

## Workshop on Emergency Responder PPE for Hybrid and Electric Vehicles

### 8) PPE Enforcement Infrastructure



### Why is OSHA Interested in Electrical Safety?

- About 8,000 electrical contact injuries referred to emergency rooms annually in the United States (not all in the workplace)
- Recent statistics indicate that one person has been electrocuted in the workplace almost every working day

### OSHA/BLS Statistics

#### Fatal and Nonfatal Electrical Contact Injuries (From OSHA Final Rule 02/14/2007)

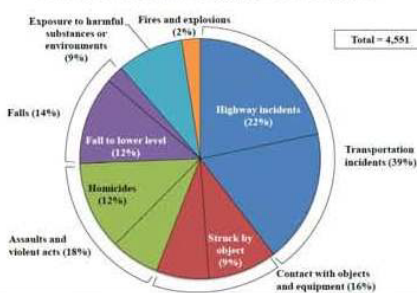
Year	Number of "Lost-Time" Injuries	Number of Fatalities
1992	4806	317
1996	4126	268
2000	3704	256
2004	2650	254

Recent BLS Statistics (2009):  
2960 "Lost-Time" Injuries and 192 Fatalities

### Safety Triangle



#### Manner in which fatal work injuries occurred, 2009



More fatal work injuries resulted from transportation incidents than from any other event. Highway incidents alone accounted for more than one out of every five fatal work injuries in 2009.

### OSHA Standards for Enforcement

- The General Duty Clause - Requires workplaces free from recognized hazards
- Employees are required to comply with rules pursuant to the act
- The Specific Duty Clause - Requires the employer to comply with OSHA standards

Figure E(1): Presentation by M. Earley on "PPE Enforcement Infrastructure"

**OSH Act  
General Duty Clause**

**SEC. 5. Duties** (29 USC 654)

(a) Each employer --

(1) shall furnish to each of his employees employment and a place of employment which are free from recognized hazards that are causing or are likely to cause death or serious physical harm to his employees;

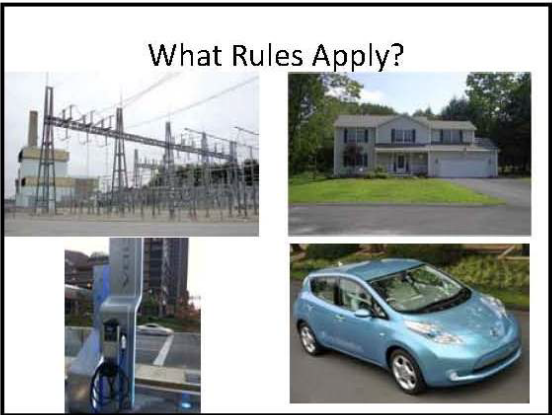


Figure E(2): Presentation by M. Earley on "PPE Enforcement Infrastructure"

### Codes, Standards and Regulations

Electrical PPE Requirements

### Codes, Standards and Regulations

Vehicle requirements

### Codes, Standards and Regulations

Electric vehicle charging requirements on electric utility property

### Who is the Enforcer?

### PPE Enforcement Infrastructure

- Federal OSHA is just now becoming aware of the EV issue.
  - They will need more time to study this, and scope of the topic and how it applies to OSHA is not clear at this time.

### PPE Enforcement Infrastructure

- Approximately 26 states also have a state OSHA, and they must meet or exceed federal OSHA.
  - Thus, in about half the states it's possible to have additional more rigorous requirements.
- Federal OSHA has jurisdiction only if other Federal authorizes have relinquished jurisdiction (e.g., off-shore oil rigs are covered by others).
  - This is another detail they will need to address to ultimately clarify scope of responsibility.

Figure E(3): Presentation by M. Earley on "PPE Enforcement Infrastructure"



### PPE Enforcement Infrastructure

- The scope of federal OSHA coverage is dependent of the particular emergency scenario in question.
  - For example, while a publically employed fire fighter at a vehicle fire on the highway might be outside their scope of jurisdiction, a private electrician working on a charging station in a parking garage would likely be covered.
- Generally federal OSHA does not apply to public employees, which would include publically employed emergency responders (and thus some but not all).
  - However, private employees such as electricians or salvage/tow operators are not necessarily excluded from the scope of OSHA (unless for other reasons).

