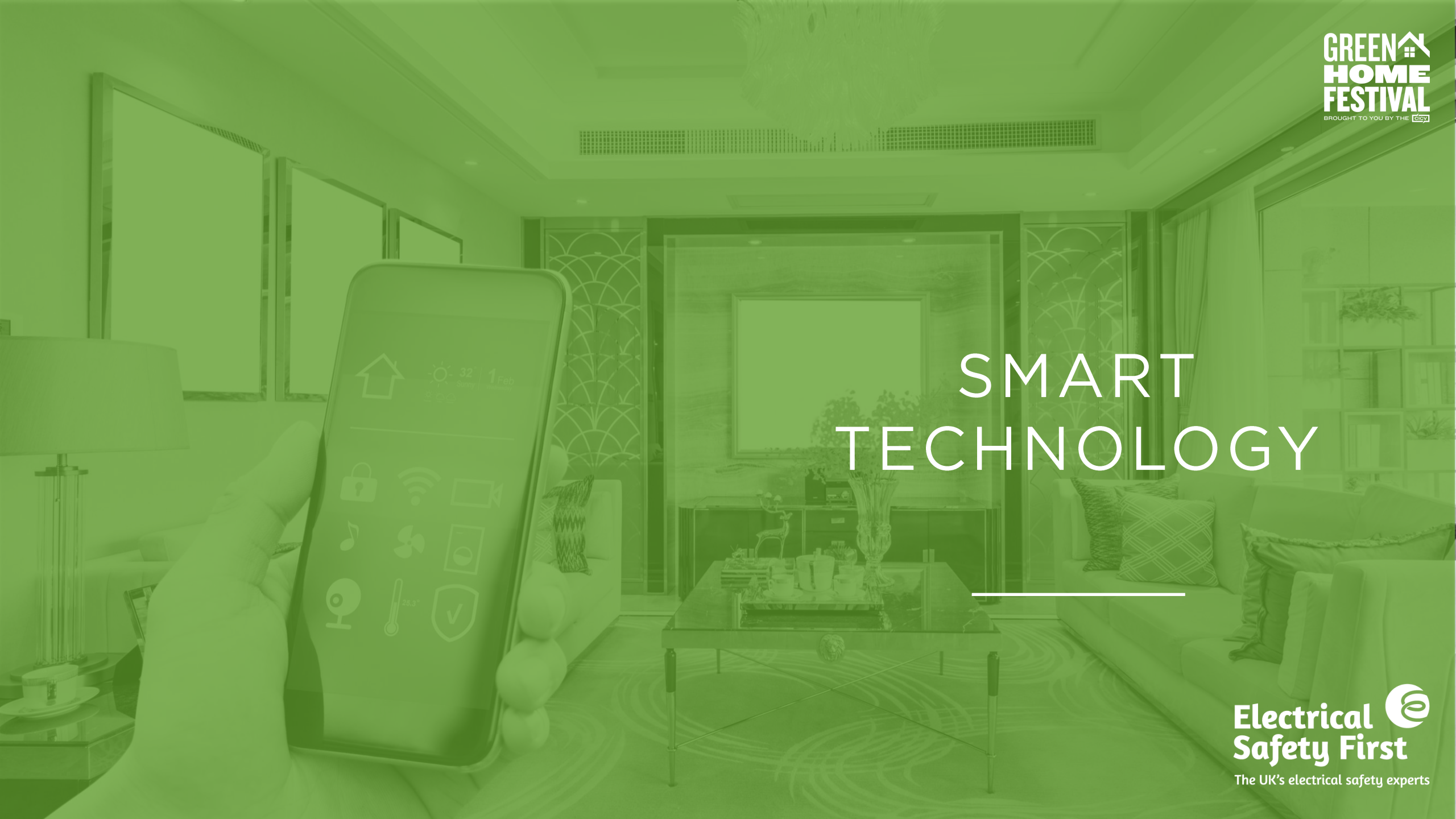
EXCESSIVE USE OF TRAILING LEADS



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SMART TECHNOLOGY

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WHAT SMART TECH CAN DO

- Systems can effectively manage the production, storage and consumption of energy.
- Appliances respond to price signals through demand response.

