Incident Summary #II-1977850-2025 (#58852) (FINAL)

SUPPORTING INFORMATION	Incident Date		October 11, 2025
	Location		New Westminster
	Regulated industry sector		Electrical - Low voltage electrical system (30V to 1000V)
	Impact – Injury	Qty injuries	0
		Injury description	N/A
		Injury rating	None
	Impact – Damage	Damage description	An electric vehicle (EV) charger caught fire and was destroyed. The burning lithium-ion battery released toxic emissions in the area and caused heat and fire damage to the surrounding trees, streetlight and vehicle charging at the adjacent charger. The neighboring fast-food restaurant was evacuated by the responding fire department.
		Damage rating	Major
	Incident rating		Major
	Incident overview		An EV charger with an integrated lithium-ion battery pack overheated and burst into flames while not in use at a retail EV charging station.
INVESTIGATION CONCLUSIONS	Site, system and components		The charger involved in the incident was a "Boost 200" battery integrated direct current (DC) fast charger manufactured by Freewire Technologies. The charger can provide a maximum charging of 200-kW through a CCS1 style connection. The boost charger was certified to standards for both UL and UL-C (Canada) including the UL2202 - Safety requirements for Electric Vehicle Charging System Equipment. **Boost style chargers** Boost-style EV chargers have integrated 160-kWh lithium-ion batteries and are designed to deliver up to 200-kW DC output fast charging even when the local power grid can't supply enough energy. Instead of pulling all the power directly from the grid during charging, the system uses its built-in batteries as a buffer. The batteries can slowly store energy from the grid and then release it quickly to the EV when needed, providing a "boost" in power. This system can reduce strain on the grid and allow high-speed charging in areas with limited electrical capacity. **Battery temperature control systems** Boost chargers use a Battery Management System (BMS) to keep their lithium-ion batteries operating safely and efficiently. These systems use heating, ventilation, and air conditioning (HVAC) for both cooling and heating functions. Cooling is achieved through liquid, air circulation, and air conditioning units combined with sensors that monitor battery temperature to prevent overheating during high-power charging or rapid discharge. Heating is equally important because batteries perform poorly in very cold conditions. The battery block is made up of eight individual 100-V battery module "stacks" that are bolted together and wired to create one large 800-V battery "cube" (Image 4). The system uses four electric heating mats above the battery stacks to warm the cells when needed to an optimal range before charging or discharging.

Incident Summary #II-1977850-2025 (#58852) (FINAL)

	Maintaining the correct temperature is critical for safety, as extreme heat can cause thermal runaway and fire, while extreme cold can reduce charging speed and damage the battery. By actively managing temperature, the charger intends to achieve safe reliable performance and battery life. **Equipment certification and testing** EV vehicle chargers are tested and certified through a structured evaluation by an accredited certification body that confirms the product meets the same level of safety as a recognized standard. This includes reviewing the design, assessing critical safety components, and conducting laboratory testing. When an exact standard does not exist which can be common for new and emerging technologies, certifiers apply comparable standards alongside engineering judgment and risk analysis to demonstrate equivalent safety outcomes. When certification is granted, it applies only to the tested configuration and remains valid only while no unapproved design, component, or software changes are made. **Lithium-ion battery thermal runaway and fires** Thermal runaway in a lithium-ion battery is a chain reaction where the battery's temperature rises uncontrollably, leading to catastrophic failure. It usually starts when the battery is damaged, overcharged, or exposed to high heat, causing internal components to break down. As the temperature climbs, the separator inside the battery can melt, creating an internal short circuit. This triggers chemical reactions that release even more heat and flammable gases, accelerating the process. If the heat cannot escape, the pressure builds up until the battery vents or ruptures, and the gases often ignite, resulting in fire or even explosion. Because this reaction is self-sustaining and spreads quickly, thermal runaway is one of the most serious hazards associated with lithium-ion batteries. Lithium-ion battery fires pose serious risks because they generate intense heat, release toxic emissions, and are difficult to control. When these batteries overheat, they can enter a state called thermal runaway, causing rapid ignition and even explosions. The fire can reach temperatures above 1,000°C, easily spreading to nearby materials and structures. Burning batteries release harmful gases including hydrogen fluoride and carbon monoxide, which are dangerous to inhale and can contaminate the environment. Extinguishing these fires can be challenging because they often require massive amounts of water and can reignite hours or days later. Beyond health and safety hazards, such incidents can lead to significant property damage, operational disruptions, and environmental contamination, making prevention and proper handling critical.
Failure scenario(s)	Freewire Technologies designed and manufactured Boost EV chargers. The original design was approved and certified under three separate model number series and authorized to carry the MET certification mark, indicating compliance with multiple UL and CSA safety standards. Freewire technologies ceased operation in 2024. Speed Charge Services directly arose from the Freewire closure. Speed Charge Services formed a team of former Freewire experts to support and maintain Freewire Boost Chargers. They are based out of California and provide a supply chain for spare parts, technical support and remote monitoring for diagnostics and troubleshooting. Two Freewire Boost 200 EV chargers were installed at the retail fueling location in November 2024. In August 2025 preventative maintenance was performed by a qualified technician from a third-party contractor. The preventative maintenance did not identify any issues with the charger or battery pack.

