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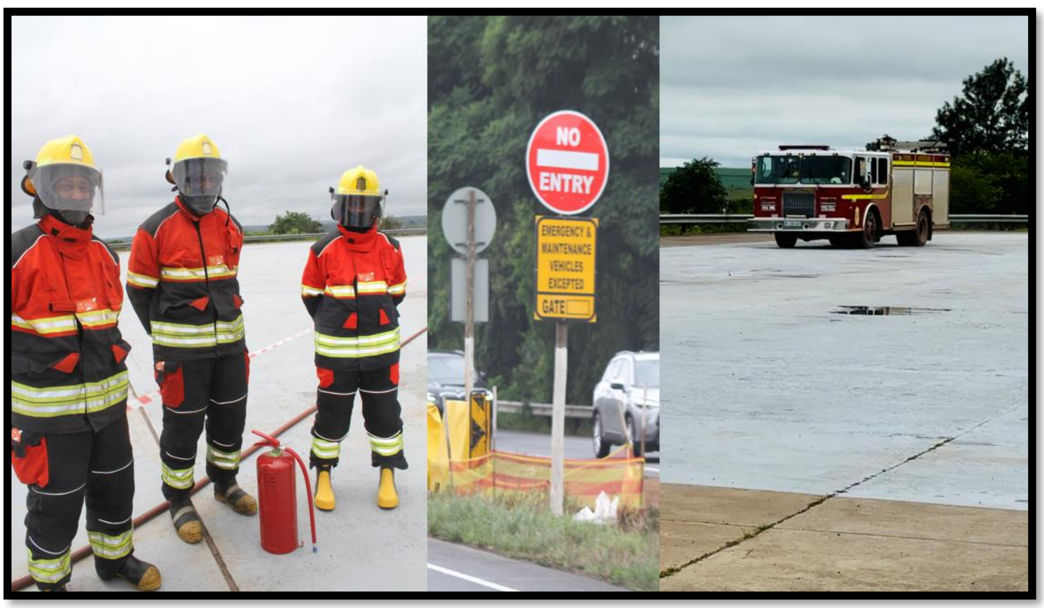
NEW ENERGY VEHICLES:

A REVIEW OF BEST PRACTICES FOR FIRST RESPONDERS.



Dec 2025

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RIMS
ROAD INCIDENT MANAGEMENT SYSTEM

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DISASTER MANAGEMENT AND EMERGECNY RESPONSE FOR NEVS

1.1. Introduction

NEVs introduce unique hazards in the event of a crash. NEVs are equipped with advanced powertrains and energy storage systems that differ significantly from those in traditional internal combustion engine vehicles. The high-voltage batteries in BEVs and HEVs, as well as the high-pressure hydrogen tanks in FCEVs, pose distinct risks, including electric shock, fire, explosion, and the release of hazardous materials. Additionally, the complex electronic systems in these vehicles require specialized knowledge and tools for safe handling.

1.2. Incident response guidelines

Pre-Incident Planning

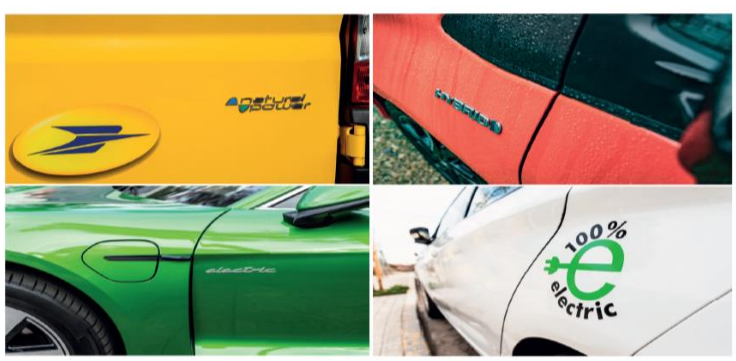
Proper training and the right protective equipment are crucial for first responders to safely manage the risks associated with high-voltage systems in EVs. Training programs should focus on understanding and identification of EV systems, safe extrication techniques, handling battery fires, and post-incident procedures.

