

# Plugged into Safety

## Speaker:

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# Agenda



**Introduction**



**BEV Hazards**



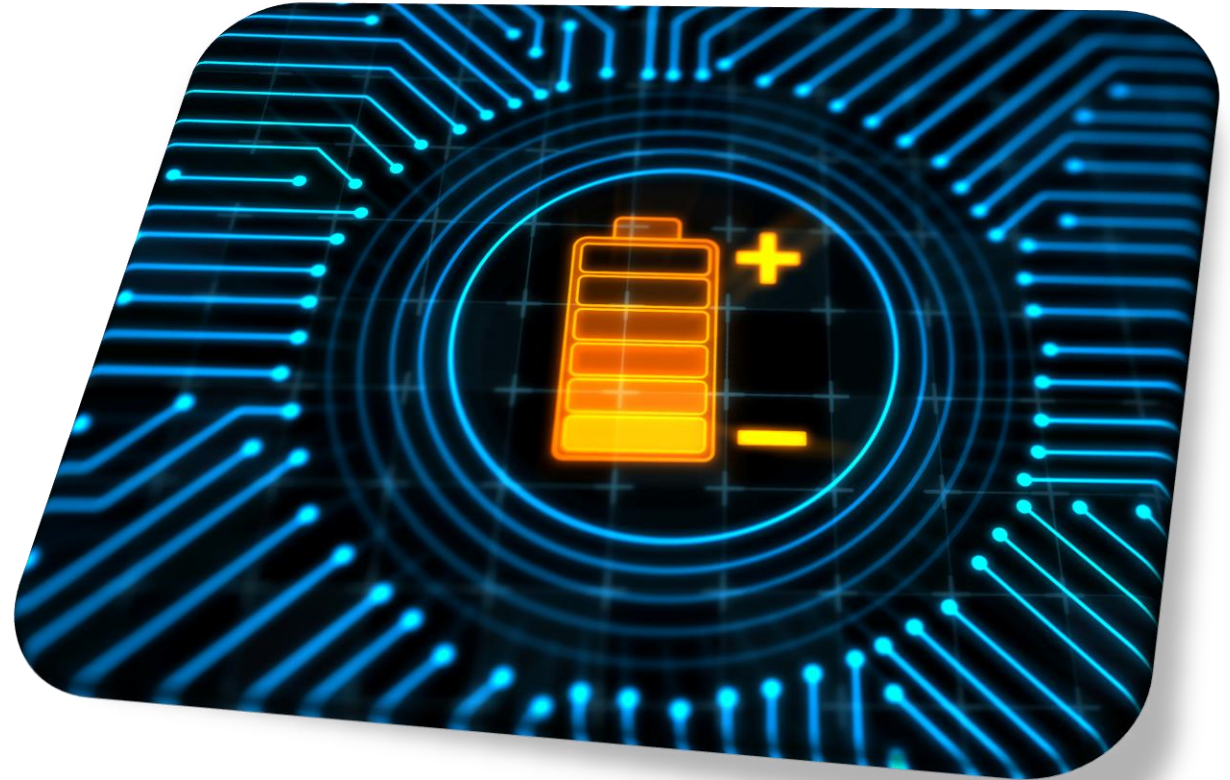
**Legislation**



**Opportunities**



**Resources**



# Introduction



- **Electric vehicles (EV) sales topped 17 million worldwide in 2024, rising by more than 25%<sup>[1]</sup>**
- **Ontario is positioning the Province as a global leader in the EV supply chain**
  - Over the last four years, **Ontario has attracted \$46 billion in new investments** from global automakers, parts suppliers, manufacturers of EV batteries and battery materials<sup>[2]</sup>

Sources:

[1] IEA, 2025 [\*Global EV Outlook 2025\*](#)

[2] Ontario, 2025 [Ontario Welcomes Siemens' \\$150 Million Investment to Establish New Technology Centre in Oakville](#) | Ontario Newsroom

