



TESLA ENERGY BATTERY SYSTEM SAFETY OVERVIEW

The following is an overview of the battery system safety aspects for the Tesla Energy Powerpack and Powerwall products. The products are intended for use in residential battery storage applications (the Powerwall) and industrial/utility applications (the Powerpack). Both the Powerwall and Powerpack products are described here.

TECHNOLOGY OVERVIEW

Each battery is composed of multiple small format, cylindrical lithium ion cells. The cells are connected in series and parallel within each module. Each module has a capacity of several kWh. One or more modules are combined within an assembly referred to as a "pod". Each pod contains independent protection hardware and an electrically-isolating controlled power electronics stage. Each pod connects directly with the battery thermal management system.

The Powerwall contains one pod. The Powerpack contains multiple pods, connected in parallel and housed in a standalone NEMA 3R enclosure. Both units are designed and manufactured to meet or exceed the requirements of UL 1973, in addition to several other industry standards.

SAFETY DISCUSSION

The Tesla Energy products contain UL 1642 listed lithium-ion cells. These cells are hermetically sealed and do not produce any off gassing during normal operation. The Powerwall and Powerpack products are manufactured in the United States with repeatable and precision processes. This enables a high level of quality control and the ability to mass produce a safe, UL listed product when it leaves the factory.

To achieve compliance with UL 1973, Tesla Energy products must meet the following requirements:

1. Products must be robust to internal fire exposure: they must demonstrate that a single cell failure will not cascade to cause a fire external to the product, or an explosion.
2. Products must be robust to mechanical stresses: they must withstand drop and impact tests as well as other mechanical stresses.
3. Products must be robust to environmental stresses: they must withstand high heat and humidity tests, as well as salt fog exposure and other environmental stresses.
4. Products must be robust to electrical abuse: they must withstand overcharge and short circuit tests, as well as other abuse conditions.

Beyond requirements found in industry standards for stationary systems, Tesla leverages experience gained from the automotive environment and designs and tests all batteries to ensure that they survive harsh vibration, shock, corrosion, thermal, and electrical conditions. In particular, Tesla designs all battery packs to be resistant to single cell failure and propagation.

In Tesla's experience, city and county regulations do not require sprinklers or explicit fire suppression measures for lithium-ion battery installations.

Water is the recommended suppressant in case of a fire involving a lithium-ion battery. Often confusion arises with regard to the mixture of water with batteries, especially lithium-ion batteries. Lithium-ion batteries do not contain any solid metallic lithium (a water reactive material); and thus the use of water is appropriate, and will not exacerbate a fire involving lithium ion cells.