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Read below for a comment from an expert in the field.

Lithium Batteries - Not as safe as you might believe!

By Ann Roffey

Four years ago my Aunt and Uncle retired to their dream home - a self-sustained, off-grid house with coastal views on acreage, enough solar power to run the property and ample rainwater so they will never have to pay a power or water bill again.

They have made many improvements to the house, including the installation of an aquaponics system, a new kitchen, sun room, pool, and the replacement of 24 lead-acid batteries to12 lithium.

On a Sunday evening in April this year, while sitting with visitors at a table near the kitchen, a huge explosion ripped through the air. After the explosion they discovered that two lithium batteries in the purpose-built pit had failed, only four metres from where they sat. Glass windows and doors smashed, the bathroom (including composting toilet) is no more. Soffits and guttering destroyed on impact. They are happy just to be alive ... if the batteries had caught fire, all four would now be dead. Especially given there were two gas bottles located nearby.

The lithium batteries were housed in a 120mm thick concrete pit that was engineer-designed and council-approved. The pit was adequately ventilated by two fans that ran continuously, with 150mm pipes going from the pit up above the two-storey roof, taking gas away from the house. The batteries themselves had fans in them. How could this happen? The company they bought the batteries from does not want to take responsibility for the fault.

Luckily, house insurance will cover the $150,000 damage to the house. Shards of glass and pieces of PVC pipe are still being found within a 40 metre radius of the blast site. They will have to make do with a Portaloo for a while yet. While they await repairs on their house, they are keen to share their story to alert lithium battery owners of their very real dangers.

Damage from the lithium battery explosion at my Aunt and Uncle's house. They moved their bedroom to the other end of the house, as it was right above the explosion and sustained significant damage.

Response from David Keenan

“I spent several hours gleaning what I could from the very limited information given in the July 2025 ROGI article, and more hours writing it up. It was a fun bit of detective work.

I note that the article says that the batteries did not burn, but contrary to the author's claims, if the battery had burned, the occupants would not now be dead, although their house may well have been destroyed by fire, entering through the window that the battery should never have been sited under. But the battery did not burn. The photos bear that out.

It was clearly a fuel-air explosion. The fuel may have been electrolyte solvent venting from overheated cells, or something else I'll mention later, but only someone with no training, would put a lithium battery in a covered pit in the ground, with no way for heavier-than-air vapours or gasses to drain out. I note that the article refers to "the company they bought the batteries from", not "the company that installed the batteries". It was clearly an amateur installation job as can be seen from the unsupported cables with no mechanical protection.

The pit is described as "purpose built" and "engineer-designed and council-approved". It certainly wasn't purpose built, engineer-designed or council-approved for housing lithium-ion batteries! They mention that the lithium battery replaced a 24-cell lead-acid battery, but I don't think the pit was designed or approved for that either. It's directly below a window! There should be no window or door within 600 mm either side of a battery, let alone above it.

I believe that pit was purpose built, engineer-designed and council-approved for one purpose, and that is for servicing the composting toilet mentioned in the article. In one photo I believe one can see part of the black plastic hatch for removing the composted waste from a Clivus Multrum style toilet. So the fuel, in the fuel-air

mixture that exploded, may have been methane from the composting toilet.

The article claims that "the pit was adequately ventilated by two fans that ran continuously, with 150mm pipes going from the pit up above the two-storey roof, taking gas away from the house". But where was the balancing air inlet? Not below the batteries I'd wager. I submit that those fans and vent pipes were there only for the purpose of ventilating the composting toilet chamber, and if the toilet seat was left up, they would not draw any air from the pit.

But whatever the fuel, I'm fairly certain the battery supplied the spark that ignited the explosive mixture. But how and why would the battery cause such a spark?

The kind of lithium battery modules we can see, housed in the kind of 19" racks we can see, are not approved for outdoor installation, nor are they approved for installation in an environment with extreme humidity and water condensation as would be inevitable in such a pit. You can see a line of dampness on the brickwork inside the pit in one photo.

Most informative is the bottom left photo, a close-up of two modules in the bottom of a 19" rack. In another photo we can see that there is another 19" rack which looks undamaged apart from debris and possibly bootprints on top of it. It looks to be full of battery modules and so it presumably houses the other 10 modules of the 12 referred to in the text.

But when we zoom in to the two-module rack, we can see that the modules were originally white. And we can see part of a logo on the ground that looks like it begins with "C Po". I eventually found they are made by Power Plus Energy, an Australian company, and are almost certainly the older Eco4840P model because you can make out some blue text behind the soot, where the newer Eco4847 model has black text and a different looking

circuit breaker. https://www.powerplus-energy.com.au/legacy-batteries/

And the company has changed its logo. These modules were sold by many retailers. I only link to this page, belonging to a highly reputable company, because they still show the old logo for PowerPlus Energy, so you can compare it with the fragment you can see on the ground in the photo in the article. https://www.springers.com.au/shop/eco4847-powerplus-eco-48v-4-7kwh-lithium-battery-18090?gQT=1&product=18090#attribute_values=78https://www.springers.com.au/shop/eco4847-powerplus-eco-48v-4-7kwh-lithium-battery-18090?gQT=1&product=18090#attribute_values=78

We can also see that the double-pole circuit breaker in the upper module has completely melted and puddled onto the top of the module below. But the lid of the upper module is not charred at all. This puddle suggests that this circuit-breaker was arcing for many minutes. The starting of this arc would have ignited the fuel-air mixture in the pit, and blown the cream coloured plastic door of this rack to pieces before propagating to the rest of the pit and the vent pipe and causing all the damage we can see. But the arc would have had to continue for some time after the explosion.

My first thought was that these may not have been reputably branded or suitably rated DC circuit breakers. But then I saw that they were NoArk brand 63A DC breakers. This is an extremely reputable brand and their standard DC breakers should be more than up to the task.

The only hypothesis I can come up with is that water condensation, or possibly ants, created a current path between the positive and negative poles of the circuit breaker allowing an arc to track across the surface. It may have taken months or years for this tracking to build up to the point where it arced over.

The heat of this arc would have caused the nearest cells to vent flammable solvent, but this would immediately

have been ignited by the arc and burned in a flame as it came out, and would not have had time to build up an explosive mixture with air.

But it may also be that a BMS failed in some other module, due to condensation, and allowed some cells to overheat and vent flammable solvent into the pit for some time with no source of ignition, before the tiny arc, that is always momentarily present during a perfectly valid tripping of the circuit breaker due to overload, ignited it.

But no matter what the sequence of events, the primary cause of the explosion was the siting of perfectly-good CEC-approved indoor-rated (IP40) battery modules in an outdoor pit.

-- Dave Keenan

Dave Keenan has recently retired. He worked as an accredited designer and installer of lithium-ion battery systems, both on and off grid, and he trained and assessed electricians to design, install, maintain and fault-find on grid-connected battery systems.