EV FIRE SAFETY

2025 TECHNICAL GUIDE

GEORGIA NETWORK *for* ELECTRIC MOBILITY

UNIVERSITY OF GEORGIA

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EXECUTIVE SUMMARY

Electric vehicles (EVs) are driving one of the most important technological shifts of the 21st century. As governments, fleets, and other consumers and stakeholders begin to transition to emerging technologies, EVs are expected to account for over half of all new car sales globally by 2030. This transition isn't just about electrifying transportation, it's reshaping how we design infrastructure, deliver energy, and respond to emergencies.

Yet, one critical issue remains under-addressed: fire safety. The pace of EV adoption has outstripped the development of unified safety standards, response protocols, and fire prevention measures. Across cities and regions, fire departments, utilities, and developers often operate in a fragmented landscape without consistent guidance, leaving gaps in preparedness, especially in urban areas where EV infrastructure is rapidly expanding.

Lithium-ion batteries, the heart of modern EVs, are efficient but come with unique risks. Under certain conditions, such as mechanical damage, overheating, or manufacturing defects, they can undergo thermal runaway, a chain reaction that rapidly increases heat, releases toxic gases, and ignites fires that can spread or reignite hours later. Though significantly rarer, these fires differ from traditional fuel fires: they're harder to extinguish, unpredictable in behavior, and require specialized response techniques.

Many first responders lack access to updated high-voltage schematics, protective gear, and scenario-specific training. In addition, safety technologies, such as battery heat diagnostics, smoke detectors, and automated disconnect systems, remain inconsistently adopted across installations, despite their potential to prevent or contain incidents.

Some regions are beginning to respond. As mentioned in our June 2025 whitepaper, Atlanta enacted a pioneering EV Readiness Ordinance requiring new developments to include both EV charging infrastructure and fire safety provisions, such as spacing requirements, disconnect systems, and fire-resistant design features in enclosed garages. At the national level, the U.S. is also taking steps by adopting ISO 17840, giving emergency responders real-time access to standardized vehicle schematics.

To keep pace with EV growth, fire safety can no longer be an afterthought. It must be integrated into building codes, emergency training, and infrastructure planning from the start.

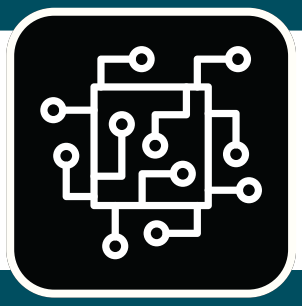
ARE EVS AND EV CHARGERS SAFE?

Electric vehicles and their associated charging systems are widely considered safe when designed, installed, and operated according to recognized standards and protocols. EVs are statistically safer than their internal combustion engine (ICE) counterparts in terms of overall fire risk, with fire incident rates between 1 in 30,000 and 1 in 100,000 vehicles sold, depending on the region and data source.

A common misconception is that EV batteries can spontaneously combust. However, data shows that battery ignition generally requires an external trigger such as:

Severe physical impact (e.g., traffic collision)

Exposure to sustained high temperatures or open flame



Significant manufacturing defect or electrical short circuit

Modern EVs are engineered with multilayered protections, including:

- Thermal barriers between individual battery cells
- Pressure release vents to safely discharge gases
- Battery Management Systems (BMS) to monitor charging rates and cell temperatures
- Intelligent software that limits overcharging and excessive current flow

Thermal runaway, the key hazard associated with EV batteries, occurs when one cell in a battery pack overheats and triggers adjacent cells to also overheat, leading to a potentially catastrophic chain reaction. During such an event, internal temperatures can exceed 1,000°C (1,832°F), creating flames, toxic gas plumes (including hydrogen fluoride and carbon monoxide), and risk of re-ignition even after initial suppression.

HOW SAFE IS INDOOR CHARGING?