Equipping responders with insulated gloves, tools, protective clothing, thermal imaging cameras, and fire suppression equipment will enhance their safety and effectiveness in emergencies involving EVs.

Knowledge and Training

Training and education for first responders ensures that emergency personnel are educated on the differences between NEVs and traditional vehicles, including specialized training on identification of high-voltage systems and battery or fuel cell technology.

Identification of the type of vehicle in an EV incident is an important first step. Internationally, NEVs have specific colours and markings that are mounted on the bottom edge or tailgate wing



International markings and identification of NEVs (Institute for technology and engineering, 2021)

Currently there are no national standardised signs, symbols, or pavement markings in South Africa to identify Low and Zero Emission Vehicles (LZEVs) charging infrastructure or charging locations (Monyatsi, 2023).

Some stakeholders and agencies have commenced installing some infrastructure signage without a clear national standard and this can potentially cause frustration amongst drivers and consequently pose a risk for road users.

The Institute for Technology and Engineering (2021) states that components specific information related to equipment in NEVs should be visible and easy to locate such as in the front vehicle compartment, the boot or on the equipment themselves.

International recommendations for locating component specific information (Institute for technology and engineering, 2021)

Furthermore, all safety and operational instructions pertaining to the NEV should be in the OEM specific vehicle specific handbook. This should also include a service and maintenance history for the vehicle.

Recommendations for first responder training and protocols for assessing NEVs in incidents.

First responder training and protocols for NEVs

Theme	Objective	Actions
Identification of Electric vehicles	Helps responders quickly and accurately identify electric drive vehicles involved in an incident.	Visual identification cues such as badges, logos, and external charging ports. Information on accessing vehicle identification numbers (VIN) to determine the type of vehicle.
Components and Layouts	Familiarize first responders with the basic components and electrical systems of BEVs, including high-voltage cables, battery packs, and electric motors.	Conduct classroom sessions covering the anatomy of various BEV models. Use diagrams and physical models to illustrate the location

First responder training and protocols for NEVs		
Theme	**Objective**	**Actions**
		and appearance of high-voltage components. Emphasize the color-coding of high-voltage cables (typically orange).
Identifying and Deactivating High-Voltage Systems	Train responders to quickly and safely identify and deactivate the high-voltage system in an emergency.	Teach the use of manufacturer-specific emergency response guides that detail the location of high-voltage disconnect points. Provide hands-on training with actual BEVs or realistic simulators. Demonstrate procedures for safely cutting the power to the high-voltage system, such as using insulated tools to disconnect the 12-volt auxiliary battery, which often controls the high-voltage contactors.
Safe Extrication Techniques	Develop skills for safely extricating occupants from BEVs without encountering high-voltage components.	Practice scenarios that involve accessing trapped occupants while managing high-voltage risks. Train on proper cutting techniques and the use of extrication tools to avoid high-voltage areas. Highlight the importance of maintaining a safe distance from high-voltage cables and components during extrication

First responder training and protocols for NEVs		
Theme	**Objective**	**Actions**
Handling Battery Fires and Thermal Runaway	Equip responders with knowledge on how to manage and extinguish battery fires, which may behave differently from conventional vehicle fires.	Conduct fire suppression training specific to lithium-ion battery fires, including the use of water and specialized fire extinguishers (e.g., Class D). Teach the signs of thermal runaway and appropriate cooling techniques to prevent reignition. Emphasize the need for continuous monitoring of the vehicle after extinguishing a fire to detect possible re-ignition.
Post-Incident Procedures	Ensure safety after the immediate danger has passed, including handling damaged batteries and contaminated sites.	Train on securing and transporting damaged BEVs to prevent further incidents. Provide protocols for dealing with battery spillage and environmental hazards. Teach proper reporting and documentation practices for incidents involving EVs.
References: U.S. Department of Energy's Emergency Response Guide for Electric Drive Vehicles (2014). (Society of Automative Engineers National Fire Protection Association (NFPA) 70E: Standard for Electrical Safety in the Workplace (2017).		