	Several other Freewire boost chargers were found to have had common issues with the BMS HVAC units not operating correctly due to incorrect wiring, undersized breakers and incorrect temperature dial settings. Field fixes for the issues included rewiring, increases to breaker size and dial adjustments. These alterations were not submitted or approved by the certification body meaning the products in the field no longer reflected the certified design. With battery temperature control being vital for the safe operation of the chargers, Speed Charge was performing remote diagnostics of the HVAC systems operability as part of a new battery health initiative for all the chargers owned by the retail charging station network in BC. The checks were meant to ensure the cooling and heating systems were functioning properly. The process did not necessitate onsite visits, just remote diagnostics through the backend online system. A remote technician from California accessed the charger online in New Westminster and placed it in a diagnostic mode. This mode allowed the manual functioning of low-voltage components like HVAC and heaters, bypassing normal automated temperature controls. The technician inadvertently activated the battery heater. In diagnostic mode, the integrated safeties were bypassed meaning the heater would not shut off even if the battery got dangerously hot. Over the next 26-hours, the charger was left in diagnostic mode with the battery heater on. The charger's BMS detected rising temperatures and issued a critical alert when the battery pack reached 55°C. The charger could not automatically turn off the heater because of the safety bypass in diagnostic mode. At this point, the system relied on alerts to prompt human intervention. The alerts were silent email alerts sent to Speed Charge representatives that did not require immediate acknowledgement and did not escalate. The alerts went unnoticed and were not acted on. Around noon on the day of the incident, while the charger was not in use, the battery temperature reached a critical level of 82°C, and the pack entered a thermal runaway, leading to a fire at the site.
Facts and evidence	<u>Statements</u> **Speed Charge Services General Manger and Field Support Manager** • Speed Charge maintains back-end monitoring software for diagnostics and troubleshooting, a supply chain for spare parts and technical expertise for servicing units and supporting field technicians. • Historically, HVAC units on some Freewire boost chargers were found to be non-operational due to wiring defects, undersized breakers and incorrect temperature dial settings. • Remote diagnostics was being performed to check HVAC operability as part of a new battery health initiative across the retail fueling network's fleet in BC. No onsite technicians were required for the diagnostics. • Human error occurred during remote diagnostics when the technician intended to toggle the HVAC but accidentally turned on the battery heater in diagnostic mode. • The system automatically sends critical alerts when the battery packs reach 55°C. The alerts were silent email alerts that did not require immediate acknowledgement and were not escalated. When the alert was sent for the charger, it went unnoticed and no corrective actions took place. Only Speed Charge received the alerts and nobody from the station or the retail fueling system network was notified of them.

