

Michelle R. Buck, Town Planner
Leicester Development and Inspectional Services
3 Washburn Square
Leicester, Massachusetts 01524

September 21, 2021

RE: Site Plan Review
#1355 Main Street Energy Storage System (ESS)
ZP Battery Devco, LLC
Map 26/Parcel A1

Dear Ms. Buck,

On behalf of our client ZP Battery Devco, LLC, Hannigan Engineering, Inc. is submitting an application for Site Plan Review for the installation of a Solar Energy Storage System (ESS) at #1355 Main Street in Leicester, Massachusetts (Map 26/Parcel A1). The project is located within the Highway-Business-Industrial District-1 (HB-1) Zoning District and Site Plan Review is required by the Bylaw under Section 5.2.02.1(g) Medium-scale Ground-Mounted Solar Energy Systems.

Submitted as part of this application are the Site Development Plans of the project depicting the proposed construction, along with the Drainage Analysis & Report which outlines the impacts and mitigation of the construction project relative to Stormwater Management. The Project will be situated on a portion of the #1355 Main Street property along the southerly side of Main Street (Route 9) in Leicester. The property is currently is approximately 5.44 acres which is generally undeveloped and comprised mostly of woodland and brush areas. It is noted that some areas of an existing gravel access way exist within the area of development that is associated with the previous use of the adjacent property at #1323 Main Street. Areas subject to protection under the Wetlands Protection Act and the Leicester Wetland Bylaws were reviewed and delineated by Caron Environmental. These areas are limited to a Bordering Vegetated Wetland (BVW) along the southerly property line. A Notice of Intent is being filed concurrently with this submittal with the Leicester Conservation Commission.

It is the intent of the applicant to install a new Solar Energy Storage System (ESS) on the property with an estimated storage capacity of 5-Megawatt AC. For the purposes of classification under the current Zoning Bylaw this project is being considered as a Medium-scale Ground-Mounted Solar Energy System as the net cleared area of land is less than 40,000 square feet. As such Site Plan Approval is required by the Board. As part of the general construction, a portion of the existing woodland on the property will be cleared to facilitate the construction. Unlike other Solar Energy Systems this facility is utilized purely for the storage and not the generation of energy. Thus, extensive clearing is not required.

Upon completion of the tree cutting, the installation of the appropriate erosion control measures will occur to prevent the transport of soils and sediments to the lower elevations of the site. The overall development will be comprised of eight (8) concrete pads to store the ESS units along with applicable electrical components to allow for the interconnection to the grid. The total area of alteration associated with the project will be approximately 38,000 square feet.

Access to the site will be via an existing 20-foot gravel access drive off of Main Street Road. This gravel drive will run along the easterly limit of the project area and be the permanent access to the site. It is anticipated to only be utilized on a periodic basis for general maintenance and inspections of the facility.

This access drive will be fitted with a T-turnaround which will allow for a typical emergency vehicle (SU40) or service vehicle to turnaround within the site.

The entire system will be surrounded by a chain-link security fence to prevent unauthorized entry. A gate will be provided at the entrance to the site with a Knox Box to allow emergency personnel to enter if necessary. Additional access gates will be provided along the perimeter of the system to allow for access to the proposed drainage infrastructure. Additionally, as required by the Bylaw, a sign will be added at the entrance of facility with the appropriate contact information for the operator and emergency contacts.

With respect to lighting, the only lighting for the project will be located in the area of the electrical systems and be operated by a motion sensor. Should maintenance be required, it is typically performed during daylight hours.

As part of the review, Stormwater Management Regulations are applicable, and the Stormwater Drainage Analysis and Report is included with this submission. To provide compliance with Stormwater Management Regulations for this project, a dry-detention basin will be constructed to mitigate the increases in peak rate of runoff. Stormwater generated by the completed project site will be transmitted via overland flow to the detention basin, which will be equipped with a PVC sub-drain system and an outlet structure consisting of various orifices to control the discharge rate of the flow. During smaller storm events, the stormwater will back up in the detention basin and be controlled by the discharge flow allowed by the subdrain system and outlet control structure.

The utility connection will utilize underground electrical conduits to transmit the electricity from the ESS to a series of transformers and inverters. From there, additional underground conduits will transmit the power to a series of connection poles or pad mounted equipment for final connect to the grid. The final design and connection location will be established by National Grid and is not under control of the applicant.

Safety and protocol surrounding the proposed ESS project are extensive. Each ESS container is equipped with sensors and monitors for heat, humidity and gases. There are audible and visible alarms associated with the protection system. Safety aspects above the automatic monitoring system will include "dry riser pipes" being installed and individually plumbed from each ESS container to a location outside of the fence-line. They will be labeled appropriately as to which container each pipe is plumbed to. In the event of an emergency, the fire department can directly connect to the pipe coupling associated with the affected ESS container.

SITE PLAN REVIEW

Per the Leicester Planning Board Site Plan Review Rules and Regulations, further information relative to the final project is required in aiding in the Planning Board's decision for Site Plan Approval. As stated above, the subject property is located at #1355 Main Street on land of WR Enterprises, LLC with an approximate land area of 5.44-acres. The construction is limited to less than an acre to be utilized as part of this ESS Development. Currently, the property is undeveloped and comprised of mostly woodland and brush, with a small area of jurisdictional wetland along the southerly property line. Upon the completion of construction, there will be no habitable structures on the property, with the only structures on the property being the ESS storage units and associated electrical equipment.

Due to the nature of the project, parking areas are generally not required. In addition, the need for sewer and water connections are not required as there are no facilities on the project. A waiver has been requested from providing a review of the availability of water and sewer in the project area. Upon the completion of construction, there will be no on-site employees. The only instance that workers will be on-site will be during maintenance operations once every few months which will take place during daylight hours.

As for the construction timeline, it is the intent of the applicant to start construction of this project in the Spring or Summer of 2022, pending local approvals and financing. Upon start it typically takes six to eight months to complete the project, which will be completed within a single phase of construction.

In addition to seeking Site Plan Approval from the Leicester Planning Board, a Notice of Intent has been filed with the Leicester Conservation Commission and the Department of Environmental Protection (DEP) for the work being performed within the jurisdictional areas under the Wetland Protection Act.

As for the overall scope of the project, the total area of disturbance will be approximately 38,000 square feet which encompasses the area of tree clearing and fenced areas. The only areas within the project scope that are considered impervious are the proposed ESS concrete pads, which combined are approximately 1,700 square feet. The typical height of these ESS Units is approximately 8-feet, with no structure being more than 12-feet.