First responder training and protocols for NEVs		
Theme	**Objective**	**Actions**
NFPA 70E guidelines for personal protective equipment (PPE) (2017).		

Equipment Preparedness

Evaluating and updating emergency response equipment to handle NEV incidents, such as insulated tools, chemical spill kits, and personal protective equipment (PPE) for electrical and chemical hazards .

Guidance on equipment specifications and use in NEV incidents		
Equipment	**Specification**	**Use**
Insulated Gloves	High voltage insulated gloves rated for at least 1000 volts	Always Worn when handling or working near high-voltage components
Insulated Tools	Tools with insulation rated for at least 1000 volts, including cutters, pliers, and screwdrivers.	Used for disconnecting high-voltage components and performing other tasks that involve potential contact with live parts.
Face Shields and Protective Clothing	Arc-rated face shields and flame-resistant clothing to protect against electrical arcs and fires.	Worn during extrication, cutting operations, and when working near high-voltage components.
Thermal Imaging Cameras	Cameras capable of detecting heat signatures to identify hot spots and battery fires.	Used to locate thermal runaway and monitor battery temperature during and after extinguishing fires.
Fire Suppression Equipment	Class D fire extinguishers for lithium-ion battery fires and large quantities of water for cooling.	Deployed to extinguish battery fires and prevent thermal runaway.
High-Voltage Detectors	Portable devices to detect the presence of high voltage in the vehicle.	Used to ensure that high-voltage systems are deactivated before commencing rescue operations.
References:		

Guidance on equipment specifications and use in NEV incidents		
Equipment	**Specification**	**Use**
U.S. Department of Energy's Emergency Response Guide for Electric Drive Vehicles (2014). (Society of Automative Engineers National Fire Protection Association (NFPA) 70E: Standard for Electrical Safety in the Workplace (2017). NFPA 70E guidelines for personal protective equipment (PPE) (2017).		

Incident Response Protocols

Procedures for safely approaching NEV incidents, including establishing a safe perimeter, identifying the type of vehicle involved, and assessing immediate hazards.

Applicable to all NEV incidents is the need to stabilize the vehicle by placing the vehicle in park and set the parking brake. Use wheel chocks to prevent unintended movement.

The vehicle needs to be powered down if it is not already powered down by turning off the ignition and remove the key or key fob to a safe distance. Recommendations are to follow manufacturer-specific procedures to disable high-voltage systems or hydrogen fuel systems.

Overview of response protocols for establishing a safe perimeter.

Step 1 Establish a Safe Perimeter		
Phase	**Objective**	**Action**
Initial Assessment	Conduct a quick assessment from a safe distance to evaluate the situation and determine the level of response required.	Look for visible signs of danger such as smoke, fire, leaking fluids, or damaged power lines.
Secure the scene	Create a safe working area around the incident to protect responders and the public.	Set up barriers or cones to establish a perimeter at least 15 meters away from the vehicle if there is no immediate fire or hazard. Increase the perimeter to 30 meters or more if there are visible flames or if the battery is on fire.

Step 1 Establish a Safe Perimeter		
Phase	**Objective**	**Action**
Control Traffic and Bystanders	Ensure the area remains clear of unauthorized personnel.	Use police or additional responders to manage traffic and keep bystanders outside the established perimeter.
References: U.S. Department of Energy's Emergency Response Guide for Electric Drive Vehicles National Fire Protection Association (NFPA) 70E: Standard for Electrical Safety in the Workplace		

