Calculations or Modeling Data to Determine Compliance with NFPA 68 and NFPA 69 (AMC 20.114.100)

for Tesla Megapack 2XL

The requirements necessitating compliance with NFPA 68 and/or NFPA 69 stem from the overarching General requirements listed in NFPA 855, titled "Standard for the Installation of Stationary Energy Storage Systems." (NFPA, 2020) Therein, Chapter 4 requires: Calculations or modeling data to determine compliance with NFPA 68 and NFPA 69 in accordance with **Section 4.12 – Explosion Control**.[1]

Section 4.12.1 further discusses the NFPA 68 and 69 requirements, however, the language states that, "ESS installed **within a room, building, or walk-in unit** shall be provided with one of the following: (1) Explosion prevention systems designed, installed, operated, maintained, and tested in accordance with NFPA 69 (2) Deflagration venting installed and maintained in accordance with NFPA 68.[2]

The Arlington BESS project will include ground-mounted, outdoor, sealed units, thus, the indoor explosion requirements of 4.1.2.1.3 and 4.12 do not apply.[3] However, NFPA 855 standards for ESS installation still apply and have been met by the Tesla Megapack 2XL (MP2XL) in various ways.

"The overpressure vents themselves are passive and are not actuated or controlled by another device. As such, they are not active deflagration vents listed to corresponding explosion and deflagration standards such as NFPA 68 or 69. Their rubber seals are designed to release during an overpressure event, such as the rapid ignition of flammable gases by a sparker or melt out during a fire event inside the battery module bay. The number and total area of overpressure vents is sized *following the requirements of NFPA 68*. They are designed to relieve with a safety factor of 2.5 times the enclosure's strength, including the front doors. Specifically, the overpressure vents are designed to open when subjected to an overpressure of 12 kPa or 250 pounds per square foot (psf), whereas the steel, IP66 battery module bay enclosure has an enclosure strength of 30 kPa (626 psf). Meaning, during an overpressure event inside the cabinet, the overpressure vents will open when subjected to an overpressure of approximately 12 kPa (250 psf), well before the integrity of the enclosure itself becomes compromised at 30 kPa (626 psf) with a 2.5 times safety factor."[4]

"**Tesla developed the overpressure vents and sparker system because the application of NFPA 68 or NFPA 69 is not suitable for cabinets without large volumes of open space, as is typical of BESS cabinets.** *This engineered approach is permitted by NFPA 855*[5] provided it is validated through large-scale, unit level fire testing, which Tesla has performed and met under UL9540 certification

[1] NFPA 855, Section 4.1.2.1.3 (3).
[2] NFPA 855, Section 4.12.1.
[3] NFPA 855, Section A.4.12.1; Fisher Engineering Fire Protection Engineering Analysis (2023) at 4-5.
[4] Fisher Engineering Fire Protection Engineering Analysis (2023) at 12.
[5] NFPA 855, Section 9.6.5.6.4

requirements."[6] This is addressed in the Fire and Explosion Testing Data document within this Land Use Application Submittal package.

The Tesla MP2XL units were found to meet or exceed installation level codes and standards, such as the IFC and NFPA 855, required for outdoor, ground mounted BESS installations when installed with accordance with the Tesla MP2XL Design and Installation Manual.[7]

Although NFPA 855 Section 4.12 regulates Explosion Control for indoor applications, the Tesla MP2XL includes an explosion control system to mitigate the risk of an uncontrolled deflagration. The system includes twenty-six pressure-sensitive vents (overpressure vents) and twelve sparkers installed throughout the battery module bay designed to ignite flammable gases very early in a thermal runaway event before they accumulate within the enclosure and become an explosion hazard. The sparkers are installed at a variety of locations and heights throughout the battery module bay to ensure the flammable gases released during thermal runaway quickly meet an ignition source. The twenty-two overpressure vents are installed in the roof of the sealed battery module bay's IP66 enclosure and permit gases, products of combustion and flames to safely exhaust through the roof during a thermal event. By designing this natural ventilation flow path, flammable gases are not permitted to accumulate within the cabinet, reducing the risk of a deflagration or explosion that could compromise the cabinet's integrity, push open the front doors, or expel projectiles from the cabinet. In addition, the ventilation path creates a controlled fire condition, should one occur, out the top of the cabinet. By maintaining the cabinet's integrity, keeping all the doors shut during a fire event, reducing the risk of projectiles, and creating a controlled path for flames to exit the top of the cabinet, *the likelihood of a thermal event having an impact on life safety, site personnel or first responders, is reduced*. In addition, by maintaining these features, the likelihood of a fire propagating to adjacent cabinets, electrical equipment or other exposures is also reduced and can be designed for at the installation level (i.e., maintain clearances, emergency response plans, etc.).[8]

The entire Fisher report is confidential, however, the full report, including test parameters, findings, and additional technical information is available for review, if needed.

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[6] Fisher Engineering Fire Protection Engineering Analysis (2023) at 12.
[7] Fisher Engineering Fire Protection Engineering Analysis (2023) at 2.
[8] Fisher Engineering Fire Protection Engineering Analysis (2023) at 11-12.