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+ saving lives.



ELECTRICAL SAFETY IN FUTURE HOMES



CONSIDERATIONS FOR SAFE
ADOPTION OF NET ZERO
TECHNOLOGIES IN UK HOMES





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**Electrical
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ABOUT ELECTRICAL SAFETY FIRST

Electrical Safety First is a campaigning charity that aims to reduce deaths and injuries caused by electricity in UK homes. We do this by working closely with government, the electrical industry, manufacturers, retailers and consumer safety organisations to improve safety regulation and standards. We run media and digital campaigns to share advice and guidance with consumers that will help them to stay safe in their homes.

Powering change + saving lives.

EXECUTIVE SUMMARY



The UK's homes are changing faster than at any point in a generation.

As the UK transitions to net zero, heat pumps, solar panels, battery storage, electric vehicles and smart technologies are becoming part of everyday life.

But they all depend on one thing: a safe electrical installation.

As with the foundations beneath a house, a home's electrical installation is largely invisible, but everything built upon it depends on it.

Many of the homes being asked to support new technologies were never designed with modern electrification in mind.

The UK has some of the oldest housing stock in Europe. In England alone, around one in three homes were built before 1945 and more than half were built before 1965.

Yet the condition and capacity of domestic wiring is not routinely assessed, meaning many homes may not be prepared for the technologies being installed within them.

Put simply, homes are being asked to support more electricity than they were designed for.

If we don't get the infrastructure right, homes could become less safe, households could face unexpected costs, and confidence in low-carbon technologies could be undermined.

This report is not about slowing the transition. It's about delivering it safely.

Electrical safety is fundamental to delivering a successful transition to net zero.

However, successful policy requires two things: understanding the technologies and understanding the people who use them.

That is what makes this report different.

It combines Electrical Safety First's technical expertise with one of the UK's largest behavioural science surveys of domestic electrification, drawing on the views of more than 3,000 households and facilitated by Cowry, an expert organisation in the field of behavioural science which studies how people make decisions.

Our research found that people rarely make decisions about low-carbon technologies based on electrical safety alone. Instead, they are influenced by convenience, affordability, trust, and whether new technologies fit into their everyday life.

THE RESEARCH HIGHLIGHTS THREE IMPORTANT INSIGHTS:

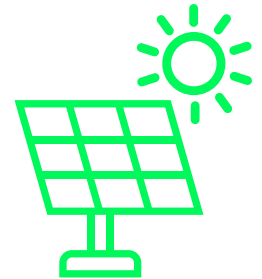
- Most households have no obvious way of knowing whether their home is electrically ready for new low-carbon technologies.
More than half had never heard of an Electrical Installation Condition Report (EICR) – a safety check for your home's electrics which is similar to an MOT for your car or a gas safety check for your boiler.
- More than **four in five households recognised the value of electrical safety checks**, demonstrating strong public support for preventing problems before they occur.
- **Seven in ten households said they would act if a trusted professional recommended an electrical safety check**, highlighting the vital role of competent, qualified installers in helping households make safe decisions.

These findings reinforce a simple principle:
households should not be expected to identify technical electrical risks themselves.

The safest systems don't rely on people having specialist knowledge or skills. Just as seatbelts protect passengers without requiring them to understand crash physics, good policy should build electrical safety into homes rather than expecting households to identify complex technical risks.

The best policy makes the safest choice the easiest choice.

**“ THE SAFEST SYSTEMS
DON'T RELY ON PEOPLE
HAVING SPECIALIST
KNOWLEDGE OR SKILLS. ”**



KEY ACTIONS FOR SAFE ELECTRIFICATION

The UK's transition to low-carbon homes is taking place across three areas: **how we heat our homes, how we generate and store electricity, and how we power transport.**

Across each of these areas, our research points to the same conclusion: the responsibility for identifying electrical risks should not sit with households. Instead, every policy and every installation should be built on three foundations: **electrically ready homes, competent installers, and data-led support.**

1 ELECTRICALLY READY HOMES

Every installation of a high-demand or electricity-generating technology must be supported by an up-to-date electrical safety assessment (EICR) to confirm home safety and suitability. Where remedial work is required for government-funded schemes, funding must be available to ensure households that need financial support can meet the safety baseline for installations.