The property is currently located within a generally commercial area with the abutting property to the east being a commercial automobile facility and the property the west being commercial as well. The abutting property to the south is the undeveloped portion of residential property with the dwelling approximately 400-feet away from the intended development area. It is noted that there are several residential dwellings located along the opposite side of Main Street. As part of the design of the site, the ESS units are approximately 12 to 18-feet below the existing grade of Main Street, thus well below the sightline of the road and residential properties. As such it is not anticipated that the ESS units will be visible to the residential properties nor the roadway due to the topography relief and the existing vegetation to remain.

As previously mentioned, this project requires the filing of a Notice of Intent with the Conservation Commission for the proposed work. As part of that review, it was found that the land does not contain any NHESP habitat areas or vernal pools. As part of that filing the applicant is required to mitigate the potential impacts to the resource areas, generated by the construction process. As such erosion control measures in the form of staked straw wattles and silt fence will be placed along the limit of work.

Furthermore, due to the scope of the project, a filing for the Construction General Permit with the EPA will be required along the creation of a Stormwater Pollution Prevention Plan (SWPPP). Within these documents further detail will be provided relative to additional erosion control measures that may be required during construction. In addition to the SWPPP, regular inspections of erosion control and the site in general will be required to insure that the contractor is complying with the approved plan and that all measures in place are properly functioning.

STANDARDS FOR SITE PLAN REVIEW

Per the Leicester Planning Board Zoning Bylaw, as part of the Site Plan review, certain considerations must be given to the proposed use and the impacts to the town. These are reviewed as follows:

A.) The use complies with all provisions of the Leicester Zoning Bylaw

As described above the project is located within Highway-Business-Industrial District-1 (HB-1) Zoning District and is allowed by right with Site Plan Approval from the Leicester Planning Board.

B.) The use will not materially endanger or constitute a hazard to the public health and safety

The ESS systems are comprised of inert solid materials. In the event of failure it is not anticipated that these materials would "leak" or emit any fluid or gas. In addition, the entire system area will be surrounded by a chain-link fence which will prevent any unauthorized personnel from entering the facility.

C.) The use will not create undue traffic congestion or unduly impair pedestrian safety

Upon the completion of construction, traffic to the site will be limited to service crews to perform periodic inspections and maintenance to insure the facility operates properly.

D.) Sufficient off-street parking exists or will be provided to serve the use

Due the nature of this type of project, off-street parking is needed for its daily operation.

E.) The use can be adequately served by water, sewer and other necessary utilities, or if these are unavailable, that they will be brought to the site at the owner's expense; or, the Planning Board is satisfied that the proposed alternatives will comply with all applicable regulations;

Due the nature of this type of project, the need for water and sewer is not necessary. A waiver has been requested relative to performing a review of the availability of such utilities. The only utility connection that will be required will be an overhead electrical connection to the existing infrastructure within Main Street.

F.) The use will not result in a substantial increase of volume or rate of surface water runoff to neighboring properties and streets, nor will result in pollution or degradation of surface water or groundwater

The project's stormwater system has been designed in accordance with the DEP Stormwater Management Regulations. As noted in Drainage Analysis and Report impacts from stormwater are not anticipated.

G.) The use will not result in any undue disturbance to adjoining property owners or the Town caused by excessive or unreasonable noise, smoke, vapors, fumes, dust, glare, etc...

Upon the completion of construction, the project will not generate any smoke, vapors, dust or glare as part of the project. The noise generated by project is isolated to ESS pad areas which will generate noise no more than that typical of a HVAC unit. These units will be located approximately 50-feet off the roadway and well below the grade of the road as to minimize sound impacts to the public way.

WAIVER REQUESTS

Per the Leicester Planning Board Site Plan Review Rules and Regulations, the Planning Board may waive any of the requirements upon submittal of information by the applicant that substantiates the waiver request. As required by the Zoning Bylaw several of the aspects of site plan review are not applicable to a project of this type specifically, traffic and water/sewer availability.

Due to the nature of this project, portions of this Site Plan Application are not applicable and waivers to these sections are requested as follows:

II.D: Traffic Study

– Due to the nature of the project, it is not anticipated that the project would have an adverse affect on traffic surrounding the site. Specifically, vehicular traffic for the project is not anticipated with the exception of the occasional maintenance and inspection. During construction, construction vehicles and equipment will be accessing the site by a proposed gravel drive off of Main Street. Additional signage will be placed along the roadway in this area to alert drivers of construction activity. Upon the completion of the project, the only traffic for the project would be for inspection and maintenance.

The applicant, therefore, requests a waiver to II.D: Traffic Study of the Bylaw.

II.E: Availability of Water and/or Sewer

-Due to the nature of the project, the project will not require any connections to the public water supply or any sewerage connections.

The applicant, therefore, requests a waiver to II.E: Availability of Water and/or Sewer of the Bylaw.

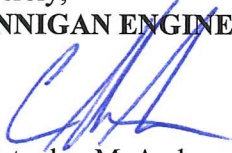
END OF TEXT

HANNIGAN ENGINEERING, INC.

8 MONUMENT SQUARE, LEOMINSTER, MA 01453 PHONE: (978) 534-1234 FAX (978) 534-6060 CIVIL ENGINEERS & LAND SURVEYORS

On behalf of our client, Hannigan Engineering, Inc. is requesting that this project be put on the agenda for the next available meeting. Representatives of this office and of the Applicant will be available to address any questions or concerns raised at that time. Should you require additional information prior to the meeting, please do not hesitate to contact this office. We appreciate the Town's assistance in this process as we look forward to working with you to obtain the anticipated approval of this project.

Sincerely,
HANNIGAN ENGINEERING, INC



Christopher M. Anderson, PE
Project Engineer

William D. Hannigan, PE
President

pc: Pete Forte, ZP Battery Devco, LLC
Tom Corbett, ZP Batter Devco, LLC


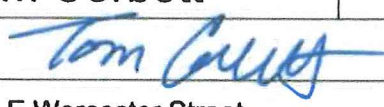
J:\My Documents\PROJECTS\3000+3010-ZP Battery Leicester\Planning\3010-Planning Narrative.docx

For Planning Office Use:
File #: SPR2021-04

**Leicester Planning Board
Site Plan Review & Special Permit Application Form**

PERMIT TYPE: ☐ Special Permit ☒ Site Plan Review

CONTACT INFORMATION

Owner Information			
Name:	William Roberts	Company Name:	W R Enterprise LLC
Signature:			
Address:	1323 Main Street Leicester, MA 01524		
Phone:	(508) 892-8007	Email:	bill@classicautomotivema.com
Applicant Information			
Name:	Tom Corbett	Company Name:	ZP Battery DevCo LLC
Signature:			
Address:	10 E Worcester Street Worcester, Ma 01604		
Phone:	(774) 479-9870	Email:	tcorbett@zpeenergy.com
Primary Contact Person (The person that will be contacted by Planning Board staff during the application process.)			
Name:	Tom Corbett	Company Name:	ZP Battery DevCo LLC
Address:	10 E Worcester Street Worcester, Ma 01604		
Phone:	(774) 479-9870	Email:	tcorbett@zpeenergy.com