Indoor EV charging is generally very safe; especially when certified equipment is installed by licensed professionals in accordance with National Electrical Code (NEC) and UL (Underwriters Laboratories) standards. Key safety features include:

- Adequate ventilation to manage heat and fumes
- Ground Fault Circuit Interrupters (GFCIs), safety devices that detect imbalances in electrical current and rapidly shut off power to prevent electric shock, installed on dedicated circuits
- Flame retardant insulation and materials
- Emergency disconnect switches and signage

Fires during EV charging are extremely rare, with incident rates below 0.03% per charger per year. Most EV fires occur after crashes or due to battery defects, not from charging itself. When charging-related fires do occur, they're usually linked to uncertified equipment or improper installation.

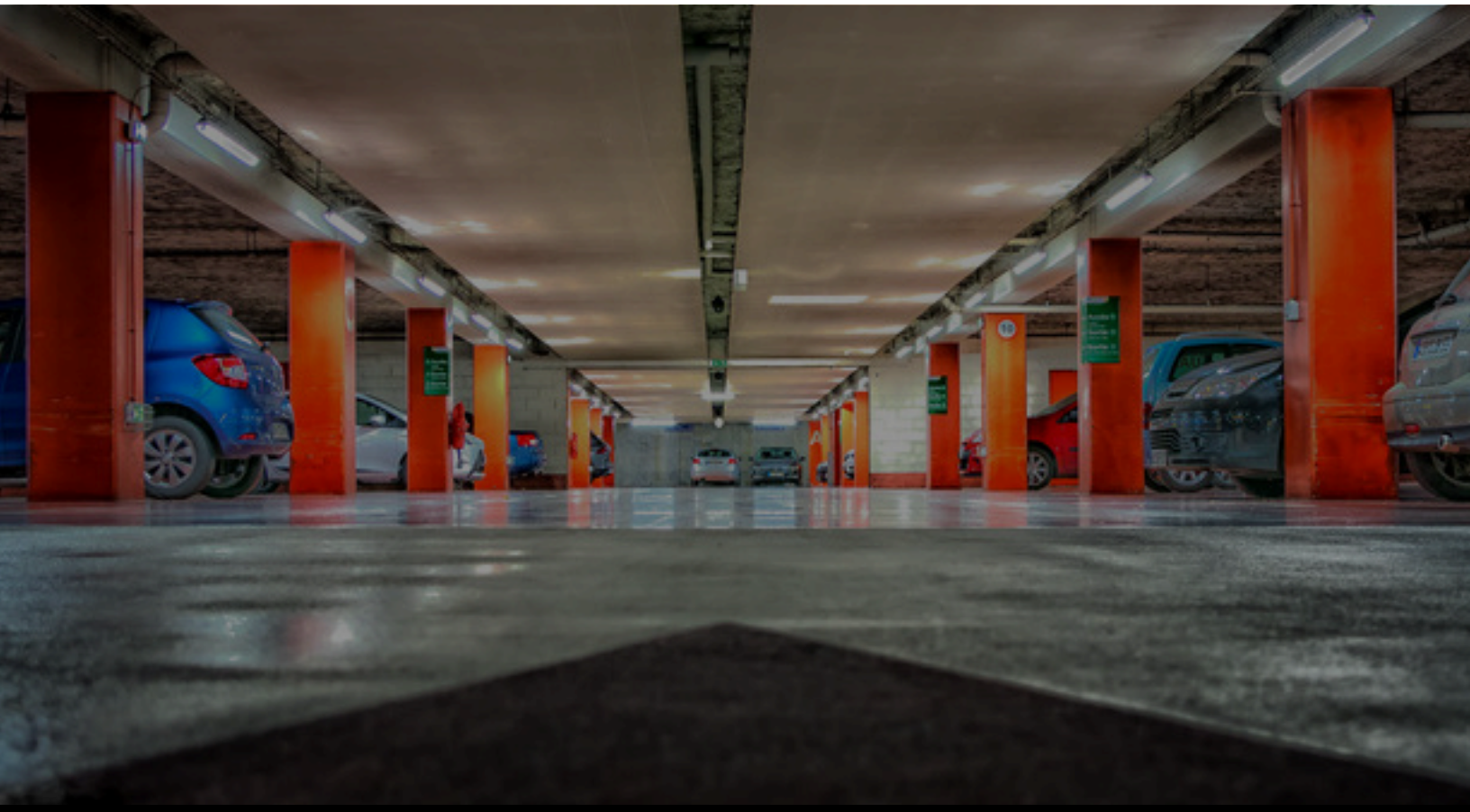
IS IT SAFE TO CHARGE IN A PARKING DECK?