Below an overview of response protocols for identifying the vehicle

Step 2 Identify the vehicle and vehicle type		
Phase	**Objective**	**Action**
Visual Identification	Determine if the vehicle involved is an NEV, such as an EV or HEV.	Look for manufacturer logos or model names that indicate the vehicle is electric or hybrid. Identify charging ports or external power connectors.
Vehicle Identification Number (VIN)	Confirm the vehicle type using the VIN	Locate the VIN, usually found on the dashboard near the windshield or on the driver's side door frame. Use mobile apps or databases provided by manufacturers to decode the VIN and confirm the vehicle type.
References:		

Step 2 Identify the vehicle and vehicle type		
Phase	**Objective**	**Action**
International Association of Fire Chiefs (IAFC) Electric Vehicle Safety for Emergency Responders SAE International's J2990 (2019) Hybrid and Electric Vehicle First and Second Responder Recommended Practice		

Overview of response protocols for assessing the scene for immediate hazards.

Table 1: Step 3 Assessing the scene for immediate hazards		
Phase	**Objective**	**Action**
Check for Visible Hazards	Identify immediate risks such as fire, smoke, or leaking fluids.	Look for flames or smoke coming from the vehicle, which may indicate a battery fire. Check for any fluids leaking from the vehicle, which could be coolant, battery electrolyte, or other hazardous materials.
Identify High-Voltage Components:	Locate high-voltage components to avoid accidental contact.	Use manufacturer-specific emergency response guides to identify the location of high-voltage cables (usually orange) and battery packs. Avoid cutting or touching any high-voltage components unless necessary and only with appropriate tools.
Evaluate the Stability of the Vehicle	Ensure the vehicle is stable and will not shift or roll	Chock the wheels and use stabilizing equipment if necessary Be cautious of the vehicle's position, especially if it is on an incline or at risk of tipping over.
National Transportation Safety Board, 2020 NFPA's Alternative Fuel Vehicles Training Program		

Table 1: Step 3 Assessing the scene for immediate hazards		
Phase	**Objective**	**Action**
Fire Protection Research Foundation's "Best Practices for Emergency Response to Incidents Involving Electric Vehicles"		

Overview of response protocols for assessing the scene.

Step 4 Implementing Safety Protocols		
Phase	**Objective**	**Action**
Deactivating High-Voltage Systems	Safely deactivate the high-voltage system to prevent electric shock.	Locate and disconnect the 12-volt auxiliary battery, which controls high-voltage relays. Follow manufacturer-specific procedures for isolating the high-voltage system.
Fire Suppression	Extinguish any fires and cool the battery pack to prevent thermal runaway.	Use large amounts of water to cool the battery. Water can effectively absorb heat and prevent the battery from reigniting. If a Class D fire extinguisher is available, use it to control the initial flames.
Extrication Procedures:	Extricate occupants from the vehicle without contacting high-voltage components.	Use insulated tools and wear appropriate PPE such as high-voltage gloves and face shields. Follow extrication guidelines provided in the emergency

Step 4 Implementing Safety Protocols		
Phase	**Objective**	**Action**
		response guides specific to the vehicle model.
U.S. Department of Energy's Emergency Response Guide for Electric Drive Vehicles Feng, X., et al. (2018). "Thermal runaway mechanism of lithium-ion battery for electric vehicles: A review." Energy Storage Materials, 10, 246-267. Society of Automotive Engineers (SAE) J2990: Hybrid and Electric Vehicle First and Second Responder Recommended Practice		

Handling Battery Fires and Thermal Runaway

Procedure: Use large quantities of water to cool the battery and prevent thermal runaway. Employ Class D fire extinguishers for initial suppression of lithium-ion battery fires.

Safety: Monitor the battery for re-ignition and ensure continuous cooling. Keep a safe distance and use thermal imaging cameras to detect hot spots (Feng, 2018).

Extrication Procedures

Procedure: Safely extricate occupants by avoiding high-voltage components. Identify safe cutting points using manufacturer-specific emergency response guides.

Safety: Use insulated cutting tools and follow proper extrication techniques to minimize the risk of electric shock and further injury to occupants (Society of Automotive Engineers, n.d.).