PROJECT INFORMATION

Project Address:	1355 Main Street	Zoning District:	HB-1
Assessors Map & Parcel #	26B A1	Deed Reference (Book & Page):	62166 / 240
Applicable Zoning Bylaw Section(s):	5.14 Ground-Mounted Solar Energy Systems		
Proposed Land Use:	Energy Storage System		
Existing Land Use:	Vacant Lot		

PROJECT INFORMATION, Continued

Size of Proposed Structure(s):		.5 acres	
Total Lot Area:		5.44 acres	
Water Source: (Select One) (NA)	<input type="radio"/> Private Well	<input type="radio"/> Cherry Valley & Rochdale Water District	
	<input type="radio"/> Hillcrest Water District	<input type="radio"/> Leicester Water Supply District	
Sewer Source: (Select One) (NA)	<input type="radio"/> Private Septic System	<input type="radio"/> Cherry Valley Sewer District	
	<input type="radio"/> Hillcrest Water District	<input type="radio"/> Leicester Water Supply District	
	<input type="radio"/> Oxford Rochdale Sewer District		
Brief Project Description: Please include a brief description on this form (i.e. do not write "see attached"). [Examples: New construction of a 20,000s.f. retail building and associated parking; Use of a 1,000s.f. portion of an existing structure for a proposed pet grooming clinic.] Construction of a 5 Megawatt Energy Storage System consisting of a 20 ft wide access Road, eight (8) battery containers, inverters, transformers and associated interconnection equipment. All equipment will be pad mounted. Electrical lines will be underground except what is necessary to be overhead per utility requirements. Stormwater feature is included in this design. the project will be completely fenced in with a Knox Box with a code that will be given to local emergency services for access.			

Application Checklist

Use this checklist to ensure you have provided all required information. See Planning Board Site Plan Review & Special Permit Regulations for details. 13 copies are required except where noted.

<input checked="" type="checkbox"/> Plans (2-full-size & 11-11"x17")	<input checked="" type="checkbox"/> Detailed Project Narrative including any waiver requests ¹	<input checked="" type="checkbox"/> Drainage Analysis/ Stormwater Report, (3 copies) <input type="checkbox"/> n/a
<input type="checkbox"/> Documentation of Availability of Water & Sewer <input checked="" type="checkbox"/> n/a	<input checked="" type="checkbox"/> Certified Abutters List (1 copy) ² <input type="checkbox"/> n/a	<input type="checkbox"/> Traffic Study (3 copies) <input checked="" type="checkbox"/> n/a
<input checked="" type="checkbox"/> Fees ³	<input checked="" type="checkbox"/> .pdf copy of all required submittals (CD or USB Drive)	

¹ See Planning Board Site Plan Regulations for details on what should be included in a Project Narrative. For special permits that don't require conformance with Site Plan Review submittal requirements, submit a narrative explaining conformance with special permit approval criteria (see Special Permit Regulations for details).

² certified abutters lists are required for all Special Permits applications and for Major Site Plan Review Applications (new construction over 30,000 s.f. and ground-mounted solar over 250,000 s.f or 2 acres or more of tree clearing)

³ Please refer to the Planning Board's Fee Regulations. Checks must be made out to the Town of Leicester

For Planning Board Use:

Date of Submittal:			
Public Hearing/Meeting Date(s):			
Date of Planning Board Vote:			
Date Decision Filed with Town Clerk:			

Town of Leicester
3 Washburn Square
Leicester, Ma 01524


September 17, 2021

RE: Special Permit & Notice of Intent
1355 Main Street Energy Storage System
ZP Battery DevCo, LLC
Map 26B, Block A1, Parcel 0

To Whom it may concern:

Please be advised that W R Enterprise LLC has authorized ZP Battery DevCo, LLC to submit an application for Site Plan Approval and Notice of Intent relative to the construction of an Energy Storage System on land owned by W R Enterprise LLC depicted on Assessor's Map 26B, Block A1, Parcel 0.

Signed:



Date 9/17/21

Name: William Roberts

Title: Landowner



TOWN OF LEICESTER
Office of Building and Code Enforcement
3 Washburn Square, Leicester MA 01524
Phone: 508-892-7003 Fax: 508-892-1163
www.leicesterma.org

Mr. Tom Corbett
ZP Battery DevCo, LLC
10 E Worcester Street, Suite 3A
Worcester, MA 01604

Re: Zoning Interpretation
1355 Main Street
Leicester, Ma 01524

Dear Mr. Corbett:

I reviewed your enclosed request dated July 12, 2021 to provide a zoning determination in connection with the proposed use of the above-referenced property for the installation of an energy storage system ("ESS") at 1355 Main Street which is located in the HB-1 Zoning District. Like the existing solar energy systems, the ESS will be interconnected to National Grid's distribution grid on the LEICESTER 21W1 feeder.

For the reasons described herein, I have determined that the proposed ESS is a use allowed by Site Plan Review from the Planning Board under Section 5.14.4.0, "Ground-Mounted Solar Energy Systems" within the Town of Leicester Zoning Bylaws, as amended as of June 2, 2020 (the "Bylaws"). Section 3.2.05 of section 3 (Table of Use Regulations) of the bylaws provides that a "Medium-Scale Ground Mounted Solar Energy System is an allowed use by Site Plan Review from the Planning Board in the HB-1 zoning district.

Section 5.14.2 of the Bylaws (Definitions) defines a "Solar Energy System" as "Any solar collector or other solar energy device, including appurtenances, mounted on a building or on the ground, the primary purpose of which is to provide for the collection, storage, conversion and distribution of solar energy for space heating or cooling, water heating or generation of electricity." For purposes of this letter, I will use the term "solar energy system."

The Bylaws define a solar energy system as including the "*storage and distribution of electricity*." The Bylaws' definition of a solar energy system does not require that the sale and/or distribution of electricity immediately follow its generation. An energy storage system is necessary to sell and/or distribute electricity at a future time. Accordingly, the Bylaws' definition of a solar energy system necessarily includes the concept of energy storage.