# Introduction



- Other **common sources of lithium-ion batteries** in the workplace include, but not limited to:
  - Portable devices (cell phones, laptops tablets, etc.)
  - Forklifts and material handling equipment
  - Power tools
  - Energy storage systems



# Battery Basics

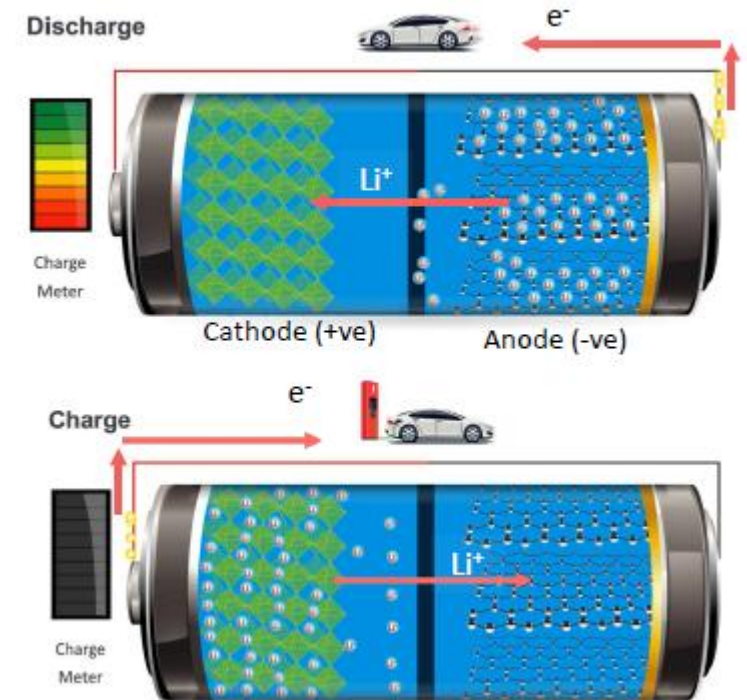


- Battery cells contain an **anode**, **cathode**, **electrolyte**, and **separator**
- Lithium-ion batteries contain various **electrolytes**
- Battery management systems are **responsible** for **balancing** the voltage and currents among cells

# Battery Basics – How they work



- In a lithium-ion battery, **lithium-ions (Li<sup>+</sup>)** move back and forth internally between the **anode and cathode** while the electrons (e<sup>-</sup>) travel through the relevant device being powered
- While the **battery is discharging**, the **anode releases lithium-ions to the cathode**, generating a flow of electrons that helps to power the relevant device
- When the **battery is charging**, the opposite occurs: lithium-ions are released by the cathode and received by the anode



Source: How Lithium-ion Batteries Work | Department of Energy

# Battery Basics – Battery Pack



**Lithium ion  
battery cell  
(LiB)**

A single unit device  
which converts  
the chemical energy  
into electrical energy