Post-Incident Management

Post-incident management of NEV crashes requires meticulous procedures and heightened awareness of the unique hazards associated with electric and hydrogen powertrains. By following established protocols, ensuring thorough documentation, and maintaining regular training, first responders can effectively manage the aftermath of NEV incidents, minimizing risks and enhancing safety for all involved.

NEV identification and procedures to safeguard the scene

International best practice stipulates that first responders need to identify the type NEV to correctly address the incident safely. Table provide an overview of procedures per vehicle. Monitor the vehicle for re-ignition and contain any hazardous materials. Use thermal imaging cameras to check for hot spots on the battery pack. Secure the vehicle and arrange for safe transport to a facility equipped to handle damaged electric vehicles (International Association of Fire Chiefs, 2017).

Overview of NEV type and procedures associated with addressing hazards for the type of NEV.

Table 2: NEV type and procedures

Type	Procedure
Battery Electric Vehicles (BEVs):	Confirm the deactivation of the high-voltage battery system. Monitor for signs of thermal runaway (e.g., smoke, hissing sounds) and be prepared to manage potential battery fires.
Hybrid Electric Vehicles (HEVs):	Verify the shutdown of both the internal combustion engine and the electric motor. Identify and avoid cutting high-voltage cables, usually marked with orange insulation.
Fuel Cell Electric Vehicles (FCEVs	Ensure safe handling of high-pressure hydrogen storage tanks. Ventilate the area if there is a suspected hydrogen leak and avoid ignition sources. Follow procedures for disconnecting or securing the hydrogen system.

U.S. Department of Energy's Emergency Response Guide for Electric Drive Vehicles

Feng, X., et al. (2018). "Thermal runaway mechanism of lithium-ion battery for electric vehicles: A review." Energy Storage Materials, 10, 246-267.

Society of Automotive Engineers (SAE) J2990: Hybrid and Electric Vehicle First and Second Responder Recommended Practice

Fire Safety and Containment

Fire suppression needs to be conducted using water or foam extinguishers to manage fires in NEVs, as they help cool the battery and extinguish flames. Recommendations are to avoid using dry chemical extinguishers on lithium-ion battery fires.

If a battery fire occurs, use copious amounts of water to cool the cells and prevent thermal runaway. After extinguishing a fire, continue to monitor the vehicle for re-ignition or further thermal events. Isolate the vehicle from other vehicles and structures to prevent fire spread (International Association of Fire Chiefs, 2017).

Towing and Storage

Towing Procedures

- Use tow trucks and personnel experienced with NEVs to avoid damaging high-voltage components.
- Ensure the vehicle is securely loaded and transported to a designated storage facility.

Storage Considerations

- Store the NEV in an isolated area, preferably outdoors, to minimize risks from delayed thermal events or hydrogen leaks.
- Ensure the storage area has adequate ventilation and fire suppression measures in place.

Documentation and Reporting

Document all actions taken during the incident, including power-down procedures, extrication steps, and fire suppression efforts. Record any unusual behaviours or safety concerns observed during the incident.

In addition, there is a need to notify the vehicle manufacturer about the incident to provide feedback on vehicle performance and safety systems. Share incident details to assist in future safety improvements and training materials.

1.3. Environmental management in South Africa

The National Environmental Management Act (NEMA) Section 30 (Control of Incidents) defines an incident as an "unexpected, sudden, and uncontrolled release of a hazardous substance, including from a major emission, fire, or explosion, causing or having the potential to cause significant harm to the environment, human life, or property''

In January 2025 the NEV working group received input from the National Department of Forestry, Fisheries and the Environment (DFFE) regarding the management of battery leakages and so forth to protect the environment.

The DFFE indicated that batteries damaged during incidents must be collected and stored by the cleanup team. The damaged batteries must then be traded or handed over to companies recycling old or damaged battery. Batteries are classified under electrical waste therefore cannot be disposed at a landfill site like any other waste.