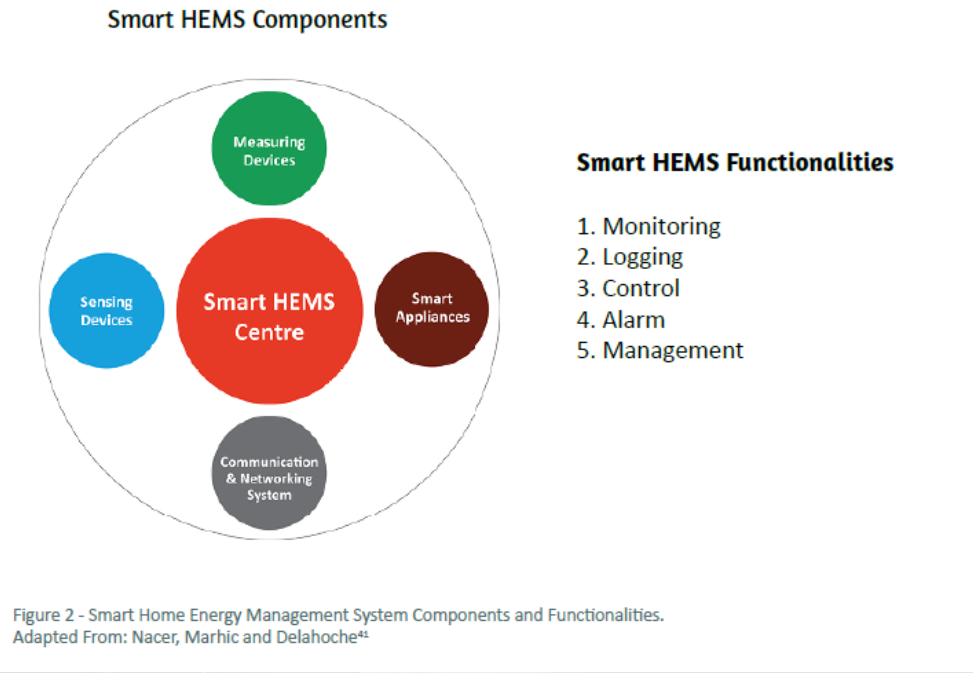

Figure 2 - Smart Home Energy Management System Components and Functionalities. Adapted From: Nacer, Marhic and Delahoche[41]

- Systems can allow for the remote control of household appliances (e.g. if anomalies are detected).
- Systems can monitor the conditions of electrical devices.
- Systems can be used to control access to the property such as for emergency response or by maintenance technicians.

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THE CIRCULAR ECONOMY

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REPLACING AND REPAIRING

REPLACING

- Low carbon, energy efficient and smart tech products are becoming more prevalent and consumers will increasing look replace current products with them
- However, there are concerns about ‘green’ products being unaffordable
- Consumers may turn to second-hand products which could be of a lower quality than new ones, or counterfeit products because they are lower cost
- Risks are amplified by the increasing use of online marketplaces

REPAIRING

- In line with net zero targets, there will likely be an increased need to repair products rather than buying new
- The EU has right to repair legislation which the UK Government committed to mirroring
- If such legislation is passed in the UK, it is vital that consumers use reputable repairers to minimise the risk from hazardous repairs

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THE CHANGING WAY WE BUY PRODUCTS

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THE DANGER OF ONLINE MARKETPLACES

- When shopping on online marketplaces products bought are from third party sellers
- This includes ‘big name’ brands such as eBay, Amazon Marketplace and Facebook Marketplace
- Consumers often assume that online marketplaces are responsible for ensuring that products sold on their platforms are safe
- BUT online marketplaces do not have the same consumer protections as high street retailers
- With online shopping continuing to increase, it is vital that consumers know about the risks and that the UK Government act to close the loophole

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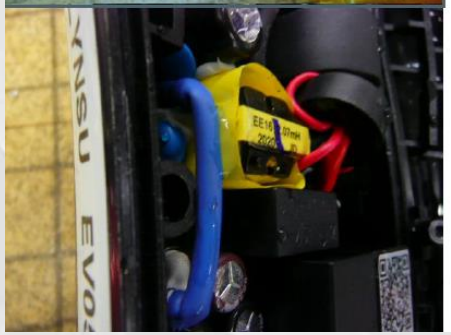
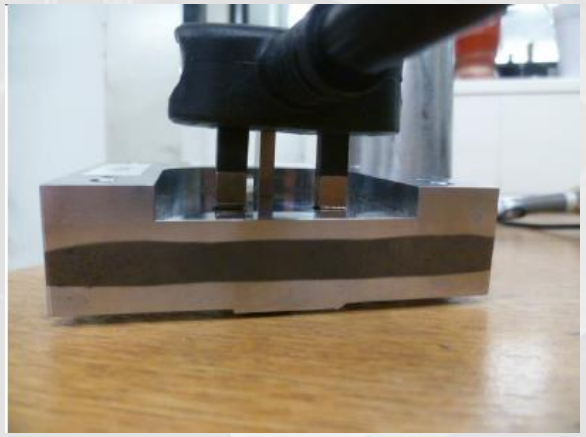
THE RISKS

