POWERTITAN BATTERY EMERGENCY RESPONSE GUIDE

PRINT AND PLACE IN FACP

LITHIUM-ION / Li-ion

Figure 1: Battery Unit. Caution contains potentially lethal voltage and arc flash hazard

Release Date 2023-01-23
Version 7.1 EN

Emergency contact details – print and place in FACP as a label

EMERGENCY PHONE NUMBERS	
Local and state emergency	911
Fire Department (not for emergency use)	
Police Department	
Ambulance	
BATTERY EXPERTS	
Subject matter expert	
Certificate of fitness holder	
Plant operator	
Network operation center NOC (BESS control)	
Sungrow USA Corporation	1-833-SGPOWER (747-6937)
SITE DETAILS	
Site name	
Site size	[ ] MW and [ ] MWh
Address	
Battery Unit Model Number(s) and chemistry	[ ] ST2752UX, [ ] ST2236UX, [ ] LFP, [ ] NMC, other:
Location of drawings	[ ] inside FACP, [ ] at control room, other:
Location of main power switch	
Main power switch interaction with auxiliary	[ ] does not affect auxiliary safety power, [ ] disconnects safety power

Battery manufacturer escalation protocol

If battery experts are unresponsive the following emergency escalation protocol may be followed to elicit help from the manufacturer. Sungrow might not have site specific knowhow.

Standard Emergency Protocol:				
1	911 (if applicable)			911
2	Service Call Center. This may also be used for general enquiries.			1-833-SGPOWER (747-6937)
Emergency Escalation: Lack of response on Standard Protocol				
2	Patrick Betzel	Sr. Field Service Manager	Patrick.betzel@sungrowamericas.com	602-373-1551
Emergency Escalation: Lack of response on Standard Protocol or Emergency Escalation Protocol				
1	Ernest Lira - Eastern Region US	FSE Manager	Ernest.lira@sungrowamericas.com	210-625-6114
2	John Fraser - BESS	FSE Manager	John.Fraser@sungrowamericas.com	480-297-2455
3	Justin Corne - Western Region US & Canada	FSE Manager	Justin.Corne@sungrowamericas.com	980-578-8636
4	Patrick Betzel	Sr. Field Service Manager	Patrick.betzel@sungrowamericas.com	602-373-1551
5	Christine Olson	CRM Manager	Christine.olson@sungrowamericas.com	602-885-8907
Address: Sungrow Service Training Center				
5780 S40th St. Ste 1 Phoenix, AZ 850401			techsupport@sungrow-na.com	

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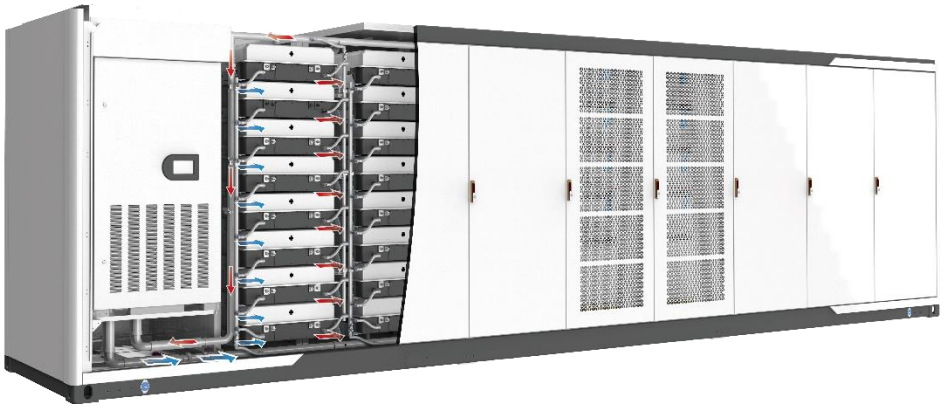


Figure 2: Glycol cooled lithium-ion battery principle

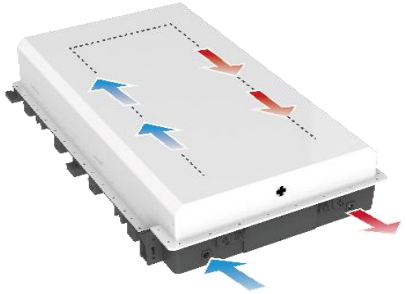


Figure 3: Lithium-ion battery module, glycol cooled. Caution contains potentially lethal voltage and arc flash hazard

Figure 4: Glycol cooling unit. Caution uses glycol and R410A refrigerant

Figure 5: Battery module. Caution contains potentially lethal voltage and arc flash hazard

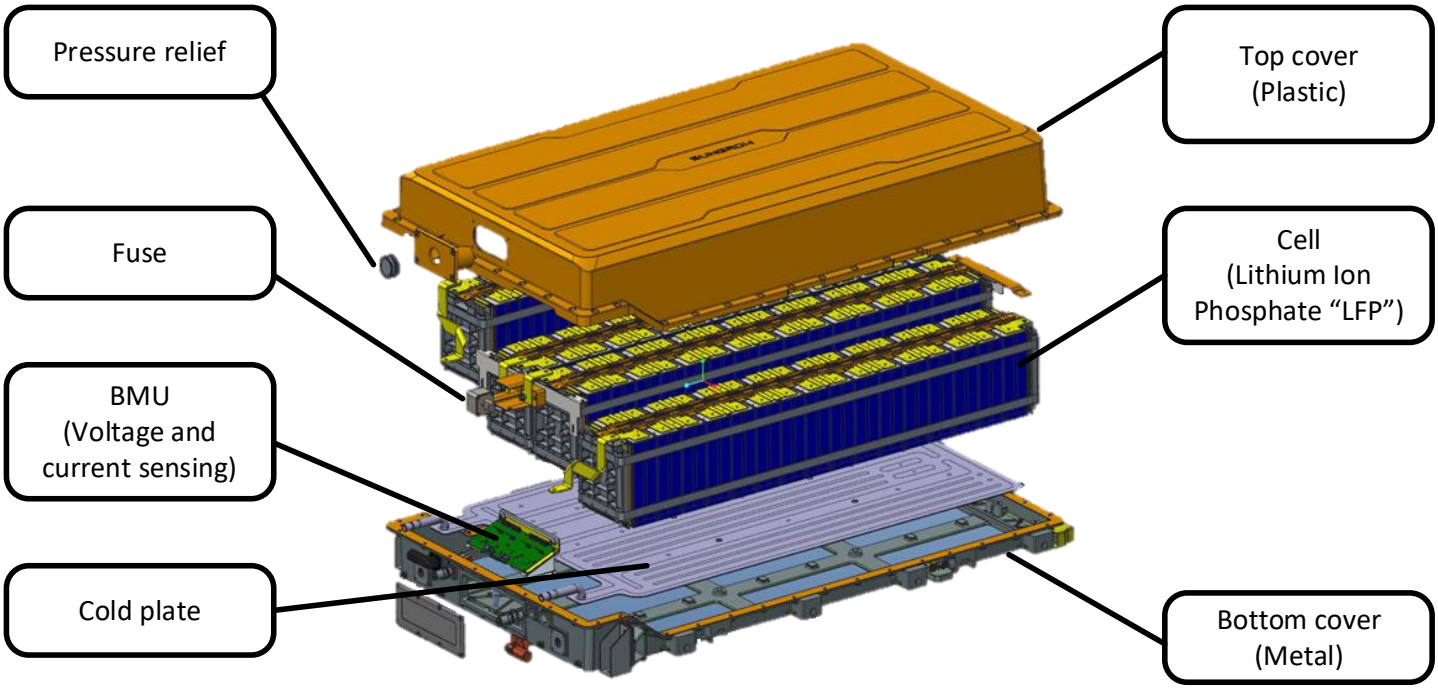


Figure 6: Battery module exploded view. Caution contains potentially lethal voltage and arc flash hazard