Yes, charging in parking decks is safe when proper safety infrastructure is in place. However, it is important to note that some locations within a deck offer better ventilation, lighting, and accessibility than others. Most modern parking facilities include key safety features such as:

- Fire-rated construction materials to contain and slow the spread of fire
- Smoke detectors and sprinkler systems for early detection and automated response
- Adequate spacing and ventilation to prevent heat and gas buildup
- Clearly marked emergency shutoffs near EV chargers for rapid response

EV chargers in parking decks should also be sited with consideration for fire safety and first responder access to standpipes and emergency equipment. For example, installing chargers in the center of a deck or along a rear wall may hinder emergency response by limiting access to critical infrastructure.

Some jurisdictions require enhanced ventilation and toxic gas mitigation systems, such as hydrogen fluoride sensors, in enclosed parking structures. When these safeguards are combined with certified charging equipment and professional installation, EV charging in parking decks poses minimal risk and is often safer than traditional fueling at gas stations.



SIDE-BY-SIDE FIRE RISK ASSESSMENT (GAS/DIESEL, HYBRIDS, EVS)

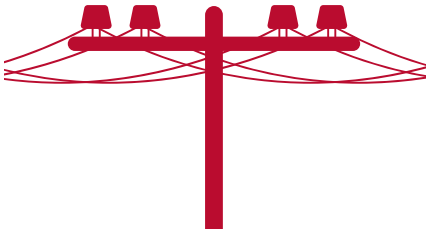
	 GASOLINE/DIESEL	 HYBRID VEHICLES	 ELECTRIC VEHICLES (EVs)
FIRE INCIDENCE RATE	~1 in 1,200 vehicles (~83 fires per 100,000)	~1,500–3,400 fires per 100,000	~1–25 fires per 100,000
PRIMARY FIRE CAUSE	Fuel leaks, vapor ignition form sparks or engine heat, flammable liquid spills. **Diesel:** Ruptures, turbo overheating	Combination of fuel leaks and battery faults, wiring insulation breakdown, hybrid system overheating	Battery damage, thermal runaway from overcharging, mechanical impact, internal short
REFUELING/ CHARGING RISK	Highly flammable vapor clouds, ~5,000 pump fires/year in the U.S. **Diesel:** Vapor ignition, static discharge	Combined risk: fuel tank ignition + high-voltage incidents (e.g., regen braking, battery stress)	<100 charger fires/year globally; thermal overload or installation faults possible
TIME TO FIRE ONSET	Seconds to minutes post-impact. **Diesel:** Often immediate after rupture or leak	Varies: seconds (fuel) to hours (battery); mixed onset timing	Hours to days post-collision/trigger event; thermal runaway can be delayed
FIRE SEVERITY	Gasoline: Moderate to high intensity, fast-spreading flames. **Diesel:** Severe, high soot and pressurized sprays	Severe; dual fuel and battery sources, emits toxic gases	Very high intensity, persistent, re-ignition risk, chemical emissions

EV FIRE SAFETY SOLUTIONS BY SECTOR

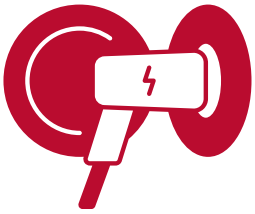
As EV adoption continues to accelerate, the burden of fire safety responsibility must be shared across sectors, from first responders to grid managers, charger manufacturers, and everyday EV users. Each group occupies a unique position within the broader EV ecosystem, and their preparedness directly influences how effectively fire risks are identified, mitigated, and responded to. This section offers a sector-by-sector guide to critical technologies, policies, and practices essential for preventing and managing electric vehicle fires; grounded in international technical standards and real-world deployment strategies.