**Battery module**

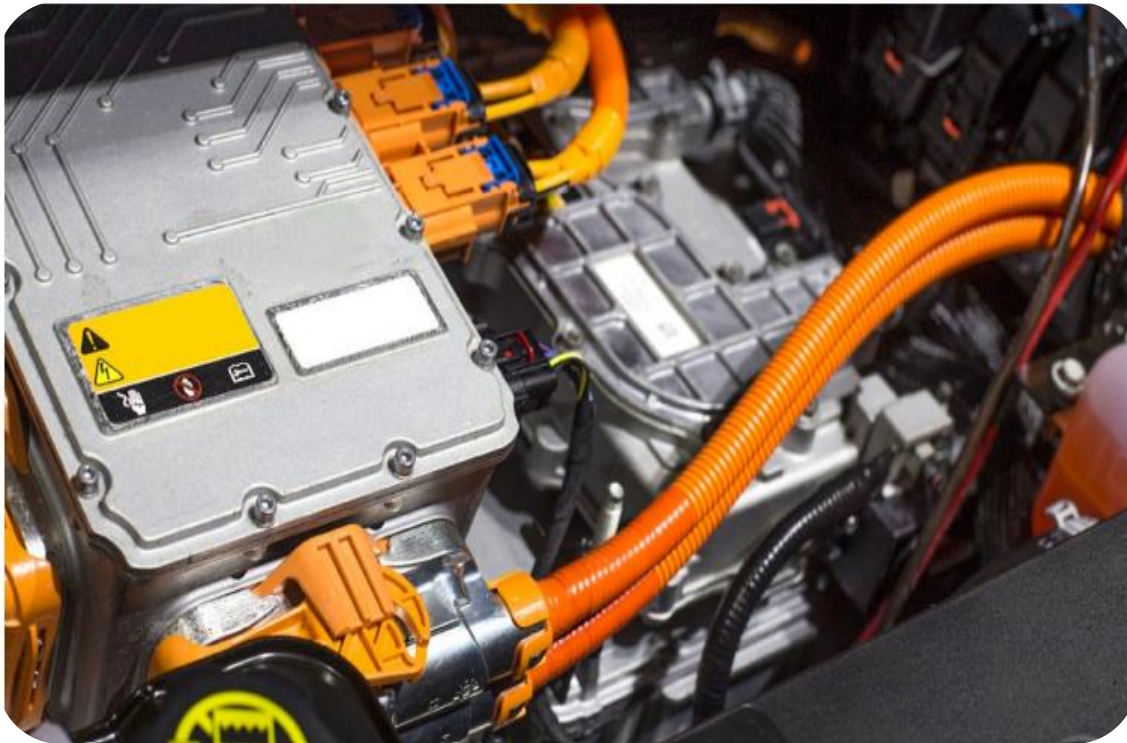
A collection of cells  
connected in series  
or in parallel



**Battery  
pack**

A series of individual  
modules and protection  
systems organized in a  
shape that will be  
installed in a vehicle

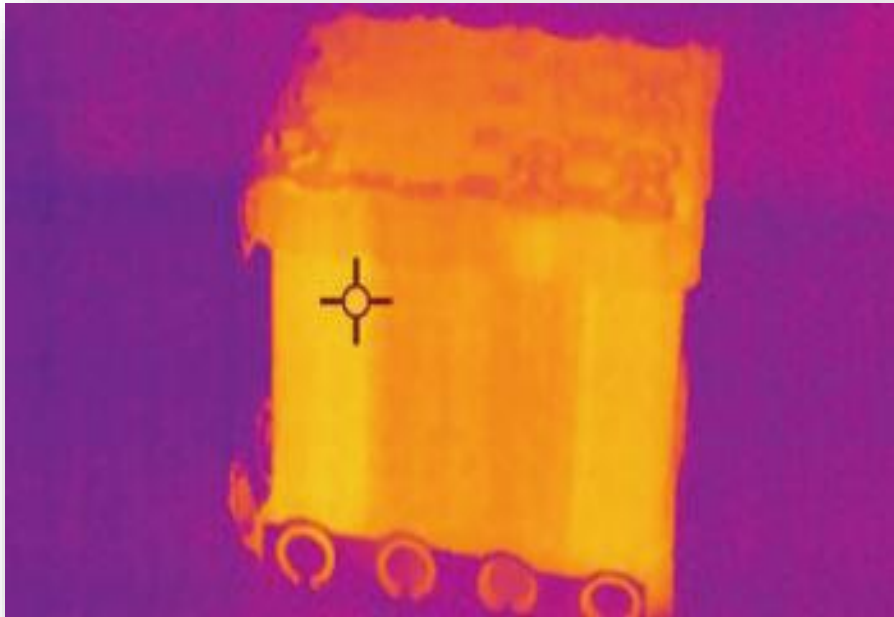
# BEV Hazards



- Thermal Runaway
- Chemical
- Control of Hazardous Energy
- Material Handling
  - Manual
  - Mechanical