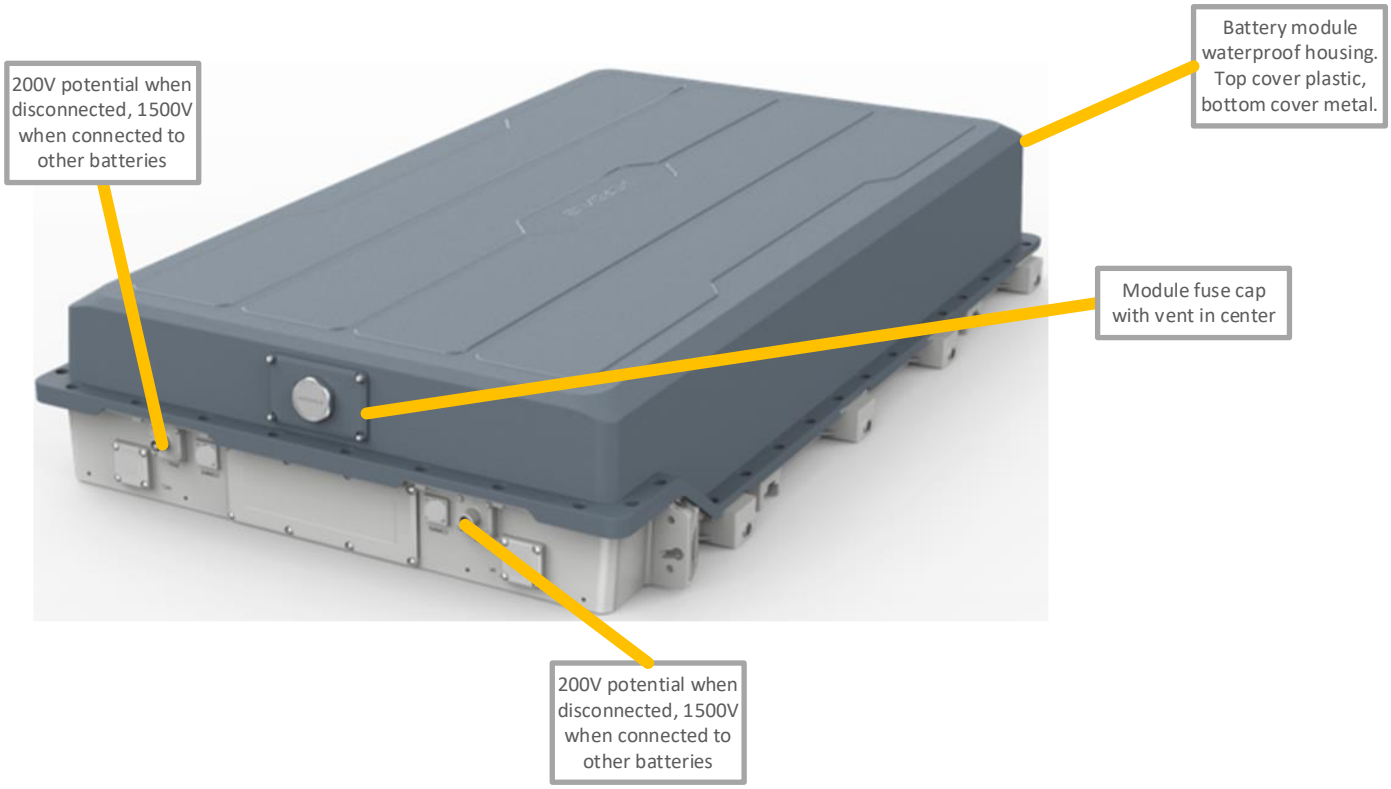


Figure 7: Battery module. Caution contains potentially lethal voltage and arc flash hazard. Typically, these are all touch safe but fire and transport damage may remove insulation and become a potentially lethal accident if touched without insulating PPE

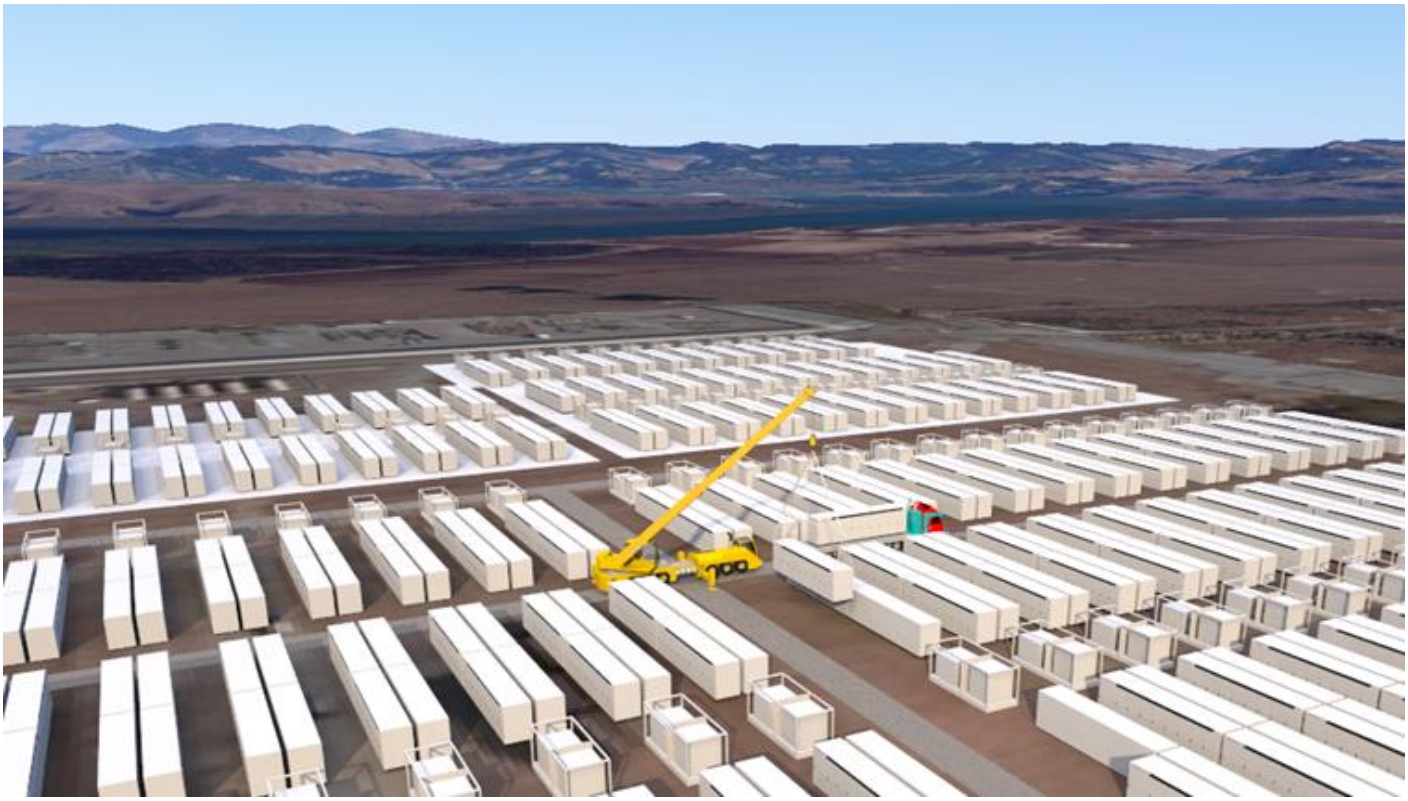


Figure 8: Typical battery site (power plant). Ensure fire hoses and typical spray can reach various areas to manage fires

