



U.S. Department
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**National Highway
Traffic Safety
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Interim Guidance for Electric and Hybrid-Electric Vehicles Equipped With High Voltage Batteries

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.

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.

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.

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.

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.

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.

- 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.

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.

- 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.

**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.

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.

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

www.safercar.gov

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

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

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

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

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

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

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