

# Statement of Technical Findings

## Fire at the Victorian Big Battery

### Background

On 30 July 2021, the Victorian Big Battery (**VBB**) experienced a fire that involved two Megapacks during commissioning. Once the CFA had brought the situation under control, it handed control of the site to Energy Safe Victoria (**ESV**). ESV then commenced an investigation into the incident to determine its root causes and what actions should be taken to prevent a recurrence.

Neoen International SAS and its contractors UGL Engineering Pty Ltd and Tesla Motors Australia Pty Ltd (Tesla), who respectively own and operate the VBB site, have cooperated with ESV throughout its investigation.

### Methodology

Two Megapacks (each being a shipping container size battery unit) were completely consumed by the fire. The most likely root cause was determined by Tesla's engineering investigation and recreation of events to replicate real data from the incident in order to determine most likely the root cause.

The following findings are informed by testing undertaken by Tesla, examination of the scene by ESV (and other Victorian agencies), video surveillance footage and telemetry data from the original incident.

### Root cause

The most likely root cause of the incident was a leak within the Megapack cooling system that caused a short circuit that led to a fire in an electronic component. This resulted in heating that led to a thermal runaway and fire in an adjacent battery compartment within one Megapack, which spread to an adjacent second Megapack.

### Contributory factors

A number of other factors contributed to this incident and the destruction of the entire Megapack. Had these contributory factors not been present, the initial fault would likely have been identified and either manually or automatically contained.

- The supervisory control and data acquisition (**SCADA**) system for a Megapack took 24 hours to 'map' to the control system and provide full data functionality and oversight to operators. The Megapack that caught fire had been in service for 13 hours before being switched into an off-line mode when it was no longer required as part of the commissioning process. This prevented the receipt of alarms at the control facility.
- A key lock was operated correctly to switch the Megapack to off-line service mode (which was no longer required for ongoing commissioning) but this caused:
  - telemetry systems for monitoring the condition of the (now out of service) Megapack to shut down and so remove visibility of the developing event
  - the battery cooling system to shut down
  - the battery protection system to shut down, including the high voltage controller (**HVC**) that could have operated a pyrotechnic fuse to disconnect the faulty battery unit.

## Lessons learned and preventing a recurrence

The following actions have been put in place to prevent a recurrence of this incident.

- Each Megapack cooling system is to be fully functionally and pressure tested when installed on site and before it is put into service
- Each Megapack cooling system in its entirety is to be physically inspected for leaks after it has been functionally and pressure tested on site
- The SCADA system has been modified such that it now 'maps' in one hour and this is to be verified before power flow is enabled to ensure real-time data is available to operators
- A new 'battery module isolation loss' alarm has been added to the firmware; this modification also automatically removes the battery module from service until the alarm is investigated
- Changes have been made to the procedure for the usage of the key lock for Megapacks during commissioning and operation to ensure the telemetry system is operational
- The high voltage controller (HVC) that operates the pyrotechnic fuse remains in service when the key lock is isolated

Designers are also working to ensure that Megapacks are engineered to fully mitigate the risk of fire propagation from one unit to another under Victorian climatic conditions, with proposed mitigation procedures to be rolled out to applicable Megapacks globally.

## Conclusion

The incident was most likely initiated by a Megapack coolant leak. The absence of a number of monitoring and protection systems that would have been available had the initial Megapack not been subsequently switched to off-line service mode allowed the initial fault to go undetected and resulted in the total loss of two Megapacks.

The affected Megapacks failed safely despite total loss.

## Next steps

ESV has advised Tesla that it has no objection to the recommencing of commissioning at the VBB providing the measures outlined above are in place.

ESV has reminded Tesla of the general duties applying to the owners and operators of complex electrical installations under the *Electricity Safety Act 1998* (Vic), which include taking reasonable care to ensure that all parts of the installation are safe and operated safely.

ESV requires Tesla to provide the final results of its investigation (when available) into why the fire resulted in the loss of a second Megapack and what it is to do to prevent that circumstance arising again.

Having completed its technical review, ESV will now determine if there have been any breaches of the *Electricity Safety Act 1998* (Vic) and supporting regulations and, if so, whether enforcement action is warranted.

## Who we are

We are Victoria's safety regulator for electricity, gas and pipelines.

Our role is to ensure that Victorian gas and electricity industries are safe and meet community expectations. We are also responsible for licensing and registering electricians, and educating the community about energy safety.