### PPE Enforcement Infrastructure

- Employees who work for state and local governments are not covered by Federal OSHA, but have OSH Act protections if they work in a state that has an [OSHA-approved state program](#). Four additional states and one U.S. territory have OSHA approved plans that cover public sector employees only. This includes: Connecticut, Illinois, New Jersey, New York, and the Virgin Islands. Private sector workers in these four states and the Virgin Islands are covered by Federal OSHA.

### PPE Enforcement Infrastructure

- Electrical inspectors only inspect the electrical infrastructure. They have no ability to enforce the use of personal protective equipment requirements.
- OSHA enforces work practice requirements, including the use of PPE.

### PPE Enforcement Infrastructure

- Department of Transportation
- Federal Aviation Administration
  - Federal Highway Administration
  - Federal Motor Carrier Safety Administration
  - Federal Railroad Administration
  - Federal Transit Administration
  - Maritime Administration
  - National Highway Traffic Safety Administration
  - Pipeline and Hazardous Materials Safety Administration
  - Research and Innovative Technology Administration
  - Saint Lawrence Seaway Development Corporation
  - Surface Transportation Board
  -

### PPE Enforcement Infrastructure

The National Highway Traffic Safety Administration (NHTSA) is responsible for reducing deaths, injuries and economic losses resulting from motor vehicle crashes. NHTSA sets and enforces safety performance standards for motor vehicles and equipment, and through grants to state and local governments enables them to conduct effective local highway safety programs. NHTSA investigates safety defects in motor vehicles, sets and enforces fuel economy standards, helps states and local communities reduce the threat of drunk drivers, promotes the use of safety belts, child safety seats and air bags, investigates odometer fraud, establishes and enforces vehicle anti-theft regulations and provides consumer information on motor vehicle safety topics. Research on driver behavior and traffic safety is conducted by NHTSA to develop the most efficient and effective means of bringing about safety improvements.

### National Transportation Safety Board

- NOT AN ENFORCEMENT AGENCY
- OFFICE OF HIGHWAY SAFETY Investigates those accidents that have a significant impact on the public's confidence in highway transportation safety, generate high public interest and media attention, or highlight national safety issues. HS staff investigates accidents involving issues with wide-ranging safety significance, such as collapses of highway bridge structures, fatalities on public transportation vehicles (such as buses and vans), and collisions at highway/rail grade crossings. In addition to these more catastrophic accident events, HS also conducts studies based on trends emerging from NTSB accident investigations and from other research and accident data to identify common risks or underlying causes of accidents.

Figure E(4): Presentation by M. Earley on “PPE Enforcement Infrastructure”