I have considered the proposed ESS project and planned work in relation to the applicable requirements of the Bylaws. Accordingly, based upon your July 12, 2021 communication, and provided that the ESS will be located on the same electric distribution feeder as existing solar energy facilities and where it is proposed that electricity used to charge the ESS will be generated by solar energy facilities on the same feeder, it is my determination that the ESS is an energy storage system with respect to those solar energy facilities for the subsequent distribution of electricity. The proposed ESS will be a component of a solar energy system as defined by the Bylaws Section 5.14.4.0.

Sincerely,

Michael Silva
Building Inspector/Zoning Enforcement Officer
Town of Leicester

Town of Leicester

Abutters List

PLANNING

ParcelID	Location	Owner	Co-Owner	Mailing Address	City	State	Zip
19 A7 0	1430 MAIN ST	LEICESTER COUNTRY CLUB LLC		PO BOX 138	LEICESTER	MA	01524
19A A1 0	1434 MAIN ST	HOLLYER MARK G	PERKINS TRACY L	1434 MAIN STREET	LEICESTER	MA	01524
19A A2 0	1360 MAIN ST	LEICESTER WATER SUPPLY DIST		124 PINE ST P O BOX 86	LEICESTER	MA	01524-0086
19A A4 0	1350 MAIN ST	CONLEY PEGGY J		1350 MAIN ST	LEICESTER	MA	01524
19A A5 0	1342 MAIN ST	BRENNAN JR TR THOMAS V	BRENNAM FAMILY TRUST	4 GREENVILLE CIRCLE	ROCHDALE	MA	01542
19A A6 0	1340 MAIN ST	DINEEN DONALD R	DINEEN PATRICIA A	PO BOX 365	LEICESTER	MA	01524
19A A7 0	1326 MAIN ST	PRIME PROPERTY DEVELOPERS I		P O BOX 318	EAST BROOKFIELD	MA	01515
19A A8 0	1312 MAIN ST	FAULKNER JASON A		1312 MAIN ST	LEICESTER	MA	01524
26A B28 0	1439 MAIN ST	CENTRAL LAND DEVELOPMENT C		1 CHARLESVIEW ROAD	HOPEDALE	MA	01747
26A B28.1 0	1445 MAIN ST	TRACTOR SUPPLY CO	KNOTT FAMILY IRREV TRUS	PO BOX 4900	SCOTTS DALE	AZ	85261
26B A10 0	RAWSON ST	KNOTT JASON G TRUSTEE		86 RAWSON ST	LEICESTER	MA	01524
26B A2 0	1323 MAIN ST	RRM CORPORATION		PO BOX 294	LEICESTER	MA	01524
26B A6 0	44 RAWSON ST	MCNABOE TIMOTHY W		44 RAWSON ST	LEICESTER	MA	01524
26B A8 0	54 RAWSON ST	WADDEN JOSHUA F	MULHEARN SHELBY	54 RAWSON ST	LEICESTER	MA	01524
26B A9 0	58 RAWSON ST	MARTINELLI DAVID C	MARTINELLI LEE ANN	58 RAWSON ST	LEICESTER	MA	01524

End of Report

Above is a certified list abutters and abutters to abutters within 300 feet of subject.
 Subject property: 1355 Main Street, Assessors Map 26B-A1, Deed Ref. 65218/149
 Subject owner(s): WR Enterprise LLC

Sandy Genna, Principal Assessor
 Prepared by: Kathleen Asquith, Assistant Assessor

STANDARDS FOR INTERCONNECTION OF DISTRIBUTED GENERATION

Exhibit I—Landowner Consent Agreement

(Note: This Consent is to be signed by the owner of the land where the distributed generation installation and interconnection will be placed, when the owner or operator of the distributed generation installation is not also the owner of the land, and the landowner's electric facilities will not be involved in the interconnection of such distributed generation installation.)

This Consent is executed by WR Enterprise LLC, (the "Landowner"; as used herein the term shall include the Landowner's successors in interest to the Property), as owner of the real property situated in the City/Town of Leicester, Worcester County, Massachusetts, known as 1355 Main Street [street address] (the "Property"), at the request of **ZP Battery DevCo LLC** [name of Interconnecting Customer] (the "Interconnecting Customer"; as used herein the term shall include the Interconnecting Customer's successors and assigns) and for the benefit of **Massachusetts Electric Company (d/b/a National Grid)** a Massachusetts corporation with a principal place of business at **40 Sylvan Road, Waltham, MA 02451** (the "Company"); as used herein the term shall include the Company's successors and assigns).

1. The purpose of this Consent is to provide the Company with assurance that the installation of a distributed generation facility (the "Facility") by the Interconnecting Customer on the Property has been approved by the Landowner.
2. The Landowner hereby acknowledges that it has authorized the Facility to be installed and operated by Interconnecting Customer on the Property pursuant to agreements between the Landowner and the Interconnecting Customer that are in full force and effect as of the date hereof.
3. The Landowner hereby acknowledges that the Landowner shall look solely to the Interconnecting Customer for the performance of and compliance with all of the terms of any agreements between the Landowner and the Interconnecting Customer, and that the Company shall not, by virtue of any agreement between the Company and the Interconnecting Customer, be deemed to have assumed any obligation or liability to the Landowner.
4. The Company hereby acknowledges that the Company shall look solely to the Interconnecting Customer for the performance of and compliance with all of the terms of any agreements between the Company and the Interconnecting Customer, and that the Landowner shall not, by virtue of any agreement between the Landowner and the Interconnecting Customer, be deemed to have assumed any obligation or liability to the Company.

STANDARDS FOR INTERCONNECTION OF DISTRIBUTED GENERATION


5. The Landowner hereby grants the Company access as necessary to the Property for Company personnel, contractors or agents, to perform Company's duties under the agreements with the Interconnecting Customer.

6. Landowner acknowledges and agrees that the Company shall have no liability to the Landowner, whether in tort or contract, or under any other legal theory, and specifically excluding any indirect, incidental, special, consequential, or punitive damages of any kind whatsoever, for any loss, cost, claim, injury, liability, or expense, including court costs and reasonable attorney's fees, relating to or arising from (a) the installation or operation of the Facility on the Property, or (b) any act or omission in the Interconnecting Customer's performance of its agreements with the Landowner or the Company, except to the extent caused solely by the negligence or willful misconduct of the Company, its agents, contractors or employees.

7. This Agreement shall be interpreted, governed, and construed under the laws of the Commonwealth of Massachusetts without giving effect to choice of law provisions that might apply the law of a different jurisdiction.

IN WITNESS WHEREOF, the Landowner and the Company have caused this Consent to be executed under seal by its duly authorized representatives.