2 COMPETENT INSTALLERS

Every installation must be carried out by appropriately qualified and competent professionals. Government should work with industry to ensure the workforce is in place to deliver the transition safely and at scale.

3 DATA-LED SUPPORT

Government must establish a national approach to recording and tracking electrical readiness through improvements to housing condition surveys, property passports – digital records containing key information about a home and its condition – and Unique Property Reference Numbers (UPRNs). This will support safer installation decisions, better targeted policy and funding, and the safe integration of new technologies.

These foundations underpin all recommendations.

THE ESSENTIAL FOUNDATIONS FOR A SAFE TRANSITION TO NET ZERO

POLICY SUMMARY

1 ELECTRICALLY READY HOMES

2 COMPETENT INSTALLERS

3 DATA-LED SUPPORT

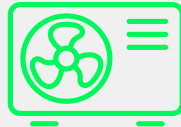
HOW WE HEAT OUR HOMES

Require pre-installation electrical assessments for all heating and retrofit programmes covering wiring conditions, consumer unit suitability, earthing and bonding, and whole-home demand and capacity.

Funding frameworks must cover any electrical upgrades required.

Targeted support for vulnerable households and embed electrical readiness within programme design.

Integrate electrical safety into heating system design and delivery with clear installation standards, coordinated installation with electricians and heating engineers, and effective oversight and compliance.



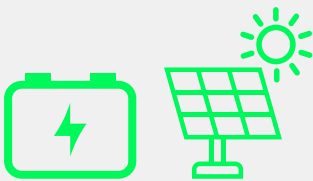
Systematically record electrical readiness and integrate into housing and retrofit data systems.

Embed electrical condition data within housing surveys and retrofit programmes.

Use assessment insights to target funding and support long-term planning for electrification of heating systems.

HOW WE GENERATE AND STORE ENERGY

Require a whole home electrical assessment before installing any generation or storage technology, confirming suitability for additional electrical load, on-site generation and safe system integration.



Ensure all generation, storage and smart energy technologies are installed by appropriately qualified and competent installers.

Maintain clear product standards and oversee the quality of installation and integration.

Ensure solar PV, battery storage and smart home technologies meet recognised safety standards, supported by robust testing, certification and effective regulation.

Improve incident reporting and monitoring, including through the Incident Recording System, to identify and manage product and system risks as deployment accelerates.

HOW WE POWER TRANSPORT

Require a whole-home electrical assessment before installing an EV charger, including checks on earthing, bonding, capacity and future load requirements.



Ensure all EV charging infrastructure is designed, installed and integrated by appropriately qualified competent professionals, supported by robust compliance, oversight and enforcement.

Implement clear technical standards, including smart charging capabilities and Vehicle-to-Grid (V2G) where appropriate.

Use data from electrical assessments to inform EV charger deployment and grid reinforcement needs.

Support Distribution Network Operators (DNOs) and local authorities with granular data on EV charging readiness and capacity to accelerate transport electrification.

1.0 HOW WE HEAT OUR HOMES

1.1 POLICY CHALLENGE



As heating shifts away from fossil fuels, heat pumps and electric heating systems will be central to how homes are powered.

These technologies place a sustained and often high demand on a home's electrical installation, significantly increasing the electrical load.

However, awareness of electrical readiness remains low, as **fewer than two in five households know when an electrical safety check should be carried out**. This is a concern given the growing demands that electrified heating systems place on home wiring.

At the same time, many existing heating retrofit schemes do not fully account for the condition or capacity of the electrical installation.

In homes that are not prepared, this can lead to:

- Overloaded wiring.
- Increased risk of faults or fire.
- System failure during use.
- Higher costs where upgrades are required later.