# BEV Hazards – Thermal Runaway



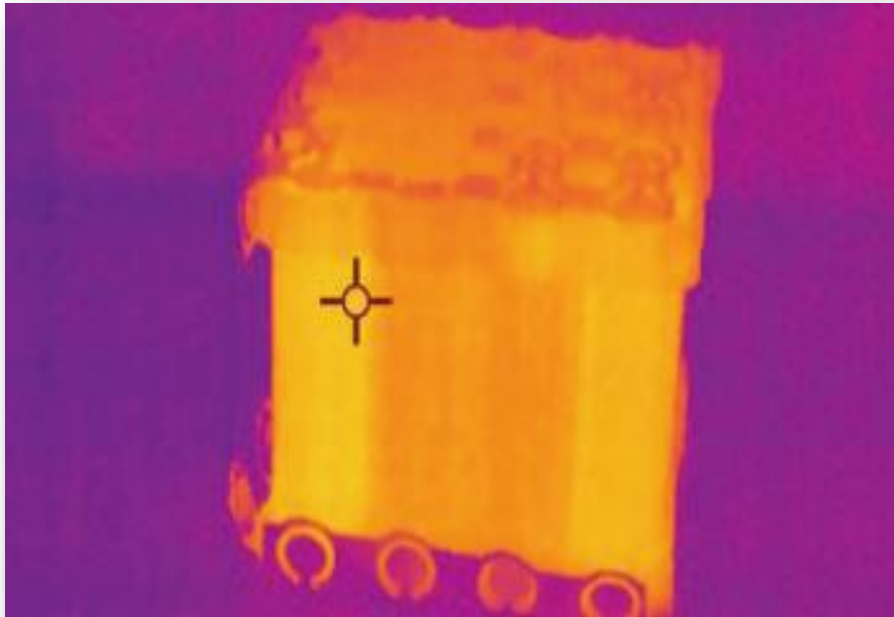
## What is 'Thermal Runaway'?

Thermal runaway is an uncontrolled, self-sustaining chain reaction where increased temperature causes further temperature increases, often leading to a destructive result like explosion or fire

**Key Point:**

**May take minutes to days for an event to begin!**

# BEV Hazards – Thermal Runaway



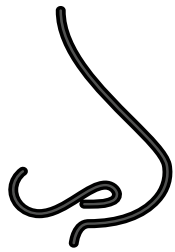
## Thermal Runaway causes:

- **Mechanical abuse**
  - Crush or collision
  - Penetration
  - Throwing around, dropping, contact
- **Electrical Abuse**
  - Internal short within circuit
  - Overcharging/discharging
- **Thermal Abuse**
  - Overheating (BMS malfunction)
- **Modifications** to vehicle, battery/battery management system
- **Manufacturing Faults**

# BEV Hazards – Thermal Runaway



How to Identify Thermal Runaway event:



## Smell

- Sweet, electrical burning odor



## See

- Fire
- Leaks and leaking fluids
- Gas & white smoke
- Arcing/arc flash
- Discolouration to battery



## Hear

- Abnormal Noises, such as:
  - Popping/banging
  - Hissing/buzzing

# BEV Hazards – Thermal Runaway



## Thermal Runaway Emergency Response Planning:

- Develop a **site and area-specific readiness plan**
  - Local fire department may be a great resource in emergency response planning
  - Fixed and portable emergency response equipment, PPE
  - Review and follow *Automotive OEM Emergency Response Guides*
  - Training, awareness → consider thermal runaway drills
- **DO NOT** go near a car/battery in **thermal runaway**
  - Evacuate the area and call 911
- A thermal **imaging cameras** and gas **monitors** may detect early signs of **thermal runaway**





# BEV Hazards – Chemical



- **Chemicals** (electrolytes) within **lithium-ion batteries may vary** between manufacturers
  - May be corrosive and flammable
  - When exposed to water, it may produce hydrofluoric acid
- **Chemical release** during a thermal event may include:
  - Asphyxiant gases
  - Irritant gases
  - Heavy metals nanoparticles
  - Fire
  - Explosions