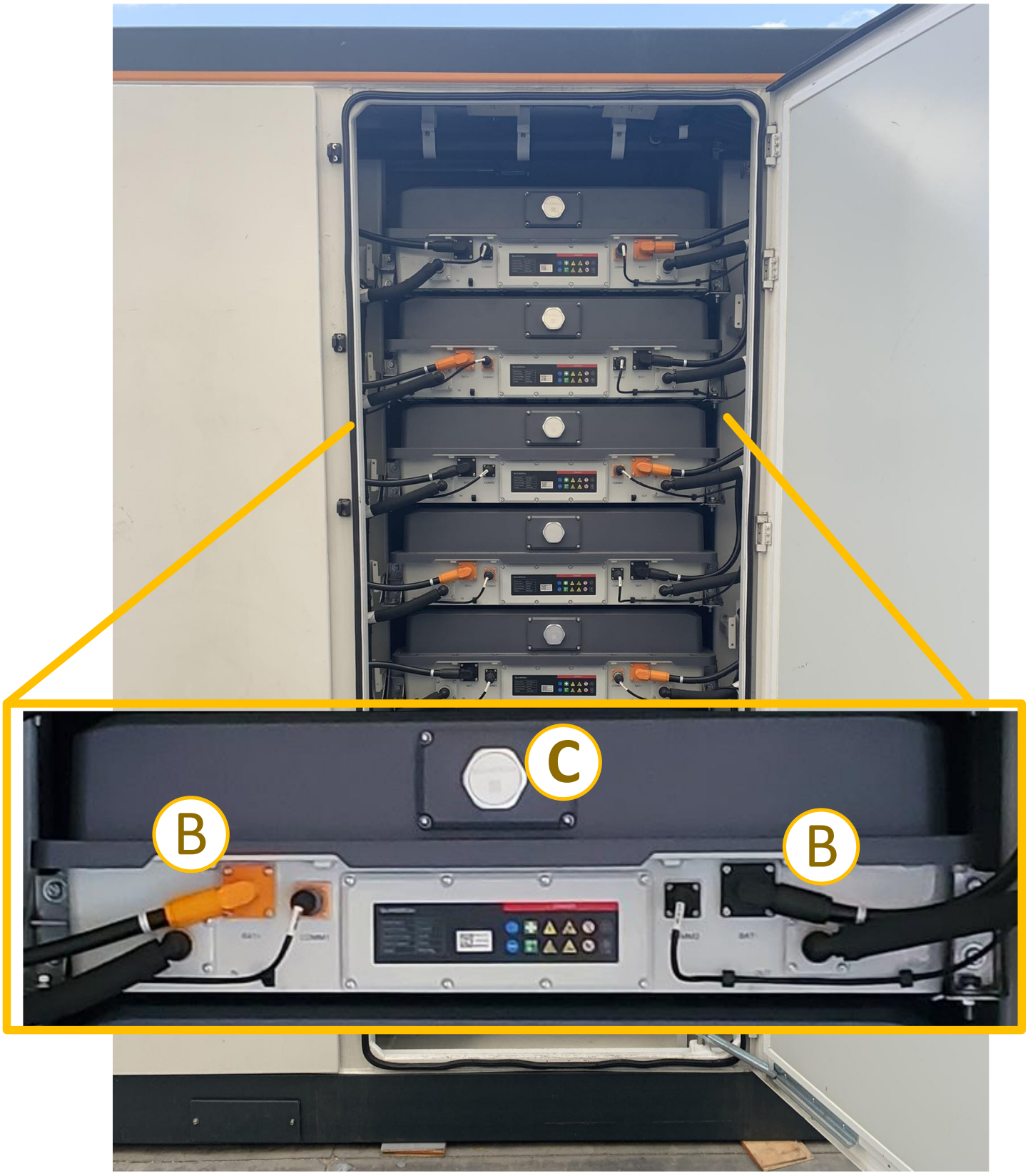
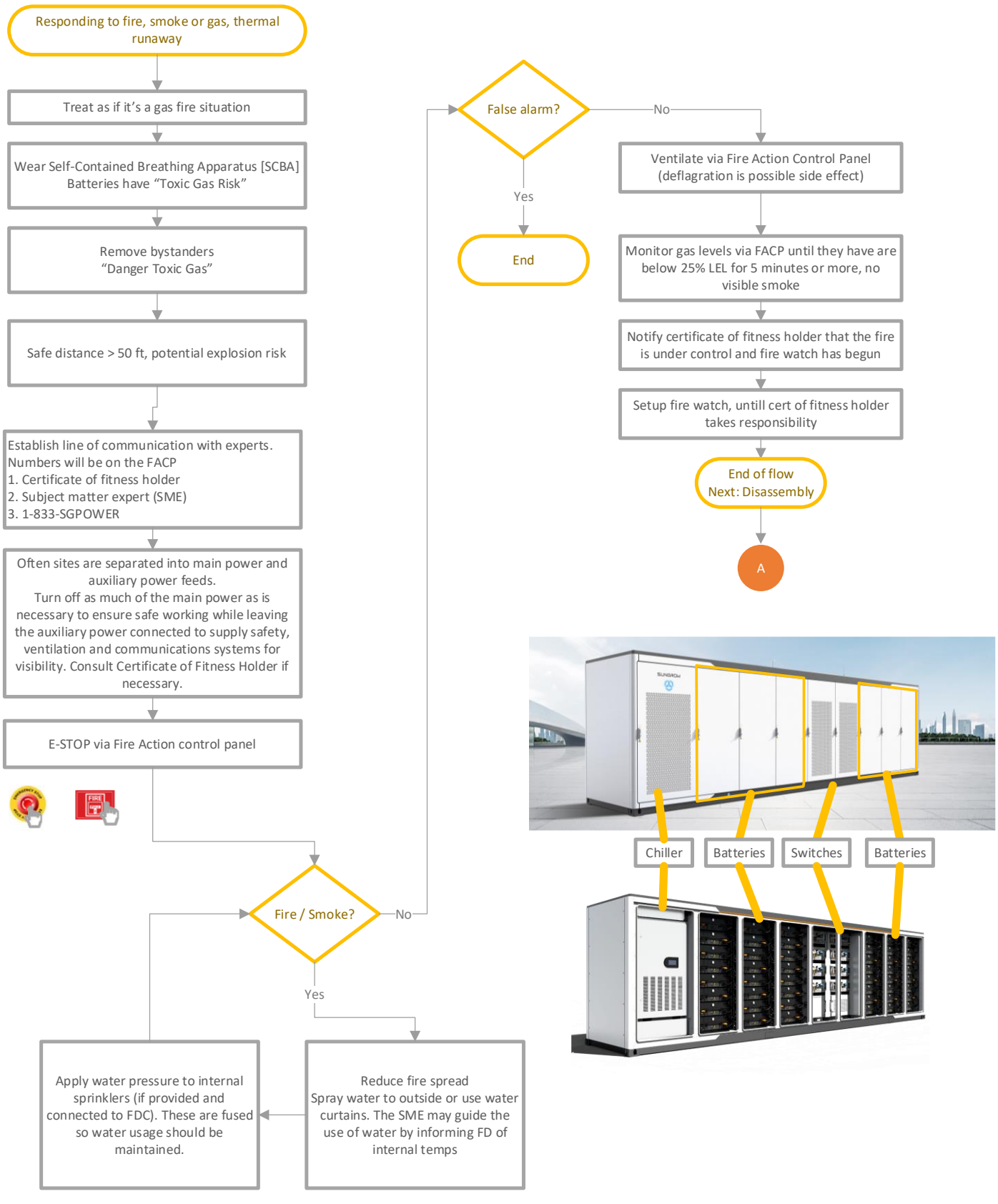


Figure 9: B battery terminals, C module fuse cap

Fire, Explosion, Toxic gas release & Smoke incident flow chart



Disassembly flow chart

A

Cert of fitness holder, notifies the FD when they are ready to open the doors

Cert of fitness holder, notifies the SME that disassembly is imminent

With FD on site. Certificate of fitness holder establishes with FD if it is safe to open the door and purge.

Ventilate via Fire Action Control Panel (deflagration is possible side effect)

Monitor gas levels via FACP until they have are below 25% LEL for 5 minutes or more, no visible smoke

Open “switch” doors (1500VDC inside)

Open switches [C] (1500VDC inside)

Check again battery compartments gas levels are below 25% LEL

Using water mist if required by the fire department (FD may treat as if it’s a gas fire situation even if gas is all clear) open battery doors (1500VDC inside)

Scan all modules with infrared cameras for hot modules. If the unit has cooled for 24h then inspect the top of each module with a inspection camera (insulate if metal) Modules with burn marks or holes in top plastic cover must removed.