These risks are typically not visible at the point of installation and only emerge over time.

1.2 WHY THIS MATTERS FOR CONSUMERS

Electrical Safety First's behavioural evidence indicates households do not typically address electrical readiness or system capacity. **Fewer than one in four people say they would be motivated to check whether their home is electrically ready** for decarbonisation.

Instead, they assume risks have already been managed through products, installers, or existing systems. This reflects broader behavioural insights: **people rely on simple assumptions and trusted signals** rather than actively assessing technical safety risks.

This means relying on individual awareness or action won't deliver safe outcomes.

Without intervention:

- Poorly designed and inefficient heating systems may be installed in homes.
- Electrical risks will remain invisible until failure.
- Safety becomes reactive rather than preventative.

This creates a clear risk for both households and policy delivery. As electrified heating becomes more widespread, the gap grows between increasing electrical demand and household readiness.

“ MANY EXISTING HEATING RETROFIT SCHEMES **DO NOT FULLY ACCOUNT** FOR THE **CONDITION OR CAPACITY** OF THE ELECTRICAL INSTALLATION. ”



1.3 WHAT NEEDS TO HAPPEN



In alignment with the core foundations set out in this report – electrically ready homes, competent installers, and data-led support, the following actions are required to safely heat our homes:

1 ELECTRICALLY READY HOMES:

All heating and retrofit programmes should require pre-installation electrical assessments, confirming homes are suitable before installation. These should cover:

- Wiring conditions.
- Consumer unit suitability.
- Earthing and bonding.
- Whole-home demand and capacity.

Funding frameworks must also include any electrical upgrades required to meet safety standards, so households are not faced with a choice between proceeding with unsafe installations or paying additional unaffordable costs.

This should be complemented by targeted support for vulnerable households and embedding electrical readiness within programme design and delivery.

2 COMPETENT INSTALLERS:

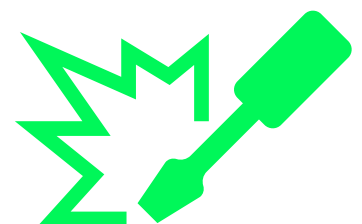
Electrical safety must be fully integrated into heating system design and delivery, including:

- Enforceable installation standards.
- Competent, coordinated installation with electricians and other relevant trades, such as heating engineers, where integration is required.
- Effective oversight and compliance.

3 DATA-LED SUPPORT:

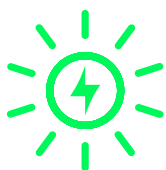
Electrical readiness must be systematically recorded and integrated into housing and retrofit data systems, enabling better decision-making and safer delivery. This should include:

- Embedding electrical condition data within housing surveys, retrofit programmes and delivery frameworks.
- Using insights from assessments used to target funding and support where it is most needed.
- Ensuring data on electrical readiness supports long-term planning for electrification of heating systems.



2.0 HOW WE GENERATE AND STORE ENERGY IN THE HOME

2.1 POLICY CHALLENGE



Homes are no longer passive consumers of electricity.

They are becoming small, integrated energy systems – generating, storing and managing electricity through solar photovoltaic (PV), battery storage systems, and smart technologies.

Adoption is accelerating. **Almost one in three households say they are considering installing these technologies** within the next three to six months.

Yet few will consider whether their home's electrical installation is prepared for this shift or whether the products they install meet appropriate safety standards.

When designed, installed and maintained correctly, they are safe. However, when they are not, risks include:

- Electrical faults and fire.
- Damage to existing wiring and systems.
- Hazards that are difficult to isolate.
- Impacts on wider infrastructure.

As adoption increases, the challenge is no longer limited to individual technologies, but how multiple, interconnected systems operate together within a single home. This creates a growing gap between system complexity and household readiness.