Responsibility to report the incident to the Department of Environmental Affairs

The report will be on a case-by-case basis. For instance, if the incident cause **fire or explosion or release of hazardous substance**, that incident can be reported to all spheres of government. The battery acid may be hazardous but the **quantity** release (e.g. 5 liters) may require cleanup company to contain, clean up and rehabilitate the contaminated site. Kindly refer to attached section 30 guideline document.

The DFFE indicated that the Department have guideline documents which provide guidance on the types of substances and quantities to be reported or trigger reporting an incident as a NEMA S30. For instance, the reportable quantity of battery fluid (no. 593) according to S30 guideline must be 10 kg or 10 litres. Anything which is 10 kg/l or above must be treated as a NEMA S30 and the responsible person must contain, cleanup and rehabilitate the contaminated site. Furthermore, the responsible person must compile and submit S30 report to all spheres of government affected (Local, province, DFFE, DWS etc.)

Qualification or experience requirements relevant to the response team

Currently there is no guidelines or specifications related to qualifications or experience of response team handling the incidents. However, a recommendation was that the response team will need to first do a do risk assessment before they handle hazardous substances.

Monitoring of the incident, including post incident procedures

Officials from local and provincials are closure to sites where incidents occur. It is therefore expected to monitor the clean-up and rehabilitation of the contaminated areas. Officials from DFFE will also monitor the site together with other officials (local and province) if need be.

Disposal of contaminated batteries and fuel cells

Contaminated product from site needs to be classified by the cleaning company. For example, waste collected can be general waste or hazardous waste. Waste contaminated by the battery acid or hydrocarbon is classified as hazardous and must be disposed of at a hazardous landfill site.

1.4. Additional considerations for South African NEV incident management

Water scarcity is a pressing issue in South Africa, exacerbated by prolonged droughts, climate change, and increasing demand from a growing population. This scarcity has critical implications for firefighting capabilities, especially when dealing with NEV incidents.

Electric vehicles (EVs), for example, require substantial amounts of water to control battery fires, which can be more intense and longer lasting than conventional vehicle fires. A study highlighted that the average EV battery fire can require up to 20,000 liters of water to be effectively managed (Smith et al., 2021). In regions where water is already a precious resource, this creates a significant hurdle for first responders.

The degeneration of infrastructure further compounds the challenges faced by emergency services. South Africa’s aging road networks, deteriorating bridges, and unreliable electrical grids hinder the rapid and effective deployment of emergency response teams. According to the South African Institution of Civil Engineering (SAICE) Infrastructure Report Card (2017), many critical infrastructures are in a state of disrepair, which affects the response time of emergency services. Poor road conditions can delay the arrival of fire trucks and ambulances to the scene of NEV incidents, while unreliable power supplies can affect communication systems and the operation of essential equipment.

The combination of water scarcity and infrastructural degeneration severely impacts the ability of emergency services to respond to NEV incidents efficiently. Delayed response times and inadequate firefighting resources can lead to more severe consequences, including prolonged fires, greater property damage, and higher risks to human life. The unique nature of NEV incidents, particularly involving lithium-ion batteries, requires specialized training and equipment, which many South African emergency services lack due to limited funding and resources (Johnston et al., 2022).

Moreover, the degeneration of infrastructure affects not just the response to NEV incidents but also the overall preparedness and resilience of communities. The lack of reliable infrastructure means that emergency drills and training exercises are less effective, further diminishing the capability of first responders to handle complex incidents involving advanced technology like NEVs (Johnston, 2022).

The challenges of water scarcity and infrastructural degeneration in South Africa present significant barriers to effective emergency first response to NEV incidents. Addressing these issues requires substantial investment in water resources, infrastructure repair and modernization, and specialized training for emergency responders. Without these critical improvements, the risks associated with NEV incidents will continue to pose serious threats to safety and property in South Africa.