- Online marketplaces are not bound to the same laws as traditional retailers
- Online marketplaces can expose consumers to unsafe goods
- Repeated investigations have found unsafe products for sale
- Smart plugs, Energy saving devices, EV charging cables

INVESTIGATIONS

EV CABLES





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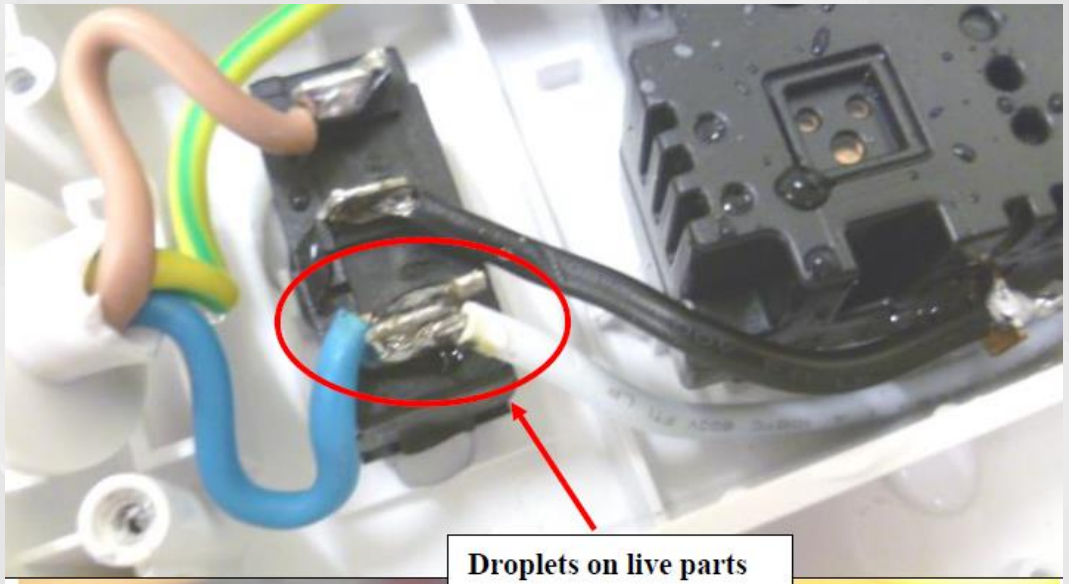
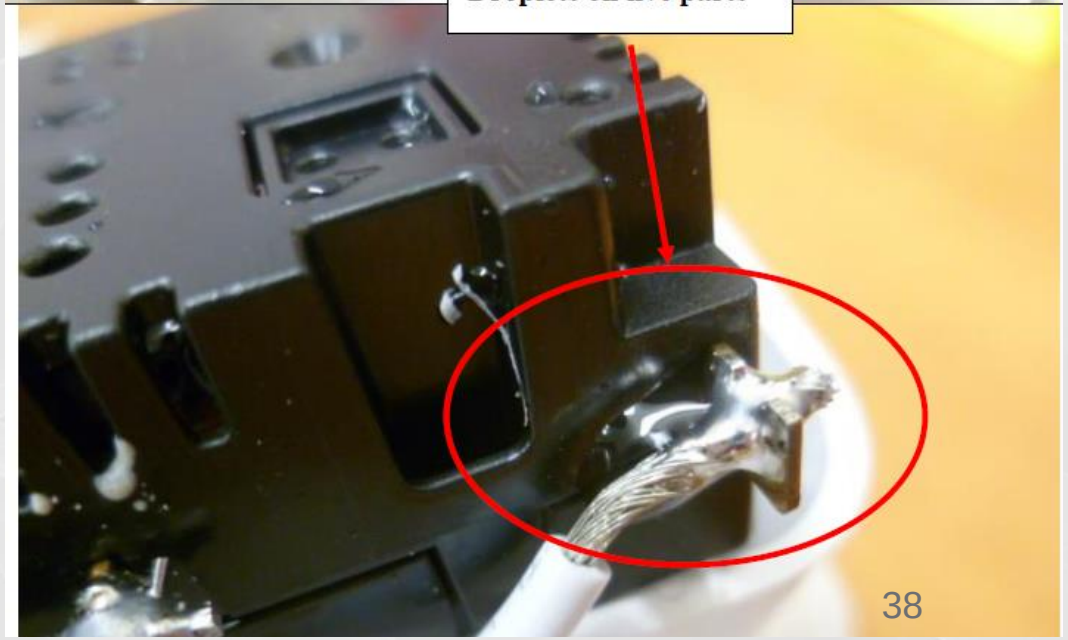
WATERPROOF SOCKET