“ THE CHALLENGE IS NO LONGER LIMITED TO INDIVIDUAL TECHNOLOGIES, BUT **HOW MULTIPLE, INTERCONNECTED SYSTEMS OPERATE TOGETHER.** ”

2.2 TECHNOLOGY-SPECIFIC RISKS



SOLAR PV

Solar PVs enable households to generate electricity for use in the home or export to the grid.

However, they introduce risks that are not present in traditional installations:

- Energy generated by solar panels in many instances cannot easily be switched off, meaning even small electrical faults can escalate quickly if not identified or addressed.
- Installation technique, component selection and lack of maintenance are key drivers of incidents, particularly on the Direct Current (DC) side of the installation.

Emerging plug-in solar technologies introduce additional risks by:

- Enabling energy to be fed into existing electrical systems not designed for additional current and bidirectional energy flow.
- Allowing consumer-led installations without appropriate safeguards.

[For more information, read our policy report here:](#)



BATTERY STORAGE



Battery storage systems enable users to store surplus electricity generated from solar PV systems, import lower cost energy through time-of-use (ToU) tariffs and release it when needed.

This concentrates large amounts of stored energy within the home.

When poorly designed, installed or maintained, risks include:

- Fire or explosion caused by faults, misuse or damage.
- Increased system complexity when combined with other technologies.
- Hazards associated with lithium-ion batteries, high-risk products commonly used in these storage systems, which present significant hazards when they fail.

As deployment increases, ensuring consistent safety standards and system integration becomes critical.

SMART HOME TECHNOLOGIES



Smart systems enable homes to actively manage energy use, improving efficiency, flexibility and cost control.

However, increased automation introduces new risks:

- Systems may operate at times when faults are less visible.
- Consumers may not understand how systems behave.
- Maintenance and safe operation become more complex.
- Inappropriate use of technology or poor maintenance can significantly heighten the risk of electrical fires.

As homes become more automated, ensuring systems are safe both at the point of installation and in use is essential.

2.3 WHY THIS MATTERS FOR CONSUMERS

Homes are increasingly expected to operate as complex energy systems, often without being designed or prepared for that role.

Behavioural evidence shows that **households do not actively assess system complexity, product safety, or system interactions**. This reflects a wider behavioural challenge: electrical risks are often invisible, underestimated, and shaped by system design.

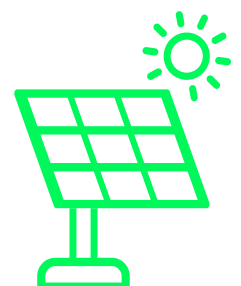
Policies that assume households will understand system complexity, identify risk and maintain systems appropriately are unlikely to deliver safe outcomes at scale.

Without intervention:

- Unsafe system interactions may go unnoticed.
- Maintenance will be inconsistent.
- Technologies may be used in ways that increase risk.



Policy must move beyond information provision and ensure that **safety is built into the system, that technologies are safe by design and in use**, and – fundamentally – that households receive clear, accessible guidance.



2.4 WHAT NEEDS TO HAPPEN



To align with the core foundations set out in this report: electrically ready homes, competent installers and data-led support, the following actions are required.

1 ELECTRICALLY READY HOMES:

Require a whole home electrical assessment before installing any generation, storage or smart home technology, confirming the home is safe and suitable for:

- Additional electrical load.
- On-site generation.
- Safe system integration.

2 COMPETENT INSTALLERS:

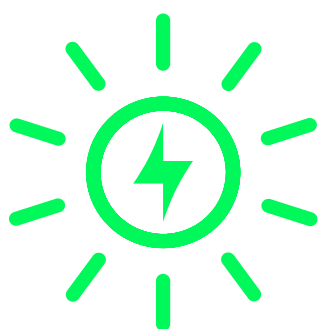
Ensure all generation and storage technologies are installed by appropriately qualified and competent professionals, including:

- Coordinated installation with affiliated trades.
- Consistent certification requirements across all technologies.
- Effective oversight and compliance.