LANDOWNER

By: 
Name: Bill Roberts
Title: *owner*

COMPANY

By: _____
Name: _____
Title: _____



CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YYYY)
03/22/2021

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

IMPORTANT: If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must have ADDITIONAL INSURED provisions or be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

PRODUCER Marsh USA Inc. 2929 Allen Parkway, Suite 2500 Houston, TX 77019	CONTACT NAME: PHONE (A/C, No. Ext): E-MAIL ADDRESS:	FAX (A/C, No):
CN115354100-GAWU-20-21	INSURER(S) AFFORDING COVERAGE	
INSURED ENGIE Holdings Inc. And their subsidiaries 1360 Post Oak Blvd, Ste 400 Houston, TX 77056	INSURER A: ACE American Insurance Company	NAIC # 22667
	INSURER B: ACE Property & Casualty Insurance Company	20699
	INSURER C:	
	INSURER D:	
	INSURER E:	
	INSURER F:	

COVERAGES **CERTIFICATE NUMBER:** HOU-003768082-01 **REVISION NUMBER:** 5

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSR LTR	TYPE OF INSURANCE	ADDL SUBR INSD WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS
A	<input checked="" type="checkbox"/> COMMERCIAL GENERAL LIABILITY <input type="checkbox"/> CLAIMS-MADE <input checked="" type="checkbox"/> OCCUR GEN'L AGGREGATE LIMIT APPLIES PER: <input type="checkbox"/> POLICY <input checked="" type="checkbox"/> PRO-JECT <input type="checkbox"/> LOC OTHER:		HDO G71080316	07/01/2020	07/01/2021	EACH OCCURRENCE \$ 1,000,000 DAMAGE TO RENTED PREMISES (Ea occurrence) \$ 300,000 MED EXP (Any one person) \$ 10,000 PERSONAL & ADV INJURY \$ 1,000,000 GENERAL AGGREGATE \$ 2,000,000 PRODUCTS - COMP/OP AGG \$ 2,000,000 EMPLOYEE BENEFITS \$ 1,000,000
A	<input checked="" type="checkbox"/> AUTOMOBILE LIABILITY <input checked="" type="checkbox"/> ANY AUTO OWNED AUTOS ONLY <input type="checkbox"/> SCHEDULED AUTOS <input checked="" type="checkbox"/> HIRED AUTOS ONLY <input checked="" type="checkbox"/> NON-OWNED AUTOS ONLY		ISA H25260090	07/01/2020	07/01/2021	COMBINED SINGLE LIMIT (Ea accident) \$ 1,000,000 BODILY INJURY (Per person) \$ BODILY INJURY (Per accident) \$ PROPERTY DAMAGE (Per accident) \$ \$
B	<input checked="" type="checkbox"/> UMBRELLA LIAB <input checked="" type="checkbox"/> OCCUR <input type="checkbox"/> EXCESS LIAB <input type="checkbox"/> CLAIMS-MADE DED RETENTION \$		XOOG27614814 006	07/01/2020	07/01/2021	EACH OCCURRENCE \$ 10,000,000 AGGREGATE \$ 10,000,000 \$
A	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? (Mandatory in NH) If yes, describe under DESCRIPTION OF OPERATIONS below	Y/N <input checked="" type="checkbox"/> N <input type="checkbox"/> N/A	WLR C50803697 (AOS) SCF C50803703 (WI)	07/01/2020 07/01/2020	07/01/2021 07/01/2021	<input checked="" type="checkbox"/> PER STATUTE <input type="checkbox"/> OTH-ER E.L. EACH ACCIDENT \$ 1,000,000 E.L. DISEASE - EA EMPLOYEE \$ 1,000,000 E.L. DISEASE - POLICY LIMIT \$ 1,000,000

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (ACORD 101, Additional Remarks Schedule, may be attached if more space is required)

CERTIFICATE HOLDER

Evidence of Insurance

CANCELLATION

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS.

AUTHORIZED REPRESENTATIVE
of Marsh USA Inc.

Freeman M. Wade

Freeman M. Wade

AGENCY CUSTOMER ID: CN115354100LOC #: Houston**ADDITIONAL REMARKS SCHEDULE**Page 2 of 2

AGENCY Marsh USA Inc.		NAMED INSURED ENGIE Holdings Inc. And their subsidiaries 1360 Post Oak Blvd, Ste 400 Houston, TX 77056
POLICY NUMBER		
CARRIER	NAIC CODE	
		EFFECTIVE DATE:

ADDITIONAL REMARKS**THIS ADDITIONAL REMARKS FORM IS A SCHEDULE TO ACORD FORM,****FORM NUMBER:** 25 **FORM TITLE:** Certificate of Liability Insurance

Contractors Professional Protective Indemnity
Carrier: Berkley Assurance Company
Policy#: PCAB-5012115-0720
Effective Date: 07/01/2020 - 07/01/2021
SIR: \$250,000
Limits: \$8,000,000

Disclaimer

Each individual BESS facility requires a customized ERP which addresses the site-specific hazards and conditions of that facility. This ERP template should be used as a starting point in developing a site-specific ERP for a particular BESS facility.

Facility Name Battery Energy Storage System Emergency Response Plan

This is an Emergency Response Plan (ERP) for the **facility name** energy storage facility located at **[full street address]**. This ERP provides information and instruction to assist first responders in preparing for and safely responding to an accident, fire, or other emergency associated with the **facility name** energy storage facility. Life safety of personnel shall be the highest priority during any event.

Table of Contents

- I. Emergency Contact Information
- II. First Priorities in a BESS Emergency
- III. Facility Description
- IV. Hazards Overview
- V. PPE
- VI. Fire Suppression System and Alarms
- VII. Emergency Response Recommendations
- VIII. HAZMAT Considerations
- IX. Appendices
 - a. Appendix A: Site Plan
 - b. Appendix B: Site Specific Signage and Placards
 - c. Appendix C: Single Line Diagram
 - d. Appendix D: Top & Side View Diagrams of Major BESS Equipment
 - e. Appendix E: Battery SDS

I. Emergency Contacts

EMERGENCY CONTACT INFORMATION	
Emergency: 911	EMS Provider EMS provider name 911 or xxx-xxx-xxxx
Local Fire Department FD name FD street address, city, state xxx-xxx-xxxx (non-emergency) xxx-xxx-xxxx (dispatch)	Hospital hospital name hospital street address, city, state xxx-xxx-xxxx
Law Enforcement PD name PD street address, city, state xxx-xxx-xxxx	Burn Center burn center name burn center street address xxx-xxx-xxxx
ENGIE North America Emergency Contacts	
ENGIE call center available hours, 24/7, etc 800-xxx-xxxx	ENGIE emergency contact #1 Available hours, M-F xxx-xxx-xxxx ENGIE emergency contact #2 Available hours, M-F xxx-xxx-xxxx