# BEV Hazards – Chemical



## Key Points:

- Independent of location within BEV supply chain, **safe storage** and **handling practices** is vital in the **prevention** of unintentional chemical release
- Within **BEV manufacturing** sector, understanding **locations** and **type of chemical exposure** throughout the manufacturing process is essential in selecting **appropriate controls** and **designing adequate ventilation systems**

# BEV Hazards – Hazardous Energy Control



- Ensure you know the **OEMs requirements** for controlling hazardous energy
- **Develop Safe Work Instructions**
- Ensure **adequate PPE** is available in the workplace
  - High voltage gloves
  - Safety glasses/shield
  - Arc flash clothing
  - Isolation mats/blankets/safety boots
  - Appropriate high voltage multimeter-meter (CAT III)



# BEV Hazards – Material Handling

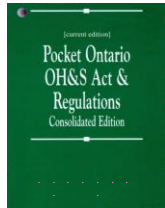


## Mechanical and Manual Material Handling Considerations:

- Lithium-ion batteries present **material handling challenges** due to their **weight** and **sensitivity** to environmental conditions
- **Lifting devices must be rated** for weight of battery/BEV or material being handled
  - This includes hoists in mechanic shops to lifting devices used within manufacturing process
- Lift tables, carts, lift assists, hoists, conveyors, robotics, cranes, and automation may **ease manual burden** for workers **handling batteries**
- **Training on safe handling of batteries** including reference to manufacturers requirements and lift points
- Always **secure vehicles to prevent unintended movement** while completing BEV maintenance



# Legislation

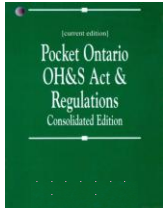


Despite being very limited direct references, the general duties of workplaces parties apply to Lithium-ion battery safety in the workplace



OHSA Reference	Application to Lithium-Ion Battery use in the Workplace
<b>OHSA - 25 1(b)</b> - equipment, materials and protective devices provided by the employer are maintained in good condition	<ul style="list-style-type: none"><li>Battery systems, manufacturing equipment, emergency response equipment, lifting devices, material handling equipment, etc used throughout BEV/LIB supply chain must be inspected and maintained to prevent failures</li></ul>
<b>OHSA - 25 2(a)</b> - provide information, instruction, and supervision to a worker	<ul style="list-style-type: none"><li>Providing BEV/LIB safe work instruction to workers. This would include, but not limited to elements such as standard operating procedures for tasks, reviewing OEM manuals, training, competent supervision, etc</li></ul>
<b>OHSA - 25 2(d)</b> - acquaint a worker or a person in authority over a worker with any hazard in the work and in the handling, storage, use, disposal and transport of any chemical or physical agent	<ul style="list-style-type: none"><li>Reviewing and training of critical information within SDS such as safe handling and storage of chemicals used, PPE safe use and requirements, etc. as well as systems in place to meet these requirements</li></ul>
<b>OHSA - 25 2(h)</b> - take every precaution reasonable for protection of a workers;	<ul style="list-style-type: none"><li>Employers must provide safe storage, PPE, emergency management equipment and protocols when using BEV/LIB in the workplace</li></ul>

# Legislation



Despite being very limited direct references, the general duties of workplaces parties apply to Lithium-ion battery safety in the workplace



OHS Reference	Application to Lithium-Ion Battery use in the Workplace
<b>OHS – 37(3)</b> - Employer must ensure that workers have instruction and training before hazardous materials are used, handled or stored at a workplace	<ul style="list-style-type: none"><li>Review, train, and enforce of critical information within SDS, as well as provide systems to implement requirements set out in SDS</li></ul>
<b>O.Reg 833 – Control of Exposure to Biological or Chemical Agents – General</b> <ul style="list-style-type: none"><li>Outlines occupational exposure limits for worker exposure</li><li>Requires employer take all measures reasonably necessary for the protection of workers from exposure to a hazardous chemical agent because of the storage, handling, processing or use of such agent in the workplace</li></ul>	<ul style="list-style-type: none"><li>Employer must assess worker exposure to hazardous chemicals related to BEV/LIB in the workplace and implement controls/control program for protection of workers</li><li>Occupational exposure limit testing is critical to design appropriate engineered ventilation systems and emergency response measures for the protection of workers</li></ul>

## Key Point:

References above are just some of many legal HS requirements that may apply to BEV/LIB use in the workplace. Also, see WHMIS (O.Reg 860) & Industrial Establishments (O.Reg 851) for additional considerations.