BEST PRACTICES FOR FIRE DEPARTMENTS

BEST PRACTICES FOR ELECTRICAL UTILITIES



BEST PRACTICES FOR EV CHARGER OEMS & INSTALLERS



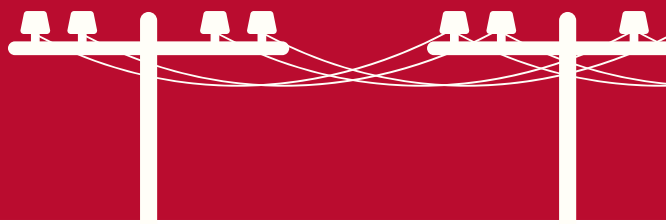
BEST PRACTICES FOR FIRE DEPARTMENTS

Fire departments serve as the frontline of defense during EV fire incidents, and they face one of the most urgent mandates in the EV fire safety equation. Unlike traditional fires, lithium-ion battery fires can re-ignite after being extinguished, emit toxic vapors, and reach extreme temperatures, requiring specialized tools and methods. Firefighters must evolve alongside EV technology to remain effective in safeguarding public safety. This means rethinking response strategies, modernizing apparatus, and ensuring that fire crews are equipped with the knowledge and tools to tackle multi-phase and high-voltage fire scenarios. Additionally, fire departments must adopt data-driven training approaches and simulation environments to prepare for the rare but high-risk nature of EV fires. Systemic coordination with city planners, utilities, and OEMs is also required to ensure preparedness is not isolated but integrated across emergency response networks.

- **Use Thermal Imaging in Multi-Phase Fire Response**
- **Submersion Readiness:** Mobile submersion containers or water tanks for thermal events
- **Equip Crews for High-Voltage Response:** Arc-rated PPE, insulated tools, ISO 17840 rescue sheets
- **Enhance Garage Ventilation Response:** High-capacity fans, smoke detectors, integrated schematics
- **Upgrade Apparatus & Gear:** Telescopic cameras, foam-safe extinguishers, mobile cooling pods
- **Adopt Smart Helmets:** AR overlays of schematics and thermal maps, LTE/5G connected
- **Train with VR Simulators:** Simulate public charger and battery fires
- **Engage Communities:** Safety workshops, EVSE audit support, fire prevention checklists

Note: These are best-in-class considerations especially for dense, urban areas. Rural areas may not need the same level of technological resources on hand

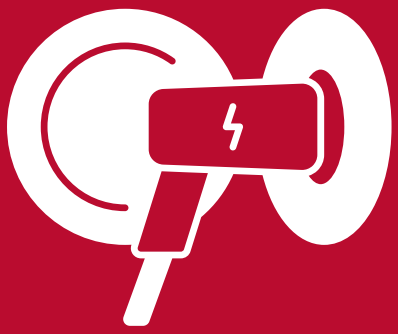
BEST PRACTICES FOR ELECTRICAL UTILITIES



Electrical utilities are the backbone of EV charging infrastructure. As charging demand surges, so do the risks of transformer overload, thermal stress, and electrical faults within distribution networks. Utilities must consider transitioning from passive grid monitoring to predictive, AI-driven analytics that identify vulnerabilities before they escalate. Coordination with fire departments and smart grid adaptation will be essential in supporting a safe and sustainable EV charging ecosystem. As charging stations proliferate across urban and suburban landscapes, electrical utilities are faced with the challenge of ensuring grid resilience under variable loads. Unanticipated thermal stress and backfed energy from bidirectional charging systems can lead to transformer failures or electrical fires. It is vital for utilities to implement predictive maintenance, adopt fire-resistant materials, and develop coordinated protocols with emergency responders to quickly address electrical faults.

- **Monitor Transformer Health in Real Time:** IoT sensors for temperature/stress tracking
- **Predict and Prevent Grid Fires:** AI powered anomaly detection and power rerouting
- **Reinforce Substation Safety:** Fire resistant cables (EN 60332), suppression systems
- **Prepare for Bidirectional Load Surges:** Account for V2G system heat risks
- **Coordinate with First Responders:** Share grid maps and emergency shutdown protocols

BEST PRACTICES FOR EV CHARGER OEMS & INSTALLERS



The design, installation, and maintenance of EV charging equipment is foundational to fire prevention. Charger manufacturers and installers are on the frontlines of safety, responsible not only for meeting stringent electrical codes but also for anticipating real world operating conditions. This includes accounting for environmental exposure, thermal loads, and component degradation over time. The integration of smart sensors, remote diagnostics, and robust shutdown mechanisms are baseline requirements for a fire-safe charging ecosystem.

