

# ELECTRIC BUSES

**INFORMATION & RESOURCES ON HAZARDS OF OPERATING AND MAINTAINING ELECTRIC BUSES**

## Hazards and Limitations of Lithium Ion Batteries

The New York State Climate Act states that all school buses purchased after 2027 must be electric and by 2035 all buses must be electric.

Electric busses present unique challenges and hazards as opposed to those fueled by petroleum products, which present their own hazards. These buses are powered by large lithium-ion batteries and operate on direct current voltages between 400 to 800-volts, compared to the 12-volt systems on petroleum fueled buses. To alert those working on electric buses, the electrical distribution systems are encased in bright orange.



If severely damaged the batteries can ignite and the fire temperatures for a lithium-ion battery range from 1,300 to 1,800 degrees Fahrenheit (700 to 1,000 degrees Celsius).

When a battery fire occurs, toxic gases are released, including hydrogen fluoride (HF), hydrogen chloride (HCl) and hydrogen cyanide (HCN). The exact gasses released are based on the internal chemistry of the battery involved.

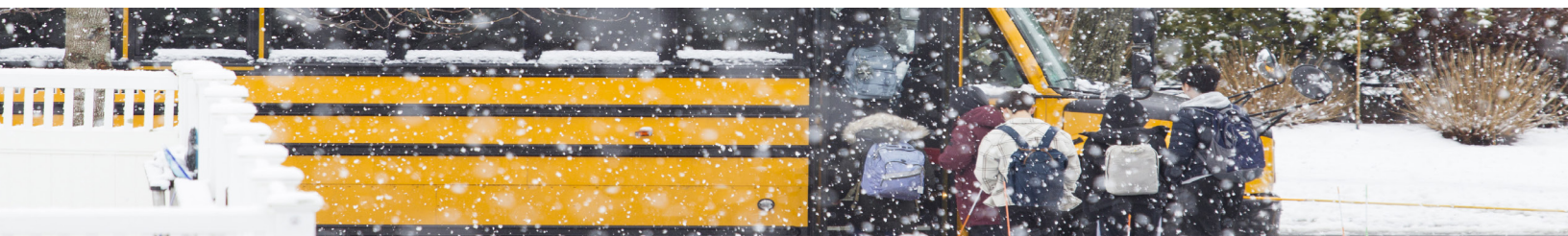


## Range and Charging Considerations

School districts may have to adjust routes based upon factors that affect the effective range of the buses such as extreme temperatures, road conditions, weight, steep inclines and limited weight roads and bridges. Electric buses are much heavier than petroleum fueled buses due to the weight of the batteries.

As part of the conversion process, school districts will have to install the appropriate level charging systems to assure the buses will be fully charged by the next school day.

The district will also have to establish a plan for responding to a stranded bus with a service that has the means to recharge them on the roadside or can tow a vehicle with the increased weight of the electric bus.



## EMPLOYER & EMERGENCY CONSIDERATIONS

- The school district needs to obtain all of the information, resources and technical assistance that is available from the school bus manufacturer concerning the safe operation, maintenance and emergency response procedures for model buses they will be receiving.
- The school district should request from the bus manufacturer information on the effects that corrosive road treatment chemicals could have on the buses batteries and electrical distribution system and the signs that school staff should look for to recognize this damage before it leads to bus failure, and electrical arc or a fire.
- Prior to the receipt of the buses, the school district should develop an electric bus implementation plan that lists all of the staff that will interact with the busses, the information and training they need to perform both regular and emergency work activities involving the bus prior to their being assigned duties involving the bus and as needed to maintain their ability to perform them.
- Prior to putting the buses into service, the school district needs to provide all of the information and training needed for their staff to perform their normal and emergency job duties as established in the electric bus implementation plan.
- School bus mechanics that have direct contact with the buses high voltage DC batteries and electrical distribution system will need additional training to protect them from potential shock and arc flash (a discharge with enough energy to cause an explosion, fire, burns, or other substantial damage). PESH regulations will require training in the control of hazardous energy systems (lockout/tagout), electrical safety training and personal protective equipment.
- The school district will have to update their emergency action plan to describe how they will address a fire involving one of the electric school buses, especially if that fire is inside the maintenance garage. That plan must also describe if employees are expected to respond to a fire and the training they will be provided to safety perform that response.
- The school should contact all of the fire departments, that are located within their district, to inform them that they will be operating electric school buses in their fire districts and to offer them all the information available from the bus manufacturer about the proper procedures for rescuing passengers and fighting a fire involving an electric bus and provide them the opportunity to see the bus.

For more information and resources visit:

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