# Opportunities - WSPS



- WSPS' research and the experiences of the subject matter experts featured in the white paper highlight the need for:
  - Resources to support Ontario employers in understanding and complying with provincial legislative requirements
  - BEV and hybrid vehicle training standards for automotive service technicians
  - Updates to CSA standards to include application to BEVs
  - A requirement for individuals providing training on BEVs to have appropriate credentials

**Plugged Into Safety - White Paper**

# Opportunities - MLITSD



*“Prevent injuries and illnesses for auto workers by developing an occupational health and safety action plan led by the CPO and in partnership with the auto sector to address the growing use of lithium-ion batteries in the sector”*


- Working For Workers Six Act, 2024 | Ontario Newsroom

## How?

1. Develop training and protocols for a safe LIB lifecycle
2. Research to understand LIB/EV hazards and controls
3. Advance standards within LIB/EV space

### Key Point:

**WSPS is supporting this initiative through our sector reach to help Ontario Businesses in the prevention of injuries**

Ontario 

Newsroom

## BACKGROUNDER

### Working For Workers Six Act, 2024

November 27, 2024

[Labour, Immigration, Training and Skills Development](#)

#### Table of Contents

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The Ontario government is building on progress from its previous five Working for Workers Acts by intending to introduce new first-in-Canada supports and even stronger protections that would, if passed, support the safety and wellbeing of workers and their families, grow Ontario's economy and create jobs for workers and businesses.



Source: Working For Workers Six Act, 2024 | Ontario Newsroom



# Resources - WSPS



## Plugged Into Safety – White Paper

- This white paper was developed in collaboration with industry groups and associations to identify the hazards associated with working on or around Battery Electric Vehicles (BEVs)



## ELECTRIC VEHICLE (EV) – Safety Hazards Associated with Working On or Around the Battery

A checklist has been developed to support employers with identifying hazards associated with working on or around EV batteries in the workplace, with legislative references and recommended controls. The legislation listed below should not be considered exhaustive, and other legislative requirements may apply. The recommended controls may not be required in all workplaces and are intended as a starting point to address the identified hazards.

Hazard	Hazard Details	Applicable?	Legal and Other Requirements	Suggested Program Elements and Controls	Additional Controls Implemented by the Workplace
Electrocution-High Voltage	EV has low and high voltage systems. The high voltage system can exceed 700 Volts. In some cases, work must be completed on the high voltage system there is a risk of electrocution in	<input type="checkbox"/> Yes <input type="checkbox"/> No	<ul style="list-style-type: none"><li>• OHSA s.25(1)(a) (b)(c)(d), (2)(a) (d)(h) (employer responsibilities)</li><li>• Reg 851 s.42 (LOTO), 421 (live work), 43 (electrical tools), 79 (PPE training), 81 (eye protection), 84 (skin protection)</li><li>• CSA Z460.20</li></ul>	<ul style="list-style-type: none"><li><input type="checkbox"/> Hazard communicated to employees (including restricting access to the work area for unauthorized personnel)</li><li><input type="checkbox"/> LOTO written procedure</li><li><input type="checkbox"/> LOTO training (theory and equipment specific)</li><li><input type="checkbox"/> Electrical safety training</li><li><input type="checkbox"/> SOP (standard operating procedures)</li><li><input type="checkbox"/> PPE and electrically rated tools (both inspected prior to use)</li><li><input type="checkbox"/> FR-rated clothing</li><li><input type="checkbox"/> Gloves dielectrically tested</li><li><input type="checkbox"/> PPE training on the care, inspection and use</li></ul>	