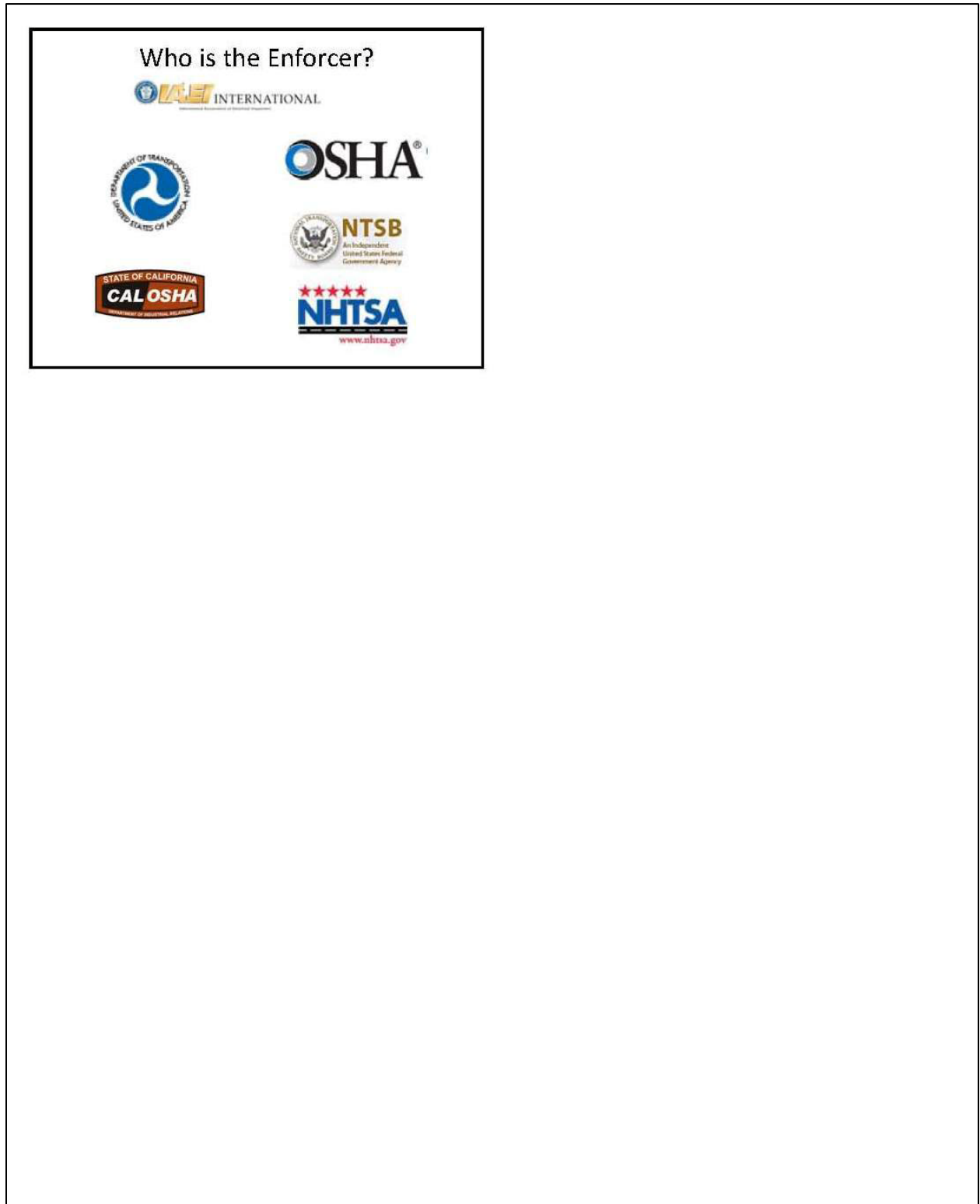


Figure E(5): Presentation by M. Earley on "PPE Enforcement Infrastructure"

Hybrid and EV First and Second Responder Task Force

**SAE J2990 RECOMMENDED PRACTICE**

**NFPA PPE WORKSHOP  
MAY 1<sup>ST</sup>, 2012**

### J2990 Scope and Rationale

- Electrified vehicles entering market
  - New potential hazards for responders
    - Electrical, chemical, thermal
- Provide common practices for response personnel
  - Take into consideration from initial emergency response through potential vehicle repair and salvage
  - Assume NiMH and Li-Ion battery chemistries

### J2990 – Who’s providing input

- Task Force includes representatives from:
  - First Responders (including NFPA)
  - Automotive OEM’s
  - NHTSA
  - Tow & Recovery Personnel
  - Battery Manufacturers
  - Salvage Yards

### J2990 TF Baseline Assumption

- Reviewed a Crash Scenario
  - Identified all response steps
    - 1<sup>st</sup> Responders through Salvage Yard
- Gaps for electrified vehicles identified
- Gaps assigned to subtask force groups

### J2990 Documentation

1. Rationale, Scope, Applicability, Definitions
  - Background
  - Pre-Incident Recommendations (for OEM’s)
    - ERG / EFG Information
    - Vehicle labeling recommendations
2. First Responder Recommendations
  - Identification of EV
  - High Voltage (HV) disabling procedure
  - Function of Manual Disconnect
  - Hazard Communication
3. Second Responder Recommendations
  - Inspections of HV System
  - Handling of damaged HV system in vehicles
  - Tow and Recovery information and precautions
4. End of Life (EOL) Considerations
  - Battery removal
  - Battery disposal
5. Next Steps and Future Work

### J2990 Timing

- Target Fall 2012 for publication

Figure F(1): Presentation by T. Mackintosh on “SAE Status Update”



U.S. Department  
of Transportation  
**National Highway  
Traffic Safety  
Administration**