Incident Summary #II-1977850-2025 (#58852) (FINAL)

- The battery overheated due to the continual heater use and led to the fire.
- After the incident software updates were made to the system to limit the time heaters can be turned on in diagnostic mode and how long a charger can remain in diagnostic mode. Updates were also implemented to communication protocols for the critical alert system to ensure proper intervention.

Representative from the certification body

- Freewire chargers were originally certified by the certification body (MET Labs) for a specific model configuration and component set, based on a formal certification report that identified critical components (e.g., breakers, power supplies, protective devices) and their approved ratings.
- Any changes to critical components (especially overcurrent protection, power electronics, insulation, or safety related parts) require prior approval from the certification body and may require partial or full retesting.
- Certification markings are only valid if the product matches the certified design and model number.
- Installed Freewire units did not match the model numbers listed in the certification report.
- Upsizing breakers without approval is never permitted, as components are only evaluated and approved for specific overcurrent protection limits.
- Freewire did not notify the certification body of these changes, meaning the products in the field no longer reflected the certified design.

Documents

Retail fueling network's incident analysis report

- The charger unit itself was placed into service in October 2024. It was in good working condition prior to the incident, with no history of malfunctions across more than 400 charge / discharge cycles. The unit had gone through an inspection very recently (six weeks prior) with no concerns noted.
- In normal operations, units are kept below 45°C (well below the high temperature alarm), and it is very rare to see the units triggering a 55°C temperature alarm other than due to sensor errors. In the temperature history of the unit, the maximum temperature ever reached was 41°C.
- The unit was placed in a diagnostic mode on Friday morning at 10:00 (26-hours prior to the fire) by a remote Speed Charge technician. While this is normally done for short intervals, the employee inadvertently failed to return the unit to operational mode. Leaving the unit in diagnostic mode (used by technicians to troubleshoot problems with the chargers and test potential fixes) results in an over-ride of the temperature safety controls (shutoff of the heater, operation of the fan, etc.) that govern the unit during normal operations.
- The same remote technician inadvertently turned the unit's heater on through manual controls. The heater was left on for 26-hours, heating the battery slowly to 82°C until it ignited.
- The operating system issued high temperature alerts in the battery pack starting on Friday at 17:21, when the battery reached 55°C; however, these alerts were not noticed or acted upon by Speed Charge. Nobody from the retail fueling network was made aware of the high temperature alert.
- In production mode, there are existing controls in place to govern the use of the heater which cannot be turned on manually in production mode.

Testing and maintenance

March 27, 2025

- Firmware, software, and Programable Logic Control (PLC) was remotely updated.

Aug 21, 2025

- Preventative maintenance performed onsite by technician.
- No visual signs of water ingress.
- Battery modules measured with no signs of swelling.
- Battery pack module voltages and insulation resistance checked out good.
- Coolant system inspected and fluid changed.

Recorded battery temperature data

- From April 2025 to two days before the incident, the battery temperature was maintained to an average of 34°C, with a minimum of 23°C and a high of 51°C while both idle and in use charging vehicles.
- Around 10:00 on October 10th, the battery temperature began rising steadily from 35°C over the next 26-hours eventually reaching a recorded maximum of 82°C at noon on October 11th (Image 5).

Causes and contributing factors

The battery heater being left on after remote HVAC system diagnostic testing resulted in the battery temperature reaching critical levels starting a thermal runaway and fire.

Contributing factors to the incident include:

System controls

- The system design permitted the charger to be left in diagnostic mode, bypassing integral safety features. This allowed the charger to remain in that state for the 26-hours, until the battery overheated to the point of critical failure.

Communications

- The high temperature alerts generated by the charger being silent email alerts that did not escalate or require immediate acknowledgement allowed the battery temperature to continually rise without intervention.
- The retail fuel network representatives and service providers not receiving the alerts prevented actions that may have prevented the incident.

Image 1 – EV charger on fire at retail charging location.

Image 2 – Damaged charger and surrounding area after incident.

Image 3 – Damaged charger after removal from site.

Image 4 – Example of a battery cube assembly inside a Freewire Boost charger showing eight individual module “stacks” bolted together to form one 800V DC lithium-ion battery (Connecting battery jumpers removed).