Release Fire Department to the station and remain on standby

Remove cables and pipes, take extreme care to not touch conductors (1500VDC) (B)

Remove module cap (C), using 8mm socket wrench

Take extreme care to not touch exposed metal wires or the fuse behind the module cap

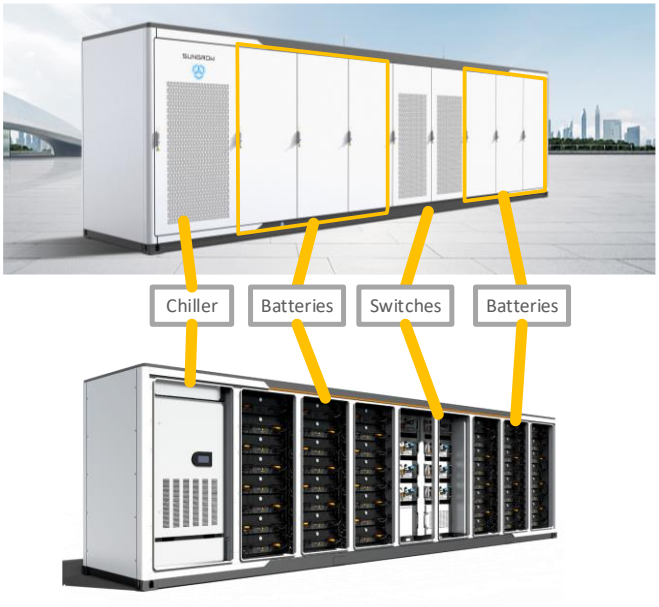
Fill module with water to prevent reignition

Leave cap off to observe smoke or reapply water if needed

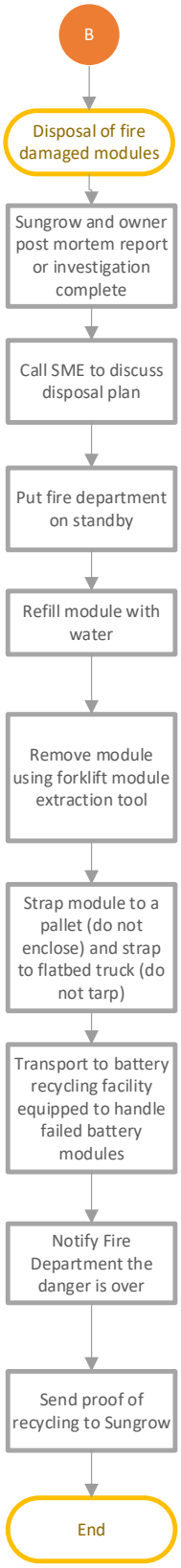
Follow disposal procedure for fire damaged modules

End of flow chart
Next: Disposal of fire damaged modules

B



Disposal of fire damaged modules flow chart



Scope

This document is a reference guide for emergency personnel. The guide is applicable to Sungrow PowerTitan energy storage systems.

The information and recommendations set forth are made in good faith and believed to be accurate as of the date of publication. Sungrow makes no warranty, expressed or implied, with respect to this information.

Overview of typical site components

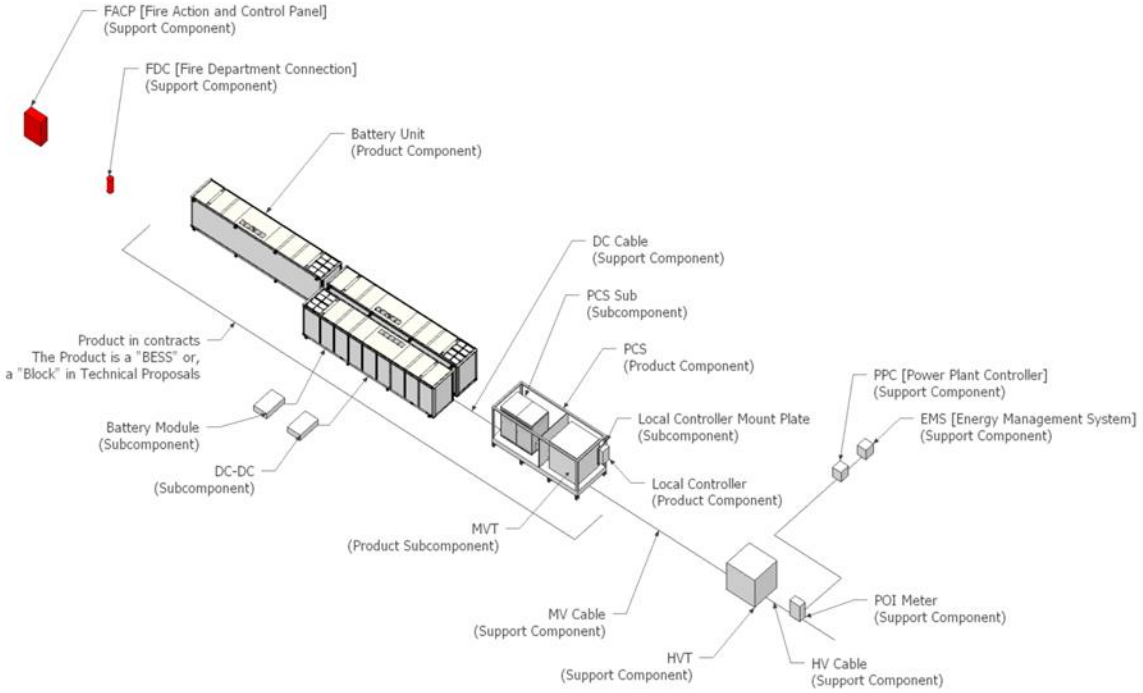


Figure 10: Typical site components of a PowerTitan based energy storage project. "Product Components" are made by Sungrow. "Support Components" are not made by Sungrow and are not always present. Site requirements and Components vary.

Figure 11: Battery Unit

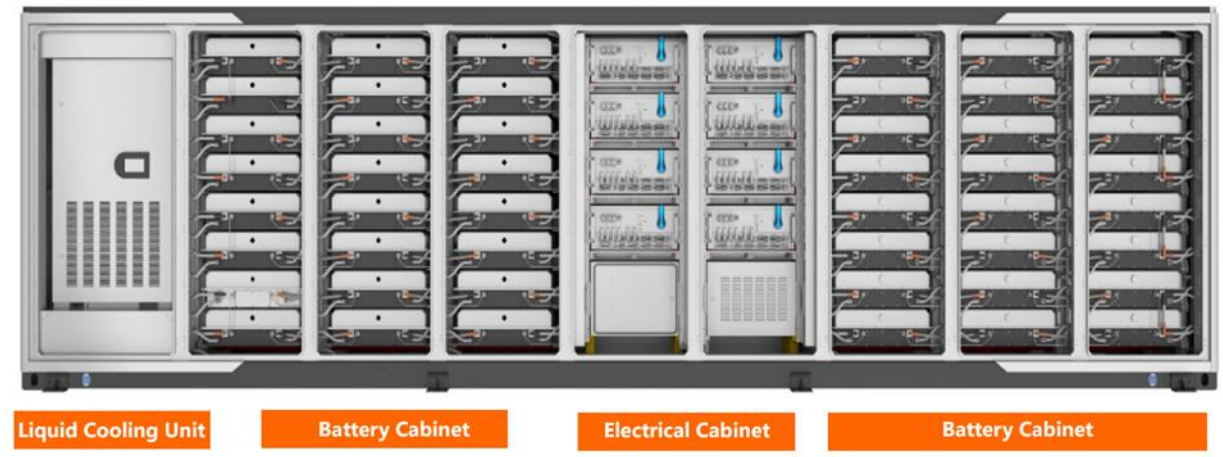


Figure 12: Battery Unit (ST2752UX) - Doors removed to expose internals: Liquid cooling unit, Battery Cabinets and Electrical Cabinet.