DOT HS 811 574

January 2012

# **Interim Guidance for Electric and Hybrid-Electric Vehicles Equipped With High Voltage Batteries**

Figure G(1): NHTSA Interim Guidance for HEVs and EVs

The National Highway Traffic Safety Administration (NHTSA) is committed to ensuring the highest standards of safety on our Nation's roadways. To better protect consumers and the public safety community from the potential risk of fire and other hazards related to vehicles that have been involved in a motor vehicle crash, NHTSA has developed "Interim Guidance for Electric and Hybrid-Electric Vehicles Equipped With High Voltage (HV) Batteries." Developed with the assistance and expert input of the National Fire Protection Association, the Department of Energy (DOE) and others, the interim guidance for electric and hybrid-electric vehicles identifies appropriate post-crash safety measures for vehicle owners and the general public, emergency responders, and for towing/recovery operators and vehicle storage facilities.

NHTSA does not believe that electric vehicles present a greater risk of post-crash fire than gasoline-powered vehicles. In fact, all vehicles—both electric and gasoline-powered—have some risk of fire in the event of a serious crash. However, electric vehicles have specific attributes that should be made clear to consumers, the emergency response community, and tow truck operators and storage facilities. Out of an abundance of caution to prevent injury and loss of property, the interim guidance identifies considerations and actions for all electric and hybrid-electric vehicle crashes, including those involving the growing number of vehicles powered by lithium-ion batteries.

This interim guidance is intended to serve as a general reference for vehicle operators and responders. It was developed using current best practices and instructions from vehicle and battery manufacturers and others. It is not intended to replace information issued by the vehicle manufacturer, but rather to be used as a supplement to vehicle-specific guides. For more information about specific vehicle models, individuals should consult guidance provided by the vehicle manufacturer.

NHTSA, together with the Department of Energy, is continuing to explore strategies to ensure that the public and responder community receive the best information in the shortest possible time. The agency hope that this guidance will help to inform activities to educate responders and the public about electric vehicles including efforts already underway by DOE, NFPA, vehicle manufacturers, and others.

Figure G(2): NHTSA Interim Guidance for HEVs and EVs



**Interim Guidance for Electric and Hybrid-Electric Vehicles  
Equipped With High Voltage Batteries  
(Vehicle Owner/General Public)**

**ELECTRIC AND HYBRID-ELECTRIC VEHICLE CONSIDERATIONS**

**In the event of damage to or fire involving an electric vehicle (EV) or hybrid-electric vehicle (HEV):**

- Always assume the high voltage (HV) battery and associated components are energized and fully charged.
- Exposed electrical components, wires, and HV batteries present potential HV shock hazards.
- Venting/off-gassing HV battery vapors are potentially toxic and flammable.
- Physical damage to the vehicle or HV battery may result in immediate or delayed release of toxic and/or flammable gases and fire.

**VEHICLE INFORMATION**

- Know the make and model of your vehicle.
- Review the owner's manual and become familiar with your vehicle's safety information and recommended safety practices.
- Do not attempt to repair damaged electric or hybrid-electric vehicles yourself. Contact an authorized service center or vehicle manufacturer representative for service.

**EMERGENCIES**

**CRASH:** A crash or impact significant enough to require an emergency response for conventional vehicles would also require the same response for electric or hybrid-electric vehicles.

If possible

- Move your car to a safe, nearby location and remain on the scene.
- Roll down windows before shutting the vehicle off.
- Place the vehicle in Park, set the parking brake, turn off the vehicle, activate hazard lights, and move keys at least 16 feet away from the vehicle.

Always

- Call 911 if assistance is needed and advise that an electric or hybrid-electric vehicle is involved.
- Do not touch exposed electrical components or the engine compartment, as a shock hazard may exist.
- Avoid contact with leaking fluids and gases, and remain out of the way of oncoming traffic until emergency responders arrive.
- When emergency responders arrive, tell them that the vehicle involved is an EV or HEV.

Figure G(3): NHTSA Interim Guidance for HEVs and EVs

**FIRE:** As with any vehicle, call 911 immediately if you see sparks, smoke, or flames coming from the vehicle.

- Exit the vehicle immediately.
- Advise 911 that an electric or hybrid-electric vehicle is involved.
- As with any vehicle fire, do not inhale smoke, vapors, or gas from the vehicle, as they may be hazardous.
- Remain a safe distance upwind and uphill from the vehicle fire.
- Stay out of the roadway and stay out of the way of any oncoming traffic while awaiting the arrival of emergency responders.