## Electric Vehicle – Safety Hazard Checklist

- Intended to assist employers recognize BEV hazards and access workplace hazard controls



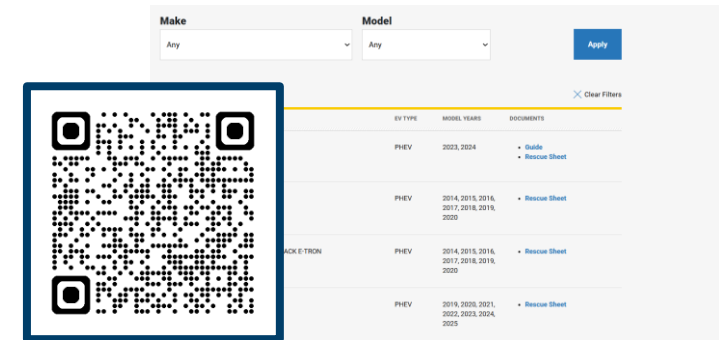
# Resources - External



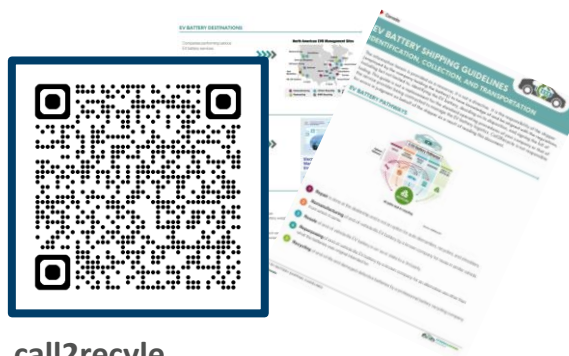
**Call2recycle & BlueWale Materials**  
Guidance Document: EV Battery Safe Handling & Storage



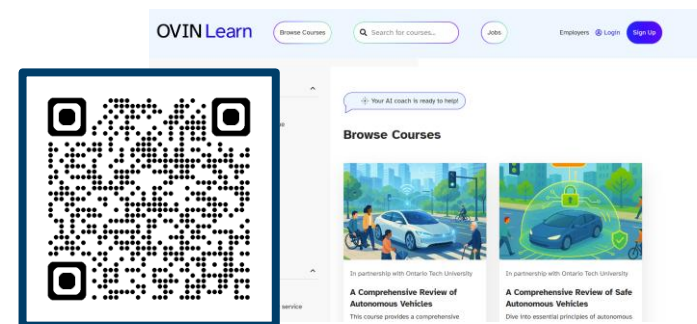
**Automotive Retailers Association**  
OHS Responsibilities and Industry-Supported Safe Work Practices for the Handling, Dismantling, Storage and Transportation of Electric Vehicles and High Voltage Batteries



**National Highway Traffic Safety Administration (US)**  
Automotive OEM Emergency Response Guides (by make and model)



**call2recycle**  
EV Battery Shipping Guidelines: Identifications, Collection, and Transportation



**OVIN Learn**  
EV Information and Training Modules

# Questions



# References

- Occupational Health and Safety Act, R.S.O. 1990, c.O.1
- R.R.O. 1990, Reg. 851: Industrial Establishments
- Ministry of Labour, Training and Skills Development (2025) *News Release Ontario Welcomes Siemens' \$150 Million Investment to Establish New Technology Centre in Oakville* – Retrieved from [Ontario Welcomes Siemens' \\$150 Million Investment to Establish New Technology Centre in Oakville | Ontario Newsroom](#)
- International Energy Agency (2025) *Global EV Outlook 2025* – Retrieved from [Global EV Outlook 2025](#)
- Ministry of Labour, Training and Skills Development (2025) *News Release Working For Workers Six Act, 2024* – Retrieved from [Working For Workers Six Act, 2024 | Ontario Newsroom](#)



For all your health and safety solutions, contact:

## **Workplace Safety & Prevention Services**

1 877 494 WSPS (9777)

**WSPS.CA**

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