2. SUPPLEMENTARY CONSIDERATIONS IN SUPPORT OF MANAGING NEV INCIDENTS

2.1. Introduction

This section explores these additional measures in detail, highlighting their importance and interconnectivity in fostering a safer environment for NEV integration into modern transportation networks.

Public education campaigns are essential to inform the general populace about the unique characteristics and potential hazards associated with NEVs. These initiatives can enhance community awareness and preparedness, reducing the likelihood of accidents and improving emergency response outcomes.

Driver education programs tailored to NEV users can significantly contribute to safe vehicle operation, emphasizing the differences between NEVs and traditional vehicles. Educating drivers on proper maintenance, safe driving practices, and emergency procedures can mitigate risks and enhance overall safety.

OEMs have a crucial responsibility in promoting NEV safety. By designing safer vehicles, providing comprehensive user manuals, and collaborating with emergency services, OEMs can play an instrumental role in incident prevention and management.

2.2. Training of EMS and first responders

The training of first responders remains a cornerstone of NEV incident management. Specialized training programs equip emergency personnel with the necessary knowledge and skills to handle NEV-specific challenges, ensuring efficient and safe responses during emergencies.

The U.S. Department of Energy (DOE) has developed an Emergency Response Guide for Electric Drive Vehicles to assist first responders in safely handling incidents involving electric and hybrid vehicles. This guide provides detailed instructions and safety protocols to address the unique challenges posed by these vehicles. The guide provides detailed identification methods, safety precautions, deactivation procedures, firefighting techniques, extrication procedures, and post-incident handling guidelines, the guide equips responders with the knowledge and tools needed to manage these incidents safely.

Key recommendations in terms of training for first responders revolve around:

- **Regular Training and Drills:** First responders should undergo regular training and participate in drills that simulate incidents involving electric drive vehicles. Regular drills will ensure familiarity with the latest technologies and safety procedures, improving response effectiveness and safety.
- **Access to Specialized Equipment:** Emergency response teams should be equipped with specialized tools and PPE designed for handling high-voltage systems. These tools and

equipment, discussed in section 5 provides the necessary protection and capabilities to manage the unique risks associated with electric drive vehicles.

SAE International's J2990 Recommended Practice for Hybrid and Electric Vehicle First and Second Responders also provides comprehensive and practical guidelines to ensure the safety and efficiency of emergency response teams. J2990 helps to standardize procedures, enhance responder safety, and improve operational effectiveness. SAE International's J2990 also focuses on procedures however added benefits include an emphasis on:

- Following standardized procedures, responders can significantly reduce the risk of injury or fatality when dealing with high-voltage systems and battery fires.
- The need for clear and concise guidelines enables responders to act quickly and effectively, improving overall response times and outcomes.
- Uniform procedures facilitate better coordination between different response teams and agencies.
- The recommended practices support the creation of standardized training programs, ensuring all responders have the necessary knowledge and skills.
- Encourages the sharing of best practices and lessons learned across different regions and organizations.
- Demonstrating the capability to handle hybrid and electric vehicle incidents safely and effectively can enhance public trust in emergency services.
- Providing clear guidelines and procedures helps in maintaining transparency and accountability in emergency response operations.

The National Fire Protection Association (NFPA) has developed the Alternative Fuel Vehicles Training Program to equip first responders with the knowledge and skills needed to safely manage incidents involving alternative fuel vehicles, including electric vehicles (EVs), hybrid electric vehicles (HEVs), and other non-conventional fuel vehicles. Like the training guides above, the training program addresses the challenges and safety considerations associated with these types of vehicles. However, this training programme also makes provision for practical training and implementation while focusing on the fact that first responders need current and up to date information pertaining to NEV technology.