#### **POST-INCIDENT**

- Do not store a severely damaged vehicle with a lithium-ion battery inside a structure or within 50 feet of any structure or vehicle.
- Ensure that passenger and cargo compartment remain ventilated, i.e., open a window, door or trunk.
- Notify an authorized service center or vehicle manufacturer representative as soon as possible as there may be other steps they can take to secure and discharge the HV battery.
- Call 911 if you observe leaking fluids, sparks, smoke, flames, or hear gurgling or bubbling from the HV battery.

Figure G(4): NHTSA Interim Guidance for HEVs and EVs

**Interim Guidance for Electric and Hybrid-Electric Vehicles  
Equipped With High Voltage Batteries  
(Law Enforcement)**

**ELECTRIC AND HYBRID-ELECTRIC VEHICLE CONSIDERATIONS**

**In the event of damage to or fire involving an electric vehicle (EV) or hybrid-electric vehicle (HEV):**

- Always assume the high voltage (HV) battery and associated components are energized and fully charged.
- Exposed electrical components, wires, and HV batteries present potential HV shock hazards.
- Venting/off-gassing HV battery vapors are potentially toxic and flammable.
- Physical damage to the vehicle or HV battery may result in immediate or delayed release of toxic and/or flammable gases and fire.

**IDENTIFY VEHICLE**

Determine if the vehicle is an electric or hybrid-electric vehicle, and if it is, advise Dispatch and all responders that an electric or hybrid-electric vehicle is involved.

**IMMOBILIZE VEHICLE**

- Always approach vehicle from the sides to stay out of potential travel path. It may be difficult to determine if the vehicle is running due to lack of engine noise.
- If possible, chock the tires, place the vehicle into Park and set the parking brake.

**DISABLE VEHICLE**

- Place vehicle in Park, set parking brake, turn off the vehicle, activate hazard lights, and move vehicle keys at least 16 feet away from vehicle.
- If your local standard operating procedures (SOPs) allow, and if you are properly trained and equipped, disconnect the 12-volt battery. CAUTION: Safety restraints, air bags and other safety systems may be active for up to five minutes after disconnecting the 12-volt battery.

Figure G(5): NHTSA Interim Guidance for HEVs and EVs

## **EMERGENCIES**

**NOTE:** Follow local standard operating procedures (SOPs) for personal protection and safety.

### **CRASH:**

- If you detect leaking fluids, sparks, smoke, flames, increased temperature, gurgling, popping or hissing noises from the HV battery compartment, ventilate passenger area (i.e., roll down windows or open doors) and request fire department response.
- Request Emergency Medical Services if there are injuries as a result of the crash.
- If you detect any unusual odors or experience eye, nose, or throat irritation, move away from the vehicle and evacuate others from the immediate area.
- Avoid contact with orange high voltage cabling and areas identified as high voltage risk by warning labels.
- Remain a safe distance upwind and uphill from the vehicle and stay out of the way of oncoming traffic until other appropriately equipped emergency responders arrive.
- Be alert. There is a potential for delayed fire with damaged lithium-ion batteries.

### **FIRE:**

- If you are unable to quickly remove the occupants, use a fire extinguisher to protect them from the flames.
- As with any vehicle fire, the byproducts of combustion can be toxic and all individuals should be directed to move to a safe distance upwind and uphill from the vehicle fire and out of the way of oncoming traffic.

## **POST-INCIDENT**

- Always assume the HV battery and associated components are energized and fully charged during investigation and storage.
- Ensure that passenger and cargo compartment remain ventilated, i.e., open window, door, or trunk during investigation and storage.
- Notify an authorized service center or vehicle manufacturer representative as soon as possible as there may be other steps they can take to secure and discharge the HV battery.
- Do not store a severely damaged vehicle with a lithium-ion battery inside a structure or within 50 feet of any structure or vehicle.
- Request fire department if you observe leaking fluids, sparks, smoke, flames, or hear gurgling or bubbling from the HV battery.