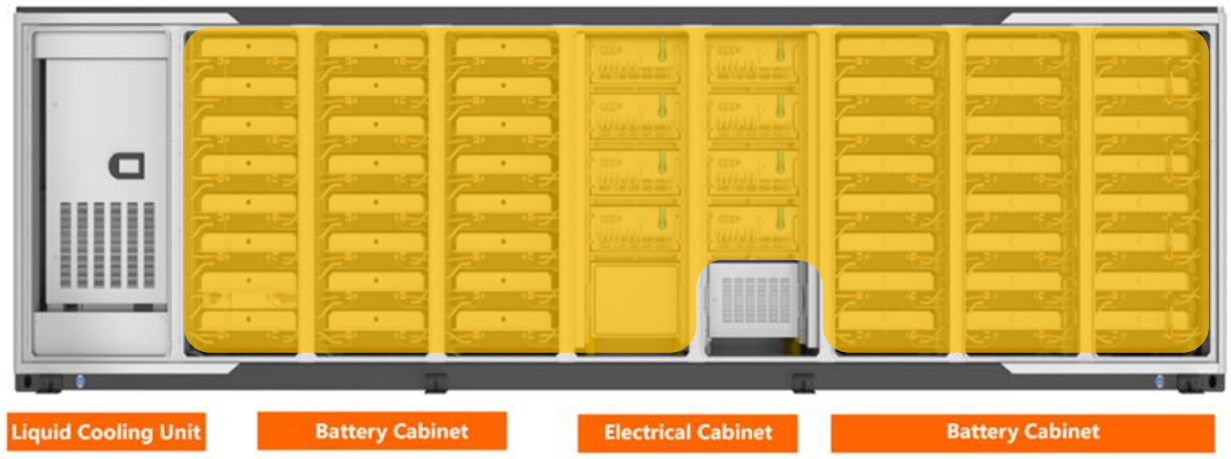


Figure 13: Battery Unit (ST2752UX) - Areas that remain energized due to stranded energy of the battery system, regardless of emergency stop or switch positions

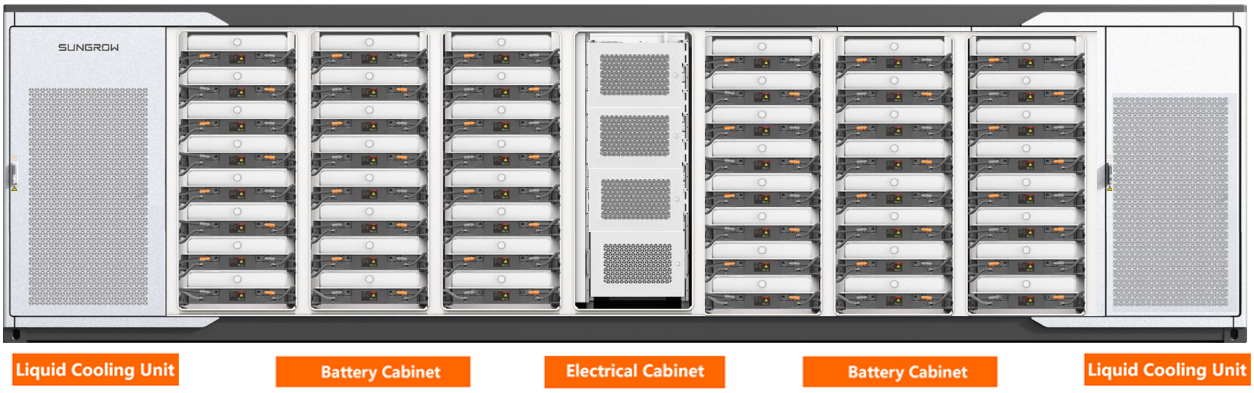


Figure 14: Battery Unit (ST2236UX) - Doors removed to expose internals: Liquid cooling unit, Battery Cabinets and Electrical Cabinet

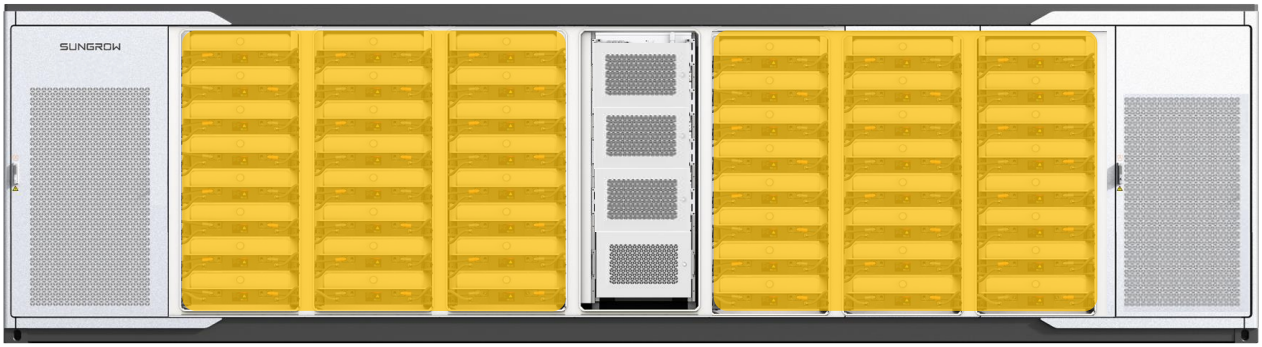


Figure 15: Battery Unit (ST2236UX) - Areas that remain energized due to stranded energy of the battery system, regardless of emergency stop or switch positions

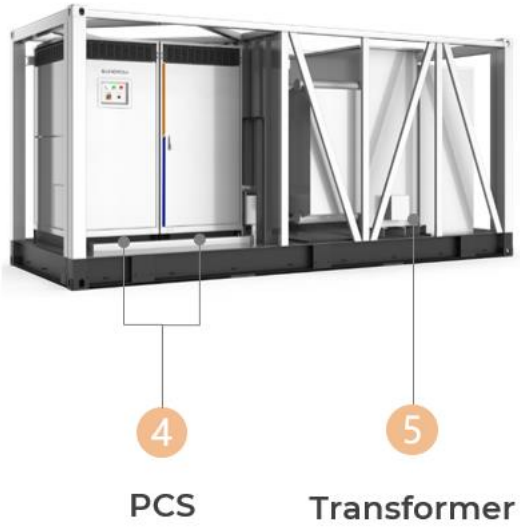


Figure 16: PCS showing subcomponents: PCS and Transformer. Occasionally the PCS will be installed without a Transformer

EMERGENCY RESPONSE LITHIUM-ION

Hazards include:

- Fire
- Explosion
- Toxic gas release
- Smoke
- Electric shock
- Arc flash

If any Fire, Explosion, Toxic gas release & Smoke incident occurs, follow “Fire, Explosion, Toxic gas release & Smoke incident flow chart”, which outlines the following measures:

1. Call the local fire department (USA 911 or the direct fire department line)
2. Contact the Subject Matter Expert (SME) and Certificate of Fitness Holders’ numbers displayed on FACP
3. Contact Sungrow for technical guidance (1-833-SGPOWER)
4. Turn off as much of the main power as is necessary to ensure safe working while leaving the auxiliary power connected to supply safety, ventilation, and communications systems for visibility
5. If the situation is safe and permits, press the E-stop button on the PCS and battery unit, turn off the system remotely via energy management system (EMS) or SCADA systems
6. Evacuate the area and remove persons from hazards
7. Contain the exposure to limit the spread of fire and other hazards
8. SME or Certificate of Fitness Holder can provide guidance as to internal battery temperatures to save water

POTENTIAL HAZARDS

FIRE OR EXPLOSION

• Lithium-ion batteries contain flammable liquid electrolyte that may vent, ignite and produce sparks when

• subjected to high temperatures (> 150°C (302°F)), when damaged or abused (e.g., mechanical damage or electrical overcharging).

• May burn rapidly with flare-burning effect.

• May ignite other batteries in close proximity.

HEALTH

• Contact with battery electrolyte may be irritating to skin, eyes and mucous membranes.

• Fire will produce irritating, corrosive and/or toxic gases.

• Burning batteries may produce toxic hydrogen fluoride gas (see GUIDE 125).

• Fumes may cause dizziness or asphyxiation.

PUBLIC SAFETY

• CALL 911. Then call emergency response telephone number on Emergency Numbers list located at the FACP or at the end of this guide, if necessary escalate via the escalation protocol with Sungrow.

• Keep unauthorized personnel away.

• Stay upwind, uphill and/or upstream.

• Ventilate closed spaces before entering, but only if properly trained and equipped.

• Stay away zone for a Battery Unit in thermal runaway is shown

PROTECTIVE CLOTHING

• Wear positive pressure self-contained breathing apparatus (SCBA).

• Structural firefighters' protective clothing provides thermal protection but only limited chemical protection.