2.3. Collaboration with NEV Vehicle Manufacturers

There is a need to work towards international standards for NEV safety features and emergency response procedures to ensure consistency and effectiveness across borders. OEMs need to provide proper identification for NEVs including vehicle badging (labelling) placed at standardized, consistent locations on the exterior and/or interior of the vehicle identifying that a vehicle contains high voltage systems for first or second responders arriving at an incident. In addition, by partnering with and encouraging collaboration between emergency response agencies and vehicle manufacturers to share information on NEV technologies there is an opportunity for OEMS and first responders to collaborate and integrate safety features designed to aid emergency responders.

2.4. Role of public training and awareness

Effective programs for informing NEV owners about the risks associated with their vehicles and how to respond in emergencies are essential for enhancing owners' safety and preparedness in the event of incidents (NHTSA., 2017).

NEV manufacturers should provide comprehensive owner manuals that include detailed information on the vehicle's components, potential hazards, and emergency procedures. Simplified quick reference guides should be included, highlighting critical safety information and emergency steps in an easily accessible format.

Kapp (2017) highlights the benefit that online training and awareness programmes can have. In addition, there is a need for OEMs to conduct regular safety campaigns through various media channels (social media, email newsletters, community workshops) to keep NEV owners informed about new safety information and updates.

OEMs can also offer hand-on-training and emergency response workshops for NEV owners. In addition, with advancements in technology OEMs can invest in the development of user applications with that integrate safety features, including emergency contact information, step-by-step emergency procedures, and real-time alerts.

2.5. Conclusion

Although an argument can be made for the adoption of NEVs in countries such as South Africa, there is still substantial hurdles to overcome before the benefits for the environment, economy, and society can evolve.

International policy frameworks are shaping the future of New Energy Vehicles. Internationally, benefits of adopting NEVs are framed in relation to stringent emission targets, providing financial incentives, and supporting infrastructure development, these frameworks drive the adoption of NEVs and contribute to global sustainability goals. However, challenges such as standard harmonization, infrastructure development, and economic equity must be addressed to ensure a smooth transition to a cleaner, more efficient transportation future.

It should however be noted that there is not an overarching legislative or policy framework that governs the range of NEVs in SADC or in South Africa. The policy frameworks governing NEVs in South Africa and the SADC region needs to shape to drive the transition towards sustainable transportation. While progress has been made, challenges such as infrastructure development, policy harmonization, and economic incentives need to be addressed to facilitate the adoption of NEVs in Southern Africa.

As the adoption of electric vehicles increases, so does the importance of preparing emergency services to handle these specific types of incidents. This includes ensuring sufficient water supplies, specialized training, and the development of new safety protocols.

NEVs differ structurally from traditional vehicles and as such requires special considerations in emergencies and incidents. NEVs are equipped with high-energy batteries that store significant quantities of energy (electricity), retain it efficiently, and discharge it at a high rate.

Each NEV type features advanced components like high-voltage batteries, electric motors, power electronics, and sophisticated energy management systems, which present unique considerations for operations, maintenance and safety as well as necessitate product specific protocols for response to NEV incidents. In terms of emergency response, the uniqueness of the vehicles needs to be considered in relation to the hazard that it can potentially be for first responders. In accidents, extricating passengers from NEVs may be more complex due to the location and nature of battery packs and electrical systems.

There is therefore a need to develop vehicle type (components, fuel source) specific safety protocols and first responders need training to safely handle incidents involving these vehicles. In addition, the byproducts of these components/ fuel sources should be considered as hazardous materials.

In crashes involving NEVs, first responders must navigate these hazards while performing rescue operations, fire suppression, and vehicle stabilization. The procedures for safely managing NEV incidents are more complex than those for conventional vehicles, necessitating specific training and preparedness.

Post-incident management of NEV crashes requires meticulous procedures and heightened awareness of the hazards associated with electric and hydrogen powertrains. Emergency personnel responding to NEV incidents need to be protected. This necessitates the need for updated firefighting techniques and equipment (PPE and equipment to investigate NEV incidents).

Country specific challenges such as a current crumbling of infrastructure and scarce resources such as water has implications for emergency response to NEV incidents in countries like South Africa.

References