Figure G(6): NHTSA Interim Guidance for HEVs and EVs

**Interim Guidance for Electric and Hybrid-Electric Vehicles  
Equipped With High Voltage Batteries  
(Emergency Medical Services)**

**ELECTRIC AND HYBRID-ELECTRIC VEHICLE CONSIDERATIONS**

**In the event of damage to or fire involving an electric vehicle (EV) or hybrid-electric vehicle (HEV):**

- Always assume the high voltage (HV) battery and associated components are energized and fully charged.
- Exposed electrical components, wires or HV batteries present potential HV shock hazards.
- Venting/off-gassing HV battery vapors are potentially toxic and flammable.
- Physical damage to the vehicle or HV battery may result in immediate or delayed release of toxic and/or flammable gases and fire.

**IDENTIFY VEHICLE**

Determine if the vehicle is an electric or hybrid-electric vehicle, and if it is, advise Dispatch and all responders that an electric or hybrid-electric vehicle is involved.

**IMMOBILIZE VEHICLE**

- Always approach vehicle from the sides to stay out of potential travel path. It may be difficult to determine if the vehicle is on due to lack of engine noise.
- If possible, chock the tires, place the vehicle into Park and set the parking brake.

**DISABLE VEHICLE**

- Place vehicle in Park, set parking brake, turn off the vehicle, activate hazard lights, and move vehicle keys at least 16 feet away from the vehicle.
- If your local standard operating procedures (SOPs) allow and if you are properly trained and equipped, disconnect the 12-volt battery. CAUTION: Safety restraints, air bags, and other safety systems may be active for up to five minutes after disconnecting 12-volt battery.

**EMERGENCIES**

**NOTE:** Follow local standard operating procedures (SOPs) for personal protection and safety

**CRASH:**

- Request law enforcement response if you need assistance with traffic control or scene safety.
- If you detect leaking fluids, sparks, smoke, flames, increased temperature, gurgling, popping or hissing noises from the HV battery compartment, ventilate passenger area (i.e., roll down windows or open doors) and request fire department response.
- Avoid contact with orange high voltage cabling and areas identified as high voltage risk by warning labels.

Figure G(7): NHTSA Interim Guidance for HEVs and EVs



- Move away from the vehicle and evacuate others from the immediate area if you detect any unusual odors or experience eye, nose, or throat irritation. Rapid extrication may be needed for injured or trapped occupants.
- Remain a safe distance upwind and uphill from the vehicle and out of the way of oncoming traffic until other appropriately equipped emergency responders arrive.
- Be alert. There is a potential for delayed fire with damaged lithium-ion batteries.

**FIRE:**

- If you are unable to quickly remove the occupants, use a fire extinguisher to protect them from the flames.
- As with any vehicle fire, the byproducts of combustion can be toxic and all individuals should be directed a safe distance upwind and uphill from the vehicle fire and out of the way of oncoming traffic.

**POST-INCIDENT**

- Always assume the HV battery and associated components are energized and fully charged.
- Ensure that passenger and cargo compartment remain ventilated, i.e., open window, door, or trunk if and when inside vehicle providing patient care.
- Notify authorized service center or vehicle manufacturer representative as soon as possible as there may be other steps they can take to secure and discharge the HV battery.
- Do not store a severely damaged vehicle with a lithium-ion battery inside a structure or within 50 feet of any structure or vehicle.
- Request fire department if you observe leaking fluids, sparks, smoke, flames, or hear gurgling or bubbling from the HV battery.

Figure G(8): NHTSA Interim Guidance for HEVs and EVs

**Interim Guidance for Electric and Hybrid-Electric Vehicles  
Equipped With High Voltage Batteries  
(Fire Department)**

**ELECTRIC AND HYBRID-ELECTRIC VEHICLE CONSIDERATIONS**

**In the event of damage to or fire involving an electric vehicle (EV) or hybrid-electric vehicle (HEV):**

- Always assume the high voltage (HV) battery and associated components are energized and fully charged.
- Exposed electrical components, wires, and HV batteries present potential HV shock hazards.
- Venting/off-gassing HV battery vapors are potentially toxic and flammable.
- Physical damage to the vehicle or HV battery may result in immediate or delayed release of toxic and/or flammable gases and fire.

**IDENTIFY VEHICLE**

- Determine if the vehicle is an electric or hybrid-electric vehicle, and if it is, advise Dispatch and all responders that an electric or hybrid-electric vehicle is involved.