II. First Priorities in a BESS Emergency

In case of emergency at **facility name**, the most important priorities are as follows, listed in order of priority:

FIRST PRIORITIES IN A BESS EMERGENCY	
#1	
#2	
#3	
#4	
#5	

HOW TO SAFELY DISCONNECT THE BATTERY ENERGY STORAGE SYSTEM	
Option #1 Activate the e-stop disconnect on-site	→ Emergency disconnects for the BESS are located [location description] . See Appendices A and D for specific location of the emergency disconnect. Only qualified and trained personnel should operate the emergency disconnect. Only operate the emergency disconnect if it is safe to do so.
Option #2 Contact ENGIE system operators to activate a disconnect remotely	→ ENGIE system operators may be able to disconnect the BESS remotely
Option #3 Activate the Fire Suppression System	→ Activating the Fire Suppression System (either electrically or manually) will cause the BESS to disconnect and shut down

III. Facility Description

Facility name is a battery energy storage facility located in [full street address], [lat/long].

The facility is comprised of lithium-ion batteries and other electrical equipment in [quantity] enclosures covering approximately [quantity] square feet. The primary entrance to the facility is located on [location], accessed from [best road / access point]. A secondary entrance to the facility is located on [location], accessed from [best road / access point]. Operation of the facility is managed remotely; there are no full-time personnel on-site. Maintenance technicians are typically on-site for maintenance or repair purposes only. There are no occupied buildings near the facility name facility.

A site plan of the facility name facility is provided in Appendix A. An electrical diagram of the main BESS and related components is provided in Appendix C. Side-view and top-view diagrams of the BESS equipment are provided in Appendix D.

The facility name facility provides electrical services to the electric grid. There are some low voltage auxiliary power devices associated with the BESS and other equipment, but the BESS does not provide electrical services or back-up power to a building, residence, or other facility.

An on-site emergency disconnect for the BESS is located [location]. See Appendices A and D for specific location of the emergency disconnect. Only qualified and trained personnel should operate the emergency disconnect. Only operate the emergency disconnect if it is safe to do so.

Facility Name Battery Energy Storage System Facility	
Facility Location	street address city, state, zip code
Major Equipment on Site	<ul style="list-style-type: none">[quantity] [footprint dimensions] enclosures containing lithium-ion batteries, inverter, HVAC units, and fire suppression system[quantity] [footprint dimensions] medium voltage transformers[quantity] solar electric (PV) panels (see Appendix [xx] for emergency response instructions regarding the PV panels)Low voltage switchgear, metering equipment
BESS Equipment	The xxMW/xxMWh BESS consists of [quantity] free-standing enclosures. Each BESS container includes [quantity] battery racks,

	<p>[quantity] DC-to-AC inverters, [quantity] HVAC units, an AC auxiliary power distribution system, a DC power distribution system, a fire suppression system, and controls equipment.</p> <p>The AC output of the inverters is connected to the low side of the medium voltage transformer. The high side of the medium voltage transformer is connected to the electric grid.</p>
--	---

IV. Hazards Overview

Hazards at the [facility name] facility include the following-

- **Electrical equipment** – Electrical equipment shall always be treated as energized. Associated hazards include electric shock, arc flash, and fire.
- **Overhead power lines** – Overhead power lines shall always be treated as energized. Associated hazards include electric shock, arc flash, and fire. For locations see facility site plan, Appendix A.
- **BESS electrical equipment** – BESS electrical equipment including batteries shall always be treated as energized. A BESS does not have a single point of disconnect to electrically isolate all components from each other. There are disconnects that will de-energize select parts of the system, but the batteries themselves will remain energized.
- **BESS battery fire** – Battery fires present unique hazards, including stranded energy and re-ignition risk.
- **BESS off-gassing** – Lithium-ion batteries release flammable and toxic chemicals when subjected to electrical or physical damage, including fire. Chemicals released can also pose an inhalation hazard.
- **BESS explosion** – Accumulated flammable gasses inside a BESS enclosure may result in an explosion, if ignited.
- **Other site-specific hazards**

V. Personal Protective Equipment (PPE)

[recommended PPE]

VI. Fire Suppression System and Alarms

Each BESS enclosure includes a chemical fire suppression system (FSS) and alarms with the following major components:

- FM-200 cylinder
- Control panel (internal)
- Indicator panel (external)
- Smoke and heat detectors
- Alarm bell and strobe light

The FSS can be activated either electrically or manually. Smoke and heat sensors inside the BESS enclosure(s) will activate the FSS discharge process if fire conditions are detected. The FSS will also activate audio and visual alarms to warn anyone on-site of potentially dangerous conditions. The FSS can be activated manually by pushing the red button marked 'MANUAL' on the indicator/external panel.

The fire alarm system for each BESS enclosure is set up into a single zone and includes both smoke and heat detectors. The system is designed with a two-stage alarm notification.

Stage 1 Smoke <u>or</u> heat detector sends an alarm signal	→ Alarm bell sounds <u>or</u> strobe light flashes → The HVAC units shut down
Stage 2 Smoke <u>and</u> heat detectors send an alarm signal	→ Alarm bell sounds <u>and</u> strobe light flashes → The HVAC units shut down → The FM-200 fire suppression system begins 30 second countdown to chemical agent release

If a red indicator light of the indicator panel is on, the FM-200 chemical agent has been deployed inside the BESS enclosure.

[add photo/diagram of the indicator/external panel, label the manual activation button and FM-200 deployment indicator light]

[add sequence of operations diagram for the FSS]

VII. Emergency Response Recommendations

BESS fires present a unique set of hazards and should be treated differently than fires involving other electrical equipment. A BESS fire may exhibit heat output in excess of 2,000 degrees Fahrenheit. Signs of a BESS fire at the **facility name** facility include:

- Smoke or flame
- Shrapnel ejection
- Hissing and popping noises

The **facility name** BESS includes lithium-ion batteries. The recommendations described below refer specifically to emergencies involving lithium-ion batteries. If fire conditions are suspected or observed, the on-site emergency BESS disconnect should be operated, if it is safe to do so. ENGIE system operators may also be able to remotely disconnect the BESS from the utility.

FIRE
XX
Fire Suppression Sources
Initial suppression source: Clean agent (FM-200). The clean agent fire suppression system may be deployed manually by means of the manual pulling station on the BESS cabinet exterior, located on the back/front/side of the BESS cabinet. [photo / diagram of the manual FSS deployment initiator]
Secondary suppression source: Water from the nearest available water sources. For locations see facility site plan, Appendix A.