INVESTIGATIONS

ENERGY SAVING DEVICES

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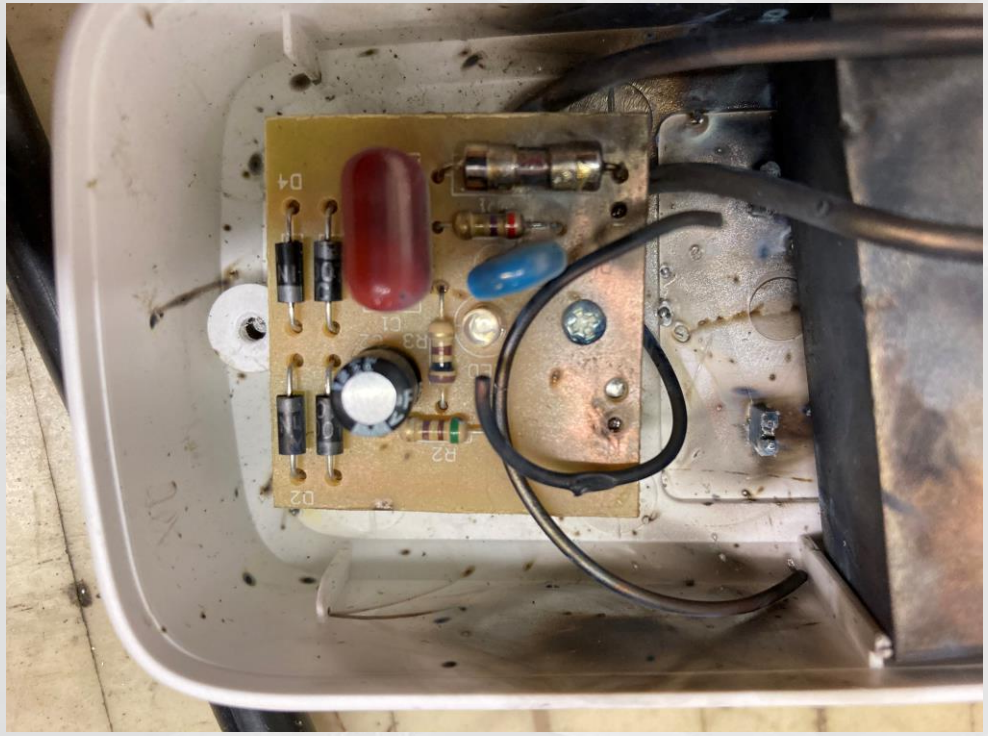

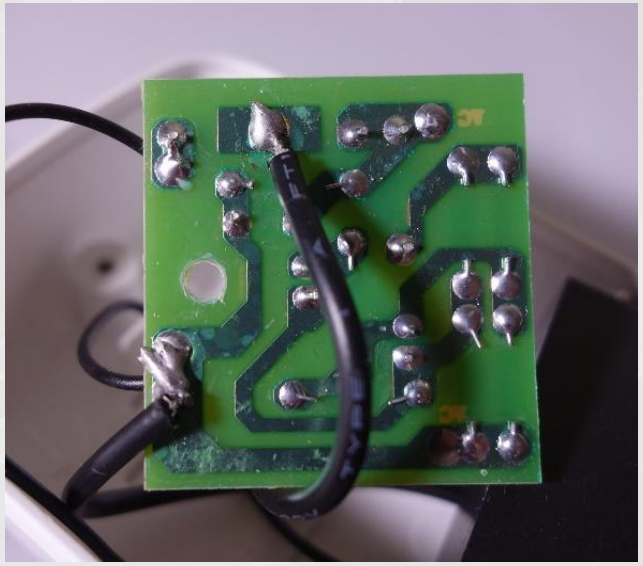

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ANY QUESTIONS?

THANK YOU

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