**IMMOBILIZE VEHICLE**

- Always approach vehicle from the sides to stay out of potential travel path. It may be difficult to determine if the vehicle is running due to lack of engine noise.
- If possible, chock the tires, place the vehicle into Park, and set the parking brake.

**DISABLE VEHICLE**

- Place vehicle in Park, set parking brake, turn off the vehicle, activate hazard lights, and move vehicle keys at least 16 feet away from vehicle.
- If your local standard operating procedures (SOPs) allow and if you are properly trained and equipped, disconnect the 12-volt battery. CAUTION: Safety restraints, air bags, and other safety systems may be active for up to five minutes after disconnecting the 12-volt battery.

**EMERGENCIES**

**NOTE:** Follow local standard operating procedures (SOPs) for personal protection and safety

**CRASH:**

- If you detect leaking fluids, sparks, smoke, flames, increased temperature, gurgling or bubbling sounds from the HV battery compartment, assume there is a battery fire and ventilate the passenger area (i.e., roll down windows, or open doors).
- If there is fire, and occupants are still inside the vehicle or are trapped, use a fire extinguisher to protect the occupants until a hose line is available or until the occupants are removed.

Figure G(9): NHTSA Interim Guidance for HEVs and EVs

- Request Emergency Medical Services if there are injuries as a result of the crash.
- Request law enforcement if you need assistance with traffic control or scene safety.
- Move away from the vehicle and evacuate others from the immediate area if you detect any unusual odors or experience eye, nose, or throat irritation. Wear full Personal Protective Equipment (PPE) and Self-Contained Breathing Apparatus (SCBA) if rapid extrication is necessary for injured or trapped occupants.
- Be alert. There is a potential for delayed fire with damaged lithium-ion batteries.

#### **FIRE:**

**NOTE:** If the fire involves a lithium-ion battery, it will require large, sustained volumes of water for extinguishment. If there is no immediate threat to life or property, consider defensive tactics and allow fire to burn out.

- If there is active fire, follow local SOP for vehicle fires. Wear appropriate Personal Protective Equipment (PPE) and Self Contained Breathing Apparatus (SCBA) at all times.
- If occupants are still inside the vehicle or are trapped, use a fire extinguisher to protect the occupants until a hose line is available or until the occupants are removed.
- Establish a safe perimeter around the vehicle.
- Consider establishing a water supply to support long-term operation.
- Use a hose line to apply water to extinguish the fire while continuing to cool the HV battery and its casing. Never attempt to penetrate the HV battery or its casing to apply water.
- Avoid contact with orange high voltage cabling and areas identified as high voltage risk by warning labels.
- Be alert. There is a potential for delayed ignition or re-ignition of a lithium-ion battery fire even after it is believed to be extinguished. This may remain an issue until the lithium-ion battery is properly discharged.
- As with any vehicle fire, the byproducts of combustion can be toxic and all individuals not properly trained, dressed, and equipped to fight the fire should be directed a safe distance upwind and uphill from the vehicle fire and out of the way of oncoming traffic.

#### **POST-INCIDENT**

- Always assume the HV battery and associated components are energized and fully charged.
- Ensure that passenger and cargo compartments remain ventilated, i.e., open window, door or trunk if and when inside vehicle providing patient care.
- Notify an authorized service center or vehicle manufacturer representative (dealer) as soon as possible as there may be additional steps they can take to secure and discharge the HV battery.
- Do not store a severely damaged vehicle with a lithium-ion battery inside a structure or within 50 feet of any structure or vehicle.
- Vehicle should be monitored for leaking fluids, sparks, smoke, flames, gurgling or bubbling sounds from the HV battery, and if detected, assume the HV battery is burning and follow above guidance to extinguish the fire.

Figure G(10): NHTSA Interim Guidance for HEVs and EVs

**Interim Guidance for Electric and Hybrid Vehicles  
Equipped With High Voltage Batteries  
(Towing and Recovery Operators and Vehicle Storage Facilities)**

**ELECTRIC AND HYBRID-ELECTRIC VEHICLE CONSIDERATIONS**

**In the event of damage to or fire involving an electric vehicle (EV) or hybrid-electric vehicle (HEV):**

- Always assume the high voltage (HV) battery and associated components are energized and fully charged.
- Exposed electrical components, wires, and HV batteries present potential HV shock hazards.
- Venting/off-gassing HV battery vapors are potentially toxic and flammable.
- Physical damage to the vehicle or HV battery may result in immediate or delayed release of toxic and/or flammable gases and fire.