ELECTRIC SHOCK
XX

ARC FLASH
XX

VIII. HAZMAT Considerations

Runoff water from fire suppression shall be attempted to be contained using diking, damming, or other preventative measures. Physical barriers such as PIGS may be utilized to control runoff. If any storm drains or other drainage types are present which may flow off-site and will not be contained to a retention area, those drains shall be covered with mats or protected with barriers.

Unlike some other battery chemistry types, lithium-ion batteries do not have free-flowing liquid electrolyte. A large spill battery acid is therefore not a significant hazard with lithium-ion battery fires or accidents.

Facility Name ERP Version Tracker		
This ERP should be updated to reflect any significant change conditions at the facility site (example: installation of additional BESS or other equipment)		
Version	Date	Author
1.0	xx/xx/xxxx	

SPILL PREVENTION PLAN & HAZARDOUS MATERIAL

Energy Storage System (ESS)

1.0 SPILL PREVENTION PLAN

1.1 MATERIAL MANAGEMENT PRACTICES

The following are the material management, practices that will be used to reduce the risk of spills or other accidental exposure of materials and substances to stormwater runoff.

1.1.1 GOOD HOUSEKEEPING:

The following good housekeeping practices will be followed during the construction project.

- An effort will be made to store only enough product required to do the job.
- All materials stored onsite will be stored in a neat, orderly manner in their appropriate containers and, if possible, under a roof or other enclosure.
- All materials will be stored outside of resource areas.
- Products will be kept in their original containers with the original manufacturer's label.
- Manufacturer, local, and State recommendations for proper use and disposal shall be followed.
- Substances will not be mixed with one another unless recommended by the manufacturer.
- Whenever possible, all of a product will be used up before disposing of the container.
- The site superintendent will inspect daily to ensure proper use and disposal of materials onsite.
- Spill kits will be located in the office trailer at all times. All subcontractors will be responsible for having their own spill kits on site at all times.

1.1.2 SPILL CONTROL PRACTICES

Spill Control Practices shall be in conformance with the guidelines set forth in the National Pollutant Discharge Elimination System (NPDES) Stormwater Pollution Prevention Plan (SWPPP)

- Manufacturer's recommended methods for spill cleanup will be clearly posted and site personnel will be made aware of the procedures and the location of the information and cleanup supplies.
- Materials and equipment necessary for spill cleanup will be kept in the material storage area onsite. Equipment and materials will include but not be limited to brooms, dust pans, mops, rags, gloves, goggles, kitty litter, sand, sawdust, and plastic and metal trash containers specifically for this purpose.
- All spills will be cleaned up immediately after discovery.
- The spill area will be kept well ventilated and personnel will wear appropriate protective clothing to prevent injury from contact with hazardous substance.
- Spills of toxic or hazardous material will be reported to the appropriate State or local government agency, regardless of the size.

1.1.3 REQUIREMENTS FOR STORAGE AND USE OF FERTILIZERS:

No pesticides, herbicides, or insecticides are to be used on the property.

2.0 HAZARDOUS MATERIALS

The ESS facility contains hazardous materials, although these materials are contained, controlled and non-hazardous during normal operation of the components. The batteries will be mounted on stationary racking systems with no movable parts. The ESS installation requires no lubricants, fuel or water for operation, and generates no wastewater requiring disposal. If a battery was to be punctured or damaged, the reaction of the electrolyte inside the battery would be hazardous to the environment and personnel.

The proposed transformers for the ESS facility will contain a non-toxic, vegetable oil- based fluid (Envirotemp FR3 fluid) as a coolant. Envirotemp FR3 fluid is formulated from seed oils (>98.5% vegetable oil) and performance enhancing additives and colorant.

During construction, hazardous materials in the form of limited quantities of fuel (gasoline or diesel), lubricating and hydraulic oil, and coolants, will be temporary introduced on the site within the construction vehicles and equipment. Refueling protocols and spill preventive measures will be further detailed within the SWPPP to be provided prior to the start work.

2.1 HAZARDOUS PRODUCTS:

These practices are used to reduce the risks associated with hazardous materials.

- Products will be kept in original containers unless they are not re-sealable.
- Original labels and material safety data will be retained; they contain important product information.
- If surplus must be disposed of, manufacturer's or local and State recommended methods for proper disposal will be followed.

2.1.1 PRODUCT SPECIFIC PRACTICES:

The following product specific practices will be followed onsite:

Lithium-Ion Batteries

As a solid, manufactured article, exposure to hazardous ingredients is not expected with normal use of Lithium-Ion batteries. Lithium-Ion batteries are articles pursuant to 29 CFR 1910.1200 and, as such, is not subject to the OSHA Hazard Communication Standard requirement and is therefore not hazardous when used according to the recommendations of the manufacturer.

Under recommended and controlled use conditions, the electrode materials and electrolyte are non-reactive provided that the cell or battery integrity remains and the seals remain intact. If cell is mechanically, thermally or electrically abused and leakage occurs, a qualified person should remove the battery from the container.

Petroleum Products

All onsite vehicles will be monitored for leaks and receive regular preventive maintenance to reduce the chance of leakage. Petroleum product will be stored in tightly sealed containers which are clearly labeled.

Equipment Coolant

The proposed transformers for the facility will contain a non-toxic, vegetable oil- based fluid (Envirotemp FR3 fluid) as a coolant. Envirotemp FR3 fluid is formulated from seed oils (>98.5% vegetable oil) and performance enhancing additives and colorant.

Sinopec -40 degrees Celsius Inverter Engine Coolant used as a heat transfer medium in the inverter. Coolant is comprised of Ethylene Glycol, water and an additive. This product is not classified as a physical, health or environmental hazard.

Concrete Products

Concrete contractors should be encouraged, where possible, to use the washout facilities at their own plants or dispatch facilities.

If concrete washout or discharge of surplus concrete or drum wash water on the site is needed for emergency purposes only, then the following must comply:

- Do not wash out concrete trucks or equipment into storm drains, streets, gutters, uncontained areas, or streams.
- Washout area shall be located within the designated construction laydown area per the approved permit plans only and advertise the location with signs.
- Direct all washwater into a leak-proof container or leak-proof pit. The container or pit must be designed so that no overflows can occur due to inadequate sizing or precipitation. Provide adequate containment for the amount of wash water that will be used
- Inspect washout structures daily to detect leaks or tears and to identify when materials need to be removed.
- Dispose of materials properly. The preferred method is to allow the water to evaporate and to recycle the hardened concrete. Full service companies may provide dewatering services and should dispose of wastewater properly. Concrete wash water can be highly polluted. It should not be discharged to any surface water, storm sewer system, or allowed to infiltrate into the ground. It should not be discharged to a sanitary sewer system without first receiving written permission from the system operator.

