**General Risk Assessment Form**



| **Date:** (1) | **Assessed by:** (2) | **Checked / by:** (3)  | **Location:** (4) | **Assessment ref no** (5) | **Review date:** (6) |
| --- | --- | --- | --- | --- | --- |
| **Task / premises:** (7) Risk Assessment for LiFePO4 Battery Packs. |

| **Activity** (8) | **Hazard** (9) | **Who might be harmed and how** (10) | **Existing measures to control risk** (11) | **Risk rating** (12) | **Result** (13) |
| --- | --- | --- | --- | --- | --- |
| Battery Charging/Discharging | Fire, smoke and fumes, burns from an overheated battery pack, corrosive burns from escaping electrolyte. Fragments from an exploding battery pack (worse case). | University staff, students and visitors – anybody near battery. | LiFePO4 Battery Packs were selected as they are a safer chemistry and are not known for catching on fire (compared to alnenertive Li Polymer and ion chemistries). This RA only covers LiFePO4 Battery Packs that. 1. A Battery Management System (**BMS**)is embedded in the battery pack ot ensure all cells are charging/discharging to the same potential.
2. The internal protection circuit AKA **BMS**, mentioned above, should also help protect the battery from any abnormal charging conditions e.g. in the unlikely case of a faulty battery charger.
3. An additional DC-DC converter will be used before the connection to the load to ensure battery pack doesn’t discharge below set threshold levels.
4. Always read safety labels on batteries and PSU: understand their individual operational ranges ( to ensure battery doesn’t get stressed).
5. LiFePO4 batteries (or any other battery for that matter) must not be left unattended whilst charging or left charging overnight.
6. This battery pack has its own charger that is intended to be used with. Both the battery and charger are labelled to show that they work together.
 | Low | A |
| Battery Storage | Electrical Shock | Staff, user | 1. A metal enclosure has been built to host the sensor and also the battery pack.
2. Battery must be kept inside the metallic enclosure at all times unless the system will be running on mains power.
3. When running on mains power the battery terminals should be protected with plastic caps to give an additional safety measure to users getting an electric shock.Can use electrical tape if caps cannot be found,to ensure that leads are never exposed.
4. Avoid mechanical or electrical abuse. Storage preferably in cool, dry and ventilated area, which is subject to little temperature change. Storage at high temperatures should be avoided.
5. Do not place the battery near heating equipment, nor expose to direct sunlight for longperiods.
 | Low | A |
| Disposal of batteries | Defective batteries, or batteries close to their limits in terms of charge might catch fire | All people in the areaFire | 1. Batteries are not to be disposed with general waste.
2. Contact campus cleansing for advice on safe dispoal.
3. For disposal the terminals should be taped and stored in a suitable and labelled cardboard or plastic container. Batteries should be bubble wrapped and kept apart from each other.
4. It is recommended to discharge the battery to the end, to use up the metal lithium inside the battery, and to bury the discharged battery in sand.
5. The battery should not be opened, destroyed or incinerate, since they may leak or rupture and release to the environment the ingredients that they containin the hermetically sealed container.
6. Do not short circuit terminals, or over charge the battery, forced over-discharge, throw to fire. Do not crush or puncture the battery, or immerse in liquids.
 | Medium | A |
| Battery | Malfucntion | Staff, user | 1. Battery packs must get a visual inspection prior to installation. Everytime the battery is used or charged (or once every 6 months if unused) a visual inspection should be made to ensure no visible scratches or dents can be seen on the battery.
2. Never use Batteries that are swollen, or show signs of damage. Report any defected batteries for safe disposal.
 | Low-Medium | A |
| Transporting batteries | Falling objects | User transporting | 1. Always wear metallic toe capped safety shoes when lifting/transporting batteries.
2. User should use good lifting ergonomics when lifting and transporting the batteries.
3. Always transport Lithium batteries in the appropriate packaging for fire containment and to minimise mechanical shock. There should also be warning labels as to the packaging contents.
4. This risk assessment does not cover the transport of these batteries off the university site by car or by any other method.
 | Medium | A |
| Working on equipment without removing the Lithium battery: | Fire, smoke and fumes, burns from a overheated battery pack, corrosive burns from escaping electrolyte. Fragments from an exploding battery pack (worse case). | University staff, students and visitors. | The Lithium battery pack should be easily accessible and removable from the equipment during the development phase of a project.The terminal (+ and -)connectors will be covered as soon as possible after being inserted or removed for maintainance. | Low | A |
| Poor Battery health | Battery leak | User opening metallic frame | First aid measures * Eye: Flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid.
* Skin: Remove contaminated clothes and rinse skin with plenty of water or shower for 15 minutes. Get medical aid.
* Inhalation: Remove from exposure and move to fresh air immediately. Use oxygen if available.
* Ingestion: Give at least 2 glasses of milk or water. Induce vomiting unless patient is unconscious. Call Doctor
 | Medium | A |

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| **Action plan** (14) |
| **Ref No** | **Further action required** | **Action by whom** | **Action by when** | **Done** |
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| **Authorisation by PI/ Line Manager****I confirm that I have considered and understand the experiment and the associated hazards. I am satisfied that all of the hazards have been identified and that the control measures to be followed will reduce the risks to acceptable levels.** **Print name: Signed:****Date:** |

**Declaration by researcher**

**I confirm that I have read this Risk Assessment and that I understand the hazards and risks involved and will follow all of the safety procedures stated.**

**Declaration by PI/Line Manager**

**I confirm that the researcher who has signed below is competent to undertake the work. My counter-signature indicates that I am happy for the work to proceed.**

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| **Name (please print)** | **Signed** | **PI/Line manager countersignature** | **Date** |
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