EVACUATION

Immediate precautionary measure

• At least 75 feet (about 23m) in all directions.

• Consider initial downwind evacuation for at least 100 meters (330 feet), more for fire.

Fire

• If Battery Unit is involved in a fire, ISOLATE for 500 meters (1/3 mile) in all directions; consider also evacuation of emergency responders for 30 meters (100 feet) in all directions and establish an approach plan for the situation. Refer to the “exclusion zone” diagram in figure 18.

FIRE

Small Fire (Battery Module in spare parts depot)

• Dry chemical, CO2, water spray. Fire is class B so any class B extinguisher.

(Foam is not recommended as battery fire may restart from under the foam)

Large Fire (Battery Unit – looks like shipping container)

• Water spray or fog.

• If it can be done safely, move undamaged Battery Units or Battery Modules away from the area around the fire.

FUMES OR MATERIAL SPILL (case: gas sensor triggered but no obvious fire, liquid emitted in a rupture but no obvious fire)

• ELIMINATE all ignition sources (no smoking, flares, sparks or flames) from immediate area.

• Do not touch or walk-through spilled material.

• Absorb with earth, sand or other non-combustible material.

• Leaking batteries and contaminated absorbent material should be placed in metal containers.

FIRST AID

• Call 911 or emergency medical service.

• Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

• Move victim to fresh air if it can be done safely.

• Give artificial respiration if victim is not breathing.

• Administer oxygen if breathing is difficult.

• Remove and isolate contaminated clothing and shoes.

• In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes.

Containing a fire exposure

Spray water in a curtain between each BESS from 150m (500ft) or less and allow the product to burn out. If there is a shortage of water, then direct spraying the container may be preferable. Many fire departments opt to let the primary source burn out and protect exposures. The Battery Units are not walk in so there will be no persons inside. Refer to fire fighters flow chart.

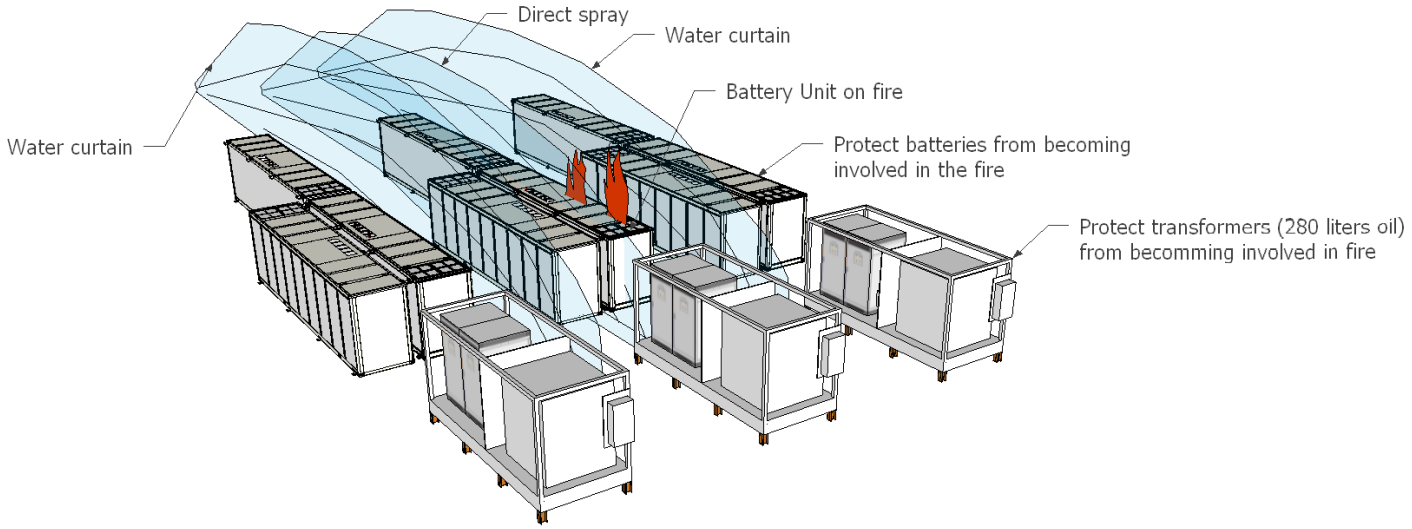


Figure 17: Example of preventing exposures from becoming involved in the fire using water curtains and direct spray. Note it may be preferable to let the fire burn out more quickly by not spraying the Battery Unit that is on fire.

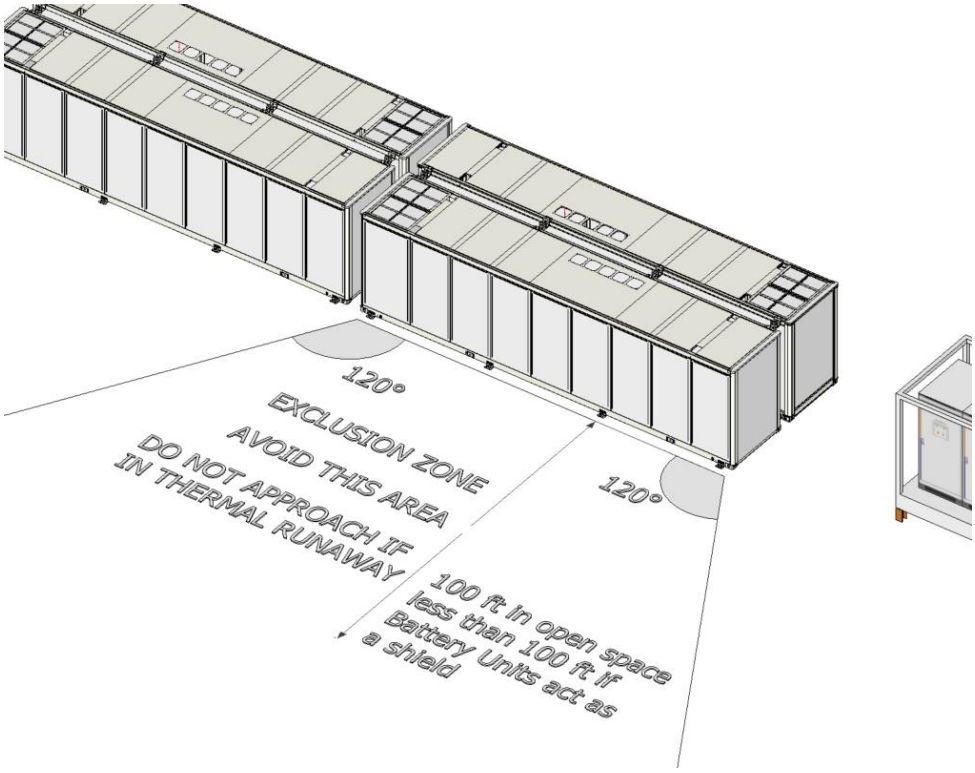


Figure 18: Recommend approach angles are outside the "AVOID THIS AREA" "EXCLUSION ZONE" if in that Unit is in thermal runaway.

Lithium-Ion Battery Transportation Emergency Response

Refer to the Department of Transport Pipeline and Hazardous Materials Safety Administration Emergency response guidebook (edition 2020 is freely available for download from the DOT).

PowerTitan batteries are Lithium-ion UN3536 Class 9 miscellaneous hazardous materials. Material ID 147 for the battery and ID 125 for hydrogen fluoride in the guidebook.

Handling Method of Leaked Coolant

3.1.1 Basic Information

1. Note the CDC provides a detailed emergency response card[1], this is a summary tailored for the energy storage system
2. Each Battery Unit contains 50-50 ethylene glycol and water[2]. 150L for any of the Power Titan models (ST2752UX and ST2236UX).
3. The fluid is blue in color and does not emit a strong odor.
4. Coolant is not part of the safety system.
5. Coolant can leak and not pose a fire risk or thermal runaway risk[3].
6. Large leaks drain at the two glycol drain holes at the front center of each battery compartment a hose may be connected for gravity or pumped drainage.
7. Refer to the ethylene glycol Material Safety Data Sheet (MSDS) for toxicological hazards.
8. Keep run-off water out of sewers and water sources.
9. Under the right conditions 50-50 glycol is flammable

3.1.2 Minimum Equipment Required

1. If engineering controls do not maintain airborne concentrations to a level[4] which is adequate to protect worker health, an approved respirator must be worn
2. Use protective gloves which are chemically resistant to this material
3. Chemical goggles, or safety glasses with side shields
4. Use protective clothing and shoes which are chemically resistant to this material

3.1.3 Procedure

1. Shut off the system. Refer to “Shut down options and processes”
2. Contact the operators immediately, and let the irrelevant personnel evacuate to the safety zone
3. If the leak is not related to a fire or thermal runaway: Approach the Battery Unit and cut off the leakage source as much as possible. If the leak is related to a fire or thermal runaway manage the thermal situation first and then attempt to manage run off at a safe distance when the situation permits and is appropriate.
4. Provide good natural ventilation conditions.
5. In case of leakage, use protective equipment to protect the human body when removing the leakage liquid.
    a. For large spills: remove with a vacuum truck or pump to storage/salvage vessels
    b. For small spills: soak up residue with an absorbent such as clay, sand, or other suitable material. Place in a non-leaking container and seal tightly for proper disposal
6. Do not drain glycol into sewers, rivers, streams, or the natural environment.

3.1.4 Poison emergency

1. Call the poison center immediately at 1-800-222-1222.

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[1] CDC glycol emergency response card

[2] This is automotive antifreeze but colored blue and not green or yellow as is common in the USA

[3] Battery modules are waterproof to IP67, leaks will not enter the module. Least to control systems will cause the battery string to be disconnected including the case of power supply failure. Pyro fuses are not used and when wet these have failed to trigger and lead to battery fires.

[4] 75 mg/m^3 in the USA according to the CDC as of 2022

2. If the poisoned person cannot wake up, has a hard time breathing, or has convulsions, call 911 emergency services.
3. For information on who to contact in an emergency, see the CDC website at emergency.cdc.gov or call the CDC public response hotline at (888) 246-2675 (English), (888) 246-2857 (Español), or (866) 874-2646 (TTY).

Handling Method of Leaked Refrigerant

3.2.1 Basic Information

1. Refrigerant is not part to the safety systems but may leak
2. Refrigerant may appear as white smoke when leaking
3. R410A:75-10-5 and 354-33-6. 14.4 kg for ST2752UX and 28.8kg for ST2236UX.
    a. Difluoromethane and Pentafluoroethane mixed refrigerant in a sealed system.
4. Refer to the R410A Material Safety Data Sheet (MSDS) for toxicological hazards.

3.2.2 Minimum Equipment Required

1. Tightly fitting safety goggles (approved by EN 166(EU) or NIOSH (US))
2. Wear cold insulating protective gloves (such as butyl rubber), passing the tests according to EN 374,US F739 or AS/NZS 2161.1 standard
3. Experienced, use a full-face respirator with multi-purpose combination (US) or type AXBEK(EN 14387) respirator cartridges.
4. Wear fire/flame resistance/retardant clothing and antistatic boots
5. Suitable Extinguishing Media after ignition: Dry chemical or carbon dioxide
6. Suitable Extinguishing Media to cool cylinder containing R410A inside Cooling Unit: Water
7. Dry sand or inert absorbent

3.2.3 Procedure

1. Shut off the system. Refer to “Shut down options and processes”
2. Ensure adequate ventilation. Remove all sources of ignition
3. Evacuate personnel to safe areas. Keep people away from and upwind of spill/leak
4. Use personal protective equipment. Avoid breathing vapors, mist, gas, or dust
5. Cool Cooling Unit by spraying water between heat source and Cooling Unit or spraying Cooling Unit directly (see Containing a fire exposure).
6. Prevent further leakage or spillage if safe to do so
7. Discharge into the environment must be avoided
8. Absorb spilled material in dry sand or inert absorbent. In case of a large amount of spillage, contain a spill by bunding
9. Adhered or collected material should be promptly disposed of, in accordance with appropriate laws and regulations
10. Remove all sources of ignition. Use spark-proof tools and explosion-proof equipment

Handling Method of Hazards Related to Hot Cells

3.3.1 Basic Information

1. Cells are at immediate risk of fire or venting above 150°C (302°F).
2. Cells exceeding >65°C indicate some trouble. Contact the Certificate of Fitness holder and shut down the system
3. Cell temperature up to 60°C is normal
4. Long-term overheating of Battery Units from heat flux or heating of battery modules from internal fire or other thermal runaway can cause cell thermal runaway, fire, or even explosion typically seen as cells exceed

3.3.2 Minimum Equipment Required

1. Remote temperature sensing equipment: Infrared temperature probe, infra-red camera, or SCADA/EMS (site computer system)
2. Safety glasses
3. Helmet with impact resistant face shield
4. Non-conductive extended pliers
5. Gloves

3.3.3 Procedure

1. As soon as a hot cell over >65°C is detected, completely evacuate the area of all personnel.
2. Shut off the system. Refer to “Shut down options and processes”
3. Periodically monitor the temperature of the cell with the remote probe or through the SCADA or Energy Management System as guided by the Certificate of Fitness Holder (if that fails then consult the SME) for the first two hours or until one of the three following situations occurs:
    a. The cell starts to cool.
    b. The cell vents
    c. The cell explodes.
4. If the cell starts to cool, monitor its temperature once an hour via the BMS/SCADA or infrared camera until it returns to ambient temperature.
5. If remote temperature sensing equipment is not available, do not handle the cell for a period of 24 hours.
6. If the cell reached over >75°C we can assume the cell is compromised and should be replaced or the entire module replaced.
7. Typically the cell will be inside a Module: Remove the Module from the work area once it has cooled and returned to normal operations.
8. If the cell is accessible due to Module disassembly, accident on factory line etc. remove the cell from the work area once it has cooled and returned to normal operations.
9. Dispose of the cell in accordance with local, state, and federal hazardous waste regulations.

Handling Method of Vented Electrolyte

3.4.1 Basic information

All lithium batteries are hermetically sealed in a case. A seal is used as an electrical feedthrough for the positive terminal. Under normal operating conditions, a cell will not leak or vent electrolyte. However, cell leakage or venting could occur if the cell or tray(pack) is overheated or subjected to excessive physical abuse.

The severity of a vent condition can range from a slight leak around pressure vent of the cell to a release of combustible gas and possibly ignition of this gas. The electrolyte contained within the lithium cells can cause severe irritation to the respiratory tract, eyes. It would be unusual to come into contact with the electrolyte as it is in small quantities as a gel and the cells are contained withing a IP65 module enclosure. In addition, violent cell/tray venting could result release or flammable vapors withing the Battery Unit which could explode.

The first responder should take all precautions and wear proper devices like SCBA to limit exposure to the electrolyte vapor.

3.4.2 Minimum Equipment Required

1. A Class B fire extinguisher
2. Eye protection or face shield
3. Respirator suitable for toxic vapors
4. Neoprene rubber gloves
5. Lab coat or chemically resistant apron
6. Bicarbonate of soda (baking soda), calcium oxide (lime), or acid spill cleanup kit
7. Vermiculite, 3M Power Sorb (universal absorbent material)
8. Speedy-Dry (clay absorbent)
9. Individual thick plastic bags with sealing mechanism

3.4.3 Procedure

1. Evacuate personnel from all areas which are affected by the gas.
2. If possible, shut off the system. Refer to “Shut down options and processes”
3. Ventilation should be initiated and continued until after the cell is removed from the area and the pungent odor is no longer detectable.
4. If the cell/tray vented as a result of excessive heating, it must be allowed to cool to ambient temperature before handling. (Refer to hot cell procedure in section 4.1)
5. Put on a lab coat, rubber gloves, safety glasses, and respirator. Remove the cell/tray to a well-ventilated area.
6. Place each leaking cell in a separate, sealable plastic bag. Eliminate excess air and seal the bag.
7. Place one cup of vermiculite or other absorbent material in a second bag along with the first bag. Eliminate excess air and seal.
8. Place the double-bagged cell in a third bag containing approximately one cup of lime or baking soda. Seal the bag.
9. Absorb and/or neutralize spilled electrolyte with an absorbent material or baking soda.
10. Sweep contaminated baking soda or absorbent material into a sealable plastic bag for disposal.
11. Clean the area with copious amounts of water or an ammonia-based cleaner.
12. Dispose of the vented cell and contaminated absorbent material in accordance with local, state, and federal hazardous waste disposal regulations.