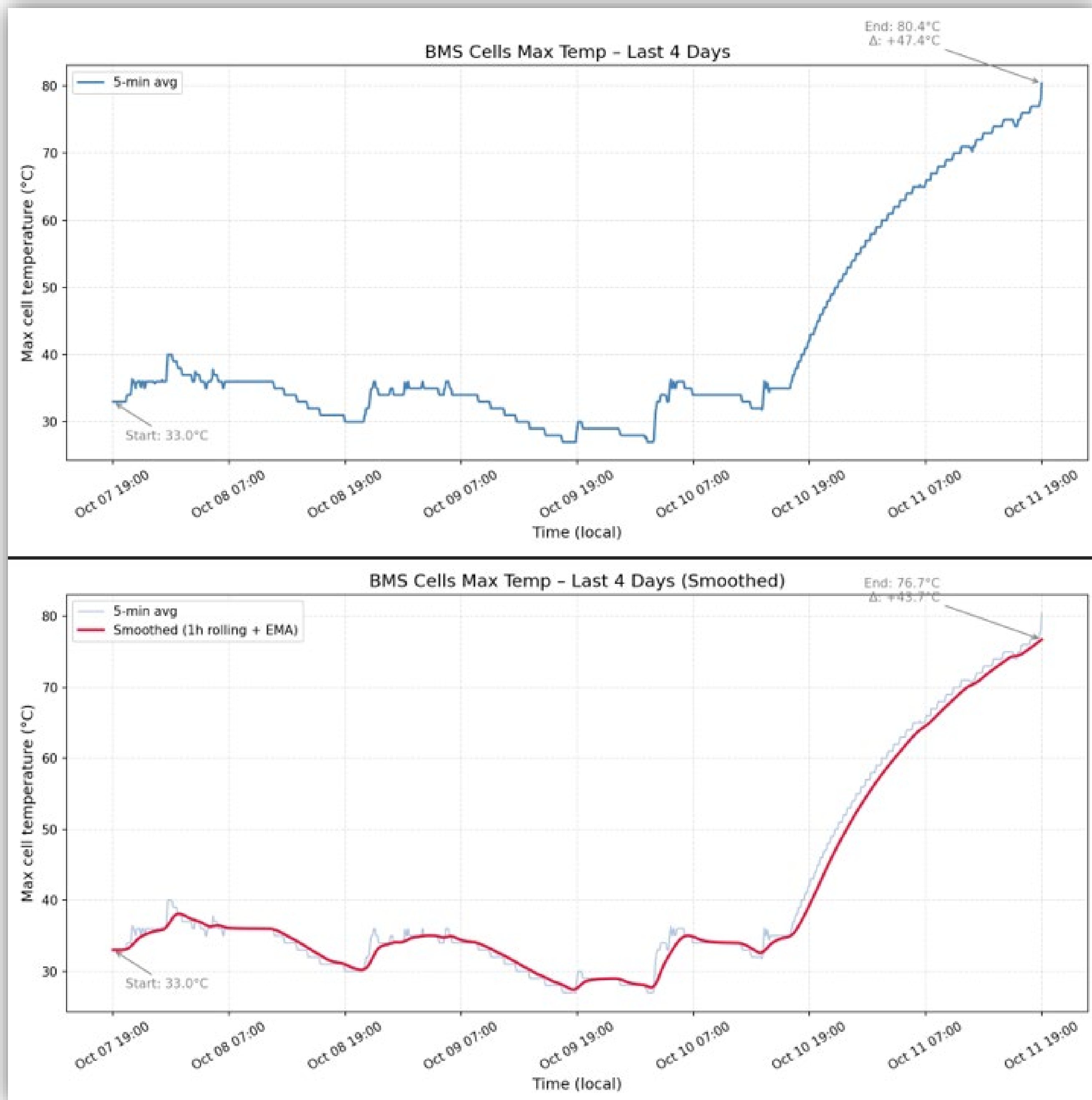

Image 5 – Graph generated from the battery temperate data showing the last four days.