CONCEPTUAL RENDERINGS

Energy Storage System (ESS)









SYSTEM OPERATIONS & COMPONENTS

Energy Storage System (ESS)



1.0 ESS SYSTEM OPERATION

An Energy Storage System is comprised of many components to successfully store energy from a distribution line and discharge that energy back into the distribution line during times of high load. Interconnection to the distribution line is done by the local power company who owns the distribution line. The interconnection to a specific distribution line is done with intricate detail to assure the system charges and discharges at appropriate times and does not cause unwanted load on the grid. In addition, the Grid Synergy (GS) Controller is a hardware interface between ESS equipment on site and the Network Operations Center. The GS controller is typically mounted by the main electrical panel within the facility. The GS controller communicates to the ESS via an ethernet connection. The GS Controller is responsible for monitoring all components of the ESS and delivers charge and discharge commands to the ESS.

The ESS will charge from existing photovoltaic systems interconnected to the same distribution line as the ESS. PV arrays generate electricity during the day while the sun shines, known as the charging window. While PV is a clean, renewable energy source it is only supplying energy to the grid during the day. This is when energy storage systems store the power produced by the PV arrays. ESS discharge the stored PV power to be utilized during times of peak demand thus creating an efficiency within the power structure.

2.0 INTERCONNECTION

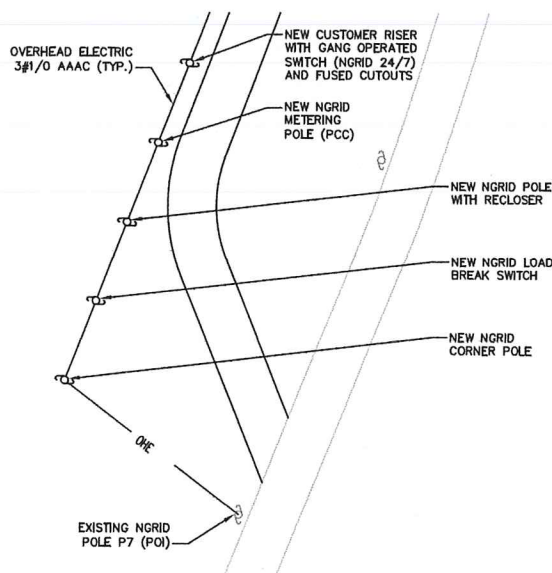
Interconnection is the energized connection of the ESS to the distribution line. The local power company designs the interconnection and what equipment is required to make the connection. The power company is also the one who makes this interconnection from the distribution line to the required project equipment on site.

A typical interconnection requires multiple pieces of equipment. That equipment can be pole mounted or pad mounted equipment. Whether the equipment is pole or pad mounted, it needs to meet the specifications and requirements of the utility company. Each connection to the distribution line goes through an interconnection service process with the utility company to assure proper relay settings and metering of the ESS.

2.1 POLE MOUNTED INTERCONNECTION

A pole mounted interconnection starts at a pre-determined utility pole in the public way. From the existing pole, the connection will go to a utility owned Gang Operated Air Break (GOAB) and Recloser, allowing the utility company to sever the connection to the site if they need to work on a failed piece of equipment. A separate line will go to the utility owned meter for the auxiliary service. Then, the line will go to a utility owned primary meter tracking the amount of power produced by the ESS.

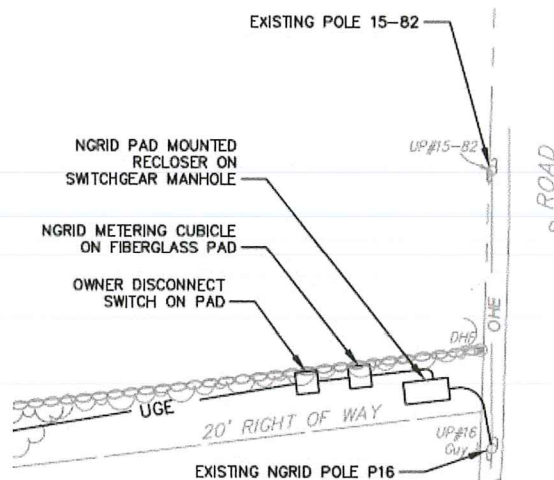
After the utility owned equipment there will be a project owned GOAB which allows the project owner to cut the power from the distribution line in case of emergency and/or maintenance of the facility. After the investor owned GOAB the line will go underground via conduit to the project location and connect to the site via a Recloser.



2.2 PAD MOUNTED INTERCONNECTION

A pad mounted interconnection starts the same way a pole mounted interconnection starts, with a GOAB/Recloser which will typically be mounted on the pre-determined interconnection pole or a new pole on the property that will get tied into the distribution line. From the Recloser, the line will go to a pad mounted, utility owned meter via underground conduit. A separate line will go to a pad mounted, utility owned meter via underground conduit from the interconnection pole for the auxiliary service.

After the utility owned equipment meter, the line will continue to a project-owned, pad mounted disconnect switch via underground conduit. The line will then continue to a Recloser and meter within the ESS site.



3.0 INTERCONNECTION COMPONENTS

3.1 GANG OPERATED AIR BREAK (GOAB)

A Gang Operated Air Break is a commonly used disconnect switch that utility companies use to break an electrical connection for isolation. It is referred to as “gang operated” because there are three separate switches, one for each phase, that are operated as a group from a single control. “Air Break” refers to it being operated in the air rather than in another medium, such as soil.



The purpose of this switch is to disconnect the project site from the incoming distribution line, not to disconnect the transformer from the load. It acts as a large safety switch that has no load breaking capability.

On the top side of the GOAB there are 300 Amp fuses that stop the flow of current in the event of an internal fault or a short circuit in the transformer.

3.2 TRANSFORMER

A transformer is a device that provides the final voltage transformation in the electric power system. In normal operation, electricity flows into the transformer on the high-voltage side where it goes into a coil of wire, usually wound around an iron core. As the electricity flows through this coil, it creates a magnetic field that “induces” a voltage in the other coil.

The transformers on site will step down the voltage that comes into the site from the distribution line for it to be stored into the battery modules. When the batteries are discharged the voltage will then be stepped up to match the voltage in the distribution line where it will be fed into.



3.3 RECLOSER

A Recloser is an automatic, high-voltage electric switch. It operates like a circuit breaker on household electrical lines, it shuts off electric power when trouble occurs. A Recloser will automatically test the electrical lines to determine whether the trouble has been removed. If the problem was only temporary, the Recloser will automatically reset and restore power.