Handling Method of Batteries after Explosion

3.5.1 Basic information

It is unlikely that any lithium battery would involuntarily explode. These events are rare and are usually the result of an abusive condition that raises the cell's temperature above its critical point. However, in the event of a lithium battery explosion, a warehouse or confined environment could fill quickly with dense white smoke which could cause severe irritation to the respiratory tract, eyes, and skin. All precautions must be taken to limit exposure to these fumes.

3.5.2 Minimum Equipment Required

1. B Class fire extinguisher (e.g. Class ABC)
2. ABC Class fire extinguisher for any secondary fires
3. Anti-fire cloth, incase of a fire after the explosion
4. Respirator suitable for toxic vapors
5. Fire-proof suit
6. Eye protection or face shield
7. Rubber gloves, lab coat or chemically resistant apron.
8. Bicarbonate of soda or calcium oxide (lime) –or acid spill clean-up kit (J.T. Baker Co.)
9. Vermiculite, 3M Power Sorb (universal absorbent material), Speedy-Dry (clay absorbent)
10. Individual thick plastic bags with sealing mechanism, glass jars.

3.5.3 Procedure

1. Evacuate personnel from all areas which are affected by the smoke.
2. Shut off all the related power systems such as circuit breakers, PV systems, chargers, etc. Refer to “Shut down options and processes” on how to shut down the Battery Units.
3. Ventilation should be initiated and continued until after the cell is removed from the area and the pungent odor is no longer detectable.
4. Although this scenario is unlikely, should there be a fire resulting from an explosion, methods for dealing with this contingency are addressed in the next section about fire handling.
5. The exploded cell may be hot. It must be allowed to cool to ambient temperature before handling (see hot cell procedures).
6. Put on a lab coat, rubber gloves, safety glasses, and respirator.
7. If a cell explodes the surrounding area may be covered with black carbonaceous material along with metal parts from the cell. Cover the black carbonaceous material with a 50/50 mixture of baking soda (or lime) with vermiculite or other universal absorbent material.
8. Sweep the contaminated baking soda/vermiculite mixture into a sealable plastic bag. Gather in such a way as to avoid excessive dust. Metal parts can also be included in this container. Note: Metal fragments should never be packaged with live cells. This could cause the cell to become shorted.
9. Seal the plastic bags in a glass jar and dispose of contents in accordance with local, state, and federal hazardous waste disposal regulations.
10. Clean the area with copious amounts of a baking soda/water solution, or an ammonia-based cleaner. Follow with soapy water.

Handling Method of Fires Involving Lithium Batteries

3.6.1 Basic information

Wear SCBA apparatus and operate upwind of a lithium-ion fire.

In the event of a lithium-ion battery fire, a confined space could become filled with dense white smoke, mostly comprised of carbon dioxide, carbon monoxide, hydrogen, hydrocarbon species, hydrogen fluoride, nitrogen monoxide and dimethyl carbonate. This condition could cause severe irritation to the respiratory tract, eyes, and skin. All precautions must be taken to limit exposure to these fumes.

3.6.2 Minimum Equipment Required

- A Class B compliant fire extinguisher (not class D as this is not metal Lithium).
- Self-contained breathing apparatus
- Full fire-fighting protective clothing
- Heat resistant gloves
- Goggles or safety glasses
- Non-conductive extended pliers
- Shovel, mineral oil

3.6.3 Procedure

1. Initial Response

In order to respond adequately to any emergency situation a primary response team should be established. After training in safety and handling procedures, along with first aid and fire fighting methods, the primary response team will be able to respond to situations involving lithium batteries.

When a fire is detected the first action is to completely evacuate all personnel from the area and sound the fire alarm immediately.

Shut off all related systems except those used for auxiliary safety functions (ventilation, FACP and battery management system monitoring) if one can access the MCCB/switch without danger. Please refer to the site specific diagram. Refer to “Shut down options and processes”

The primary response team is paged to the area where the fire is located. The team is informed of any pertinent information regarding the situation by the person who reported the fire.

Quarantine the area. Ventilation should be initiated and continued until the burning material is removed from the area and the pungent odor is no longer detectable.

Two members of the team will then enter the area with the appropriate fire-fighting and safety equipment.

Never leave the fire unattended because it may reignite.

If necessary, attend to any secondary fires with the appropriate extinguishing agent.

After all the material has apparently burned and cooled, carefully turn over the remaining residue and be prepared to extinguish, should recognize occur.

Carefully place the residue in a steel drum using a long-handled shovel.

2. Clean-up

A lab coat, rubber gloves, safety glasses or goggles, and a respirator should be worn during cleanup.

The surrounding area may be covered with black carbonaceous material along with metal parts from the cell. Cover the black carbonaceous material with a 50/50 mixture of baking soda (or lime) with vermiculite. A wet sweeping compound may also be used to avoid dust. Nonetheless, gather the material in such a way as to avoid excessive dust.

Sweep the contaminated baking soda/vermiculite mixture into a sealable plastic bag. Metal parts can also be included in this container.

Seal the plastic bags in a glass jar or other suitable container.

Clean the area with copious amounts of a baking soda/water solution, or an ammonia-based cleaner. Follow with soapy water.

Dispose of all materials in accordance with local, state and federal hazardous waste disposal regulations.

First Aid Measures

4.1 Contact with Electrolyte

EYES -- Immediately flush eyes with a direct stream of water for at least 15 minutes while forcibly holding eyelids apart to ensure complete irrigation of all eye and lid tissue. GET IMMEDIATE MEDICAL ATTENTION.

SKIN -- Flush with cool water or get under a shower, remove contaminated garments. Continue to flush for at least 15 minutes. Get medical attention, if necessary.

4.2 Inhalation of Harmful Gases

Move to fresh air. If breathing is difficult have a trained person administer oxygen. If respiration stops, give mouth-to-mouth resuscitation. GET IMMEDIATE MEDICAL ATTENTION.

4.2 Contact with coolant R410A

ON FROSTBITE: rinse with plenty of water, do NOT remove clothes. Refer for medical attention.

First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.

Site Specific Exhibits

[EPC to attach exhibits here, some exhibit examples follow]

Shut down options and processes

[EPC to replace or reuse exhibit example material under this same heading "Shut down options and processes" as this is referenced in the ERG text]

These processes are general. Contact Certificate of Fitness holder or SME if necessary and check for site specific procedures.

Partial stop

1. Press Estop on Battery Unit or FACP. Both stop the PCS and Battery Units from charging or discharging but main power and auxiliary power typically remain connected and energized.

Main power shutdown

1. Turn off BESS main power switch at power room

Main power and auxiliary power shutdown

1. Turn off site main switch or
2. BESS main power switch at power room AND BESS auxiliary power switch (after the site UPS or generator if applicable)

Battery Unit local shutdown

1. Press Estop on any Battery Unit within a "block" that share one PCS.
2. Turn off PCS motorized AC and DC breakers via the SCADA or webUI under assistance of the Certificate of Fitness Holder
3. Open the Local Controller and open all the breakers to cut the feed of backup power to the Battery Units.
4. If it is safe to open the BESS, open the auxiliary cabinet door, open the auxiliary cabinet, and open the 480V auxiliary breaker and any breakers in the cabinet. Open any DC battery switches on switch gear or DC-DC converters.
5. Lock out and tag out as work is performed to avoid accidental shock from others switching on switches by mistake.

Site drawings specific to first responders

[EPC to place map and single line drawing of site, specific and understandable to first responders working in a stressful situation. Showing labels and locations of switches that must be used by first responders, consider marking the auxiliary systems switch or UPS output switches clearly so that firs responders do not accidentally turn these off. Add notes to make the process simple]

Exhibit project specific electrical datasheets

[EPC to attach from Technical Agreement or from External Portal or Project data]

>PCS+MV skid

>Battery Unit

>Battery Module and Rack

>Other relevant datasheets and or information on other products such as Main Power Transformer, FACP etc.