To ensure full protection, a layered approach is essential, i.e., combining "smart" systems (like cloud alerts and predictive sensors) with "dumb" systems (like thermal fuses, fireproof enclosures, and fire suppression). These layers act as redundant safeguards: if one misses, the other contains. Together, they predict, prevent, and protect.

- **Conduct Fire Risk Assessments:** Evaluate site, airflow, cable distance, wall materials
- **Include Smart Thermal Shutoff:** Stop charging if connector exceeds 60°C
- **Install per International Standards:** IEC 60364-7-722 (EVSE), IEC 62752 (in-cable protection)
- **Enable Automatic Maintenance Alerts:** Log critical issues and alert stakeholders
- **Implement Digital Charger Passports:** Cloud-based IDs for every charger unit
- **Support Annual Inspections:** Ensure service history, detect thermal degradation

Note: Conduct your own ambient temperature factors. Size by ambient temp factors in each location. Baseline of 60-75 C based on current industry availability

WHAT EV OWNERS SHOULD KNOW

EV owners, whether individuals or large-scale fleet operators, play a vital role in upholding fire safety. Proper charging habits, timely maintenance, and awareness of early warning signs can mean the difference between a minor incident and a catastrophic fire. With the convenience of home charging comes increased responsibility, particularly in ensuring installations meet safety codes and that components are regularly checked for wear or overheating. This section equips users with key practices for safe charging and maintenance, whether at home, in commercial buildings, or on the road. It also emphasizes the importance of engaging with certified electricians and adhering to manufacturer guidelines. Owners must view their EV not simply as a car but as an advanced, high voltage system requiring educated use and proactive vigilance. By fostering a culture of fire safety literacy, we can empower users to prevent risks and respond effectively should a fire event occur.

FOR RESIDENTIAL OWNERS

FOR REAL ESTATE DEVELOPERS & PROPERTY MANAGERS

FOR COMMERCIAL & FLEET OPERATORS

FOR RESIDENTIAL OWNERS

Homeowners play a crucial role in ensuring that EV charging at home is both safe and sustainable. As EV adoption rises, residential charging setups must go beyond convenience and reflect long-term fire safety best practices. From the garage layout to the electrical panel, every component should be designed with risk mitigation in mind. Using certified chargers, ensuring proper equipment spacing, and planning for electrical load capacity are all essential to reducing hazards. Homeowners should consult licensed electricians to assess whether panel upgrades or dedicated circuits are needed, especially in older homes. Proactive collaboration with local code authorities and, where possible, fire safety professionals can help ensure installations meet current standards and are safely maintained over time. By taking a systems-based approach to EV charging, one that prioritizes both safety and future scalability, residential owners can protect their homes, families, and investments for years to come.

- **Use Certified Chargers:** Always purchase UL-listed Level 2 chargers. These meet national safety standards.
- **Hire Licensed Electricians:** Installation should follow National Electrical Code (NEC) standards, particularly NEC Article 625.
- **Avoid Extension Cords:** These can overheat and create fire hazards
- **Install GFCI Protection:** Ground fault circuit interrupters prevent electric shocks and reduce fire risk.
- **Ventilation Matters:** Charging in a garage? Ensure adequate airflow to prevent overheating.
- **Regular Inspection:** Check cables, connectors, and outlet wear every few months.

FOR REAL ESTATE DEVELOPERS & PROPERTY MANAGERS

As electric vehicles become more common, residential owners must treat home charging with the same care as any major electrical system. EV charging introduces sustained high-voltage demand, which, if poorly managed, can pose serious fire and safety risks. Using certified equipment and hiring licensed electricians helps ensure code compliance and minimizes the chance of electrical faults. Many older homes may also need panel upgrades or dedicated circuits to safely support Level 2 charging. Common hazards often stem from simple oversights, like using extension cords, ignoring worn cables, or charging in garages with poor ventilation. Regular inspections and proper airflow are key to preventing heat buildup and maintaining system safety. By approaching EV charging as a long-term safety investment, homeowners can better protect both their property and their families.

- **Plan for Load Management:** Anticipate increased electrical demand and install load-balancing systems.
- **Implement Smart Charging Stations:** These monitor usage and prevent overcharging or overheating.
- **Comply with Local and National Codes:** Familiarize with NFPA 70 (NEC), IBC, and state fire codes.
- **Future-Proof Infrastructure:** Design parking areas to be EV-ready with conduit pathways and appropriate power capacity.
- **Post Safety Signage:** Clearly mark emergency shutdowns and provide instructions for users.
- **Routine System Checks:** Partner with certified inspectors or original charge point installers to audit and maintain systems annually.

FOR COMMERCIAL & FLEET OPERATORS

Commercial and fleet operators face unique fire safety challenges due to the high utilization and scale of their EV operations. With multiple vehicles charging simultaneously, even a single incident can disrupt logistics, damage infrastructure, and pose serious safety risks. To prevent this, operators must adopt a layered fire risk mitigation strategy, starting with certified charging hardware, thermal monitoring systems, and well-defined emergency shutdown protocols. Regular maintenance, staff training, and inspection routines are essential to catching early warning signs before they escalate. Ongoing coordination with charger manufacturers, insurers, regulators, and local emergency services helps ensure operations remain aligned with the latest safety standards and response strategies.

Equally critical is the integration of fire-safe logistics protocols : such as dedicated buffer zones for battery-equipped vehicles, temperature-controlled staging during transport, and isolation procedures for suspect units, especially during long-haul, warehouse, or maritime operations. Battery packs in transit or parked in dense depot settings must be treated as energy-dense assets with the same fire zoning and containment considerations as flammable cargo.

- **Use Industrial-Grade Chargers:** Ensure they meet UL 2202, UL 2231, and SAE J1772 standards.
- **Central Monitoring:** Install software that tracks thermal and electrical activity in real time.
- **Implement Emergency Protocols:** Train staff on fire response and charger shutdown procedures.
- **Thermal Imaging Audits:** Use infrared scans quarterly to detect overheating components.
- **Battery Management Systems (BMS):** Use BMS-equipped vehicles to prevent overcharging or deep discharging.
- **Insurance & Compliance:** Work with insurers familiar with EV risks and comply with NFPA 855 for energy storage safety.

KEY EV FIRE SAFETY TECHNOLOGIES AND THEIR APPLICATIONS

As EV adoption expands across urban centers, highways, and residential infrastructure, so does the need for technologies that can mitigate, detect, suppress, and respond to the unique fire risks associated with lithium-ion batteries. EV fires behave differently than traditional vehicle fires: they often involve delayed ignition, high-intensity heat, toxic off-gassing, and the potential for thermal runaway to propagate across battery cells or adjacent vehicles.

Fortunately, a growing spectrum of fire safety technologies is emerging to address these challenges at every stage, from early detection and incident prevention to suppression, containment, and post-incident recovery. These tools are designed not just for fire departments, but also for charger manufacturers, property developers, utilities, municipal planners, and the general public.

This section outlines the most critical EV fire safety technologies currently in use or in development, how they function, and where they fit within the broader EV ecosystem. Some are mature and commercially available; others are cutting-edge or under pilot deployment. Together, they represent the building blocks of a modern, multi-layered approach to EV fire risk management.

EV FIRE SAFETY TECHNOLOGIES RANGING FROM MONITORING AND MAINTENANCE TO FIRE SUPPRESSION AND EXTINGUISHING

MONITORING AND MAINTENANCE	CRITICAL RESPONSE TIME	LIMITING GAS EFFECTS AND CROSS PROPAGATION	DECOMMISSIONING /DISCHARGING THE BATTERY	FIRE SUPPRESSION AND EXTINGUISHING

MONITORING AND MAINTENANCE

	PRIMARY FUNCTION	DESCRIPTION	LIMITATIONS
VESDA (VERY EARLY SMOKE DETECTION APPARATUS)	Detects microscopic particles before visible smoke	A high-sensitivity smoke detector that detects early combustion particles prior to visible flames or smoke	High cost, requires regular calibration and maintenance.
THERMAL IMAGING CAMERAS	Detects heat hotspots during and after fires	Infrared cameras spot battery hotspots or leftover heat after a fire to check for risk of re-ignition.	Needs line-of-sight and trained operators; may miss hidden sources.
IOT TRANSFORMER HEALTH SENSORS	Monitors transformer heat/load near EV clusters	Real-time sensors track stress and issues in transformers near EV hubs to help prevent fires.	Requires wide sensor deployment and stable power/connectivity.
AI-BASED GRID MONITORING SYSTEMS	Predicts overloads and electrical risks	AI monitors charging data to predict power surges, find faults, and safely reroute electricity to reduce fire risk.	Needs large datasets and integration with utility infrastructure.
DIGITAL CHARGER PASSPORTS	Stores maintenance and thermal logs	Cloud-linked logs track service history, thermal events, and firmware updates for each EV charger.	Dependent on system interoperability and data accuracy.

CRITICAL RESPONSE TIME

	PRIMARY FUNCTION	DESCRIPTION	LIMITATIONS
AUTOMATIC THERMAL SHUTDOWN IN CHARGERS	Prevents overheating of connectors and circuits	Sensors detect overheating (e.g., above 60°C) and automatically shut down the charging system.	Doesn't fix the underlying fault; might need manual checks.
REMOTE SHUTDOWN SYSTEM	Remotely deactivates EVSE/vehicle systems	Enables remote shutdown of chargers or EVs during overheating, faults, or failures to prevent fire risk.	Depends on reliable communications and response time.

LIMITING GAS EFFECTS AND CROSS PROPAGATION

	PRIMARY FUNCTION	DESCRIPTION	LIMITATIONS
FIRE BLANKETS FOR EVS	Temporarily contains fire and slows heat spread for 15–30 minutes, giving responders time to act.	Heat-resistant blankets cover burning vehicles to smother flames and stop the fire from spreading.	Bulky and hard to apply in confined or chaotic spaces; some safety and quality issues depending on suppliers
GFCI (GROUND FAULT CIRCUIT INTERRUPTERS)	Cuts power during unsafe leakage	Detects stray current paths (e.g., water or humans) and cuts circuits to prevent shocks or fire.	May trip unnecessarily outdoors or in high-humidity environments.
IEC & UL-COMPLIANT CHARGER DESIGN	Ensures safety through certified infrastructure	Ensures chargers meet fire safety codes (IEC 60364-7-722, UL 2594), including insulation, clearances, and fault protection.	Compliance doesn't prevent all hazards; relies on proper inspection and enforcement.

DECOMMISSIONING/DISCHARGING THE BATTERY

	PRIMARY FUNCTION	DESCRIPTION	LIMITATIONS
QR-CODE ACCESSIBLE RESCUE SHEETS	Quick access to EV rescue instructions	Stickers link to ISO 17840 guides showing cut zones, battery layout, and high-voltage shutoff points.	Requires smartphone/internet access and trained responders.
AR- ENABLED SMART HELMETS	Enhance responder situational awareness	Augmented reality displays EV schematics, hazards, and heat maps to guide safe firefighting.	Expensive, requires connectivity, limited runtime.

FIRE SUPPRESSION AND EXTINGUISHING

	PRIMARY FUNCTION	DESCRIPTION	LIMITATIONS
SUBMERSION CONTAINERS	Cools and isolates runaway battery fires	Large water tanks or containers are used to submerge and put out burning EVs or batteries.	Heavy and difficult to transport or deploy in all locations.
VR FIRE RESPONSE SIMULATORS	Immersive training for EV fire scenarios	Virtual simulations of EV fires help train responders in firefighting techniques and handling high-stress situations.	Not applicable in live emergencies; only useful for training.

U.S. DOMESTIC EV FIRE SAFETY TRAINING & PUBLIC RESOURCES

For First Responders & Emergency Services

National Fire Protection Association (NFPA) – Alternative Fuel Vehicles Safety Training
Online and instructor-led training for EV and hybrid fire response. Topics include high-voltage systems, extrication, and thermal runaway.
Access

U.S. Fire Administration (USFA) – EV Fire Safety and Prevention Guides
Reports and outreach tools including emergency response guides and fire stats.
Access

Texas A&M TEEX – EV Safety for First Responders (CEF102)
A free 2.5-hour course covering EV fire awareness and incident response.
Access

National Alternative Fuels Training Consortium (NAFTC)
Training for first responders and technicians, online and hands-on.
Access

For Industry Professionals (Utilities, Installers, Fleet Managers)

OSHA & NREL – EV Infrastructure Safety Awareness
Technical bulletins and electrical/fire safety guidance for EVSE installations.
Access

SAE International – EV Fire Safety and Battery Hazard Mitigation
Standards and modules on hazard control, thermal management, and compliance.
Access

Eco Auto – In-Person Charger & Rescue Training
Emergency protocols and suppression training for charger installers and responders.
Access

For the General Public

USFA Fire Prevention Outreach – EV Safety Factsheets
Home charging, lithium-ion safety, and extension cord risk education.
Access

National Renewable Energy Laboratory (NREL) – Home EV Charging Safety
Guides for proper installation, ventilation, and safety compliance.
Access

Plug In America – EV Consumer Safety Tips
Covers safe charging practices, fire prevention tips, and user FAQs.
Access

Your Local Utility Providers (e.g., PG&E, Georgia Power, Con Edison)
Many utilities offer EV safety checklists, installation rebates, and fire support lines.

CONCLUSION: A LIVING FRAMEWORK FOR A RAPIDLY EVOLVING LANDSCAPE

As noted in our June 2025 whitepaper release, *Georgia EV Fire Safety Brief 2025: Bridging local policy in Atlanta with a Call for a Universal Standard*, cities like Atlanta, Boston, and Los Angeles, along with regions like the European Union and Australia, have shown that EV fire safety can be embedded in infrastructure from the start, without slowing innovation or delaying decarbonization goals. Their proactive leadership provides a model for others.

But the broader picture remains fragmented. Without global alignment on standards, training, data, and enforcement, lessons learned in one country may arrive too late in another. And without urgent investment in fire safety infrastructure, the rapid pace of EV adoption could outstrip our ability to contain its risks.

To move forward, the global EV community (governments, automakers, utilities, responders, developers) must treat fire safety not as a side concern, but as a pillar of safe electrification. This means building systems that are:

- **Standardized** across jurisdictions
- **Data-driven** and responsive to real-time risk
- **Equitable**, ensuring access to safety tools and training for all
- **Integrated**, from charger installation to battery disposal

Without this alignment, we risk repeating the early fragmentation of EV infrastructure, but with far more severe consequences.

LOOKING FORWARD

This guide is not a static summary of technical best practices. It is meant to be a living resource, reflecting the state of knowledge and policy as of 2025. As technologies mature, batteries evolve, charger designs shift, and ambient temperature and climate conditions intensify, so too will fire safety strategies. Future editions of this guide will integrate new data, updated standards, pilot program outcomes, and evolving regulatory landscapes.

Fire safety is not just a technical obligation; it is a matter of public trust. A universal, adaptive, and forward-looking EV fire safety framework is essential not only to protect lives but also to sustain the momentum of the advanced mobility future.

ABOUT GNEM AND THE UNIVERSITY OF GEORGIA E-MOBILITY INITIATIVE

The Georgia Network for Electric Mobility (GNEM) was established to advance the State of Georgia's leadership in electric mobility through multidisciplinary research, workforce development, community engagement, and collaborative partnerships. Aligned with the mission of the university, GNEM seeks to foster economic growth, drive technological innovation, and position Georgia as a global leading ecosystem in electric vehicle technology.

This white paper serves as a strategic document, offering data-driven guidance to stakeholders, policymakers, and industry leaders on the evolving landscape of electric mobility and Georgia's emerging role. It provides a comprehensive analysis of historical trends, current opportunities, and future outlooks, establishing a foundation for strategic decision-making in electric mobility and future whitepapers related to this work.

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