**IDENTIFY VEHICLE**

- Determine if the vehicle is an electric or hybrid-electric vehicle, and if it is, advise your Dispatch and all other responders that an electric or hybrid-electric vehicle is involved.
- If you detect leaking fluids, sparks, smoke, flames, increased temperature, gurgling, popping or hissing noises from the HV battery compartment, ventilate passenger area (i.e., roll down windows or open doors) and call 911.
- Be alert. There is a potential for delayed fire with damaged lithium-ion batteries.

**RECOVERING /TRANSPORTING VEHICLE:**

- Call an authorized service center or vehicle manufacturer representative, if necessary, to determine additional steps that you should take to safely recover or transport the vehicle.
- Always approach vehicle from the sides to stay out of potential travel path. It may be difficult to determine if the vehicle is running due to lack of engine noise.
- Place vehicle into Park, set parking brake, turn off the vehicle, activate hazard lights, and remove keys to a distance at least 16 feet away from the vehicle until loading vehicle for transport.
- Refer to vehicle manual/recovery guide to locate proper attachment/connection points and transport method.
- Avoid contact with orange high voltage cabling and areas identified as high voltage risk by warning labels.

Figure G(11): NHTSA Interim Guidance for HEVs and EVs

### **STORING VEHICLE**

- **Notify authorized service center or vehicle manufacturer representative as soon as possible as there may be additional steps necessary you or they can take to secure and, discharge, handle, and store the HV battery and vehicle.**
- Do not store a severely damaged vehicle with a lithium-ion battery inside a structure or within 50 feet of any structure or vehicle.
- Ensure that passenger and cargo compartments remain ventilated.
- Prior to placing and while located in storage area/tow lot, continue to inspect vehicle for leaking fluids, sparks, smoke, flames, gurgling or bubbling sounds from the HV battery and call 911 if any of these are detected.
- Maintain clear access to stored vehicles for monitoring and emergency response if needed.

Figure G(12): NHTSA Interim Guidance for HEVs and EVs



## Resource Guide

The National Highway Traffic Safety Administration is dedicated to achieving the highest standards of excellence in motor vehicle and highway safety. NHTSA provides the public with facts on vehicle safety, driving safety, and research.

[www.nhtsa.gov](http://www.nhtsa.gov)  
[www.safercar.gov](http://www.safercar.gov)  
[www.ems.gov](http://www.ems.gov)

Electric Vehicle Safety Training is a nationwide program through the National Fire Protection Association to help firefighters and other first responders effectively deal with emergency situations involving electric and hybrid-electric vehicles. The Web site hosts an EV blog, calendar of events, training videos, emergency field guides from 19 auto manufacturers, research reports, as well as an online training course for the Chevy Volt.

[www.evsafetytraining.org](http://www.evsafetytraining.org)

SAE International is a resource for vehicle safety codes and standards. It has recently developed and revised safety standards for electric vehicles.

[www.sae.org/standards](http://www.sae.org/standards)

The Electric Drive Transportation Association is a resource for learning about different types of hybrid-electric and electric vehicles. It also has a fact sheet that details the numbers of hybrid vehicles on the road now and how many we can expect in the future.

[www.electricdrive.org](http://www.electricdrive.org)

The Alternative Fuels and Advanced Vehicles Data Center provides information, data, and tools to help fleets and other transportation decision-makers find ways to reduce petroleum consumption through the use of alternative and renewable fuels, advanced vehicles, and other fuel-saving measures.

[www.afdc.energy.gov/afdc](http://www.afdc.energy.gov/afdc)

HybridCars has detailed resources on every hybrid model on the road today. Its research section also provides studies and surveys about hybrid and electric vehicles in relation to technology, the environment, culture, and law.

[www.hybridcars.com](http://www.hybridcars.com)

The National Alternative Fuels Training Consortium promotes programs and activities that lead to energy independence, and encourages the greater use of cleaner transportation.

[www.naftc.wvu.edu](http://www.naftc.wvu.edu)

Figure G(13): NHTSA Interim Guidance for HEVs and EVs