3 DATA-LED SUPPORT:

Ensure solar PV, battery storage and emerging technologies, including plug-in systems meet recognised product safety standards before entering the UK market. Government must ensure:

- Standards development, testing and certification keep pace with deployment.
- Regulatory frameworks remain effective, particularly where rollout is accelerated by policy.
- Product safety, installation data and system risks are monitored and used to inform policy and enforcement.
- The Incident Recording System (IRS) is improved to ensure incident data related to these technologies are adequately captured and reviewed.
- Ensure smart home technologies are subject to appropriate safety standards, user protections and ongoing monitoring as adoption increases.



3.0 HOW WE POWER TRANSPORT IN THE HOME

3.1 POLICY CHALLENGE



Electric vehicles, e-bikes and other forms of electric transport are becoming part of everyday life.

As more households charge vehicles and batteries at home, the way electricity is used in our homes is changing. This places new and often significant demands on electrical installations.

Almost **one in four households are considering purchasing an electric vehicle within the next three to six months**. While policy has rightly focused on increasing uptake and expanding charging infrastructure, long-term success will also depend on ensuring homes are electrically ready and that charging is safe, accessible and trusted.

3.2 WHY THIS MATTERS FOR CONSUMERS

Our research shows that households approach home charging in the same way they approach other low-carbon technologies.

Affordability and convenience are the primary drivers of decision making.

While **almost two in three** of respondents cited cost as a major influence, **fewer than one in four considered whether their home's electrical installation was ready for EV charging or whether the charging equipment met appropriate safety standards**.

Instead, many households:

- Assume their home's electrical installation is already suitable;

- Expect installers to identify any electrical safety issues; and
- Place significant trust in recognised qualifications, accreditation and competent installers.

This is entirely understandable. Just as most people assume a new appliance can be plugged in safely without checking the wiring behind the socket, **households naturally assume their home's electrical installation can already support technologies such as EV charging.**

People don't ignore electrical safety. They simply assume the system has already managed the risk.

These findings challenge a common policy assumption.

Households should not be expected to identify technical electrical risks that they are neither trained nor equipped to recognise. Instead, policy should make the safest choice the easiest choice.

The foundations set out in this report – electrically ready homes, competent installers and data-led support – provide the basis for this. Transport, housing, energy and planning policy should then work together to remove the remaining barriers to safe home charging.

“ PEOPLE DON'T IGNORE ELECTRICAL SAFETY. THEY SIMPLY **ASSUME THE SYSTEM HAS ALREADY MANAGED THE RISK.** ”

3.3 WHAT NEEDS TO HAPPEN



To align with the core foundations set out in this report, electrically ready homes, competent installers and data-led support, the following actions are required:

1 ELECTRICALLY READY HOMES:

Government must align transport, housing, energy and planning policy, ensuring charging infrastructure and wider home electrification are planned together, rather than in isolation. This should be supported by a whole-home electrical assessment before installing any home charging infrastructure, ensuring the property is suitable for:

- Sustained electrical demand from EV charging.
- Integration with existing electrical systems and technologies.
- Safe, ongoing system use.

2 COMPETENT INSTALLERS:

All home charging infrastructure must be installed by appropriately qualified and competent professionals. This must include:

- Installation and system design by certified professionals.

- Safe integration within the home's electrical system.
- Effective oversight, compliance and enforcement.

3 DATA-LED SUPPORT:

Government must expand access to safe, reliable and convenient charging infrastructure, particularly in flats, higher-density developments and the private rented sector. This should be supported by a coordinated, system-level approach, using data and planning frameworks to:

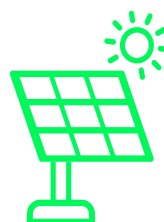
- Identify gaps in infrastructure and unmet demand.
- Reduce reliance on unsafe or improvised charging (e.g. trailing cables).
- Support equitable access to safe charging solutions.

Charging technologies, infrastructure and safety frameworks must evolve together, enabling the safe roll-out of bidirectional charging, battery and storage integration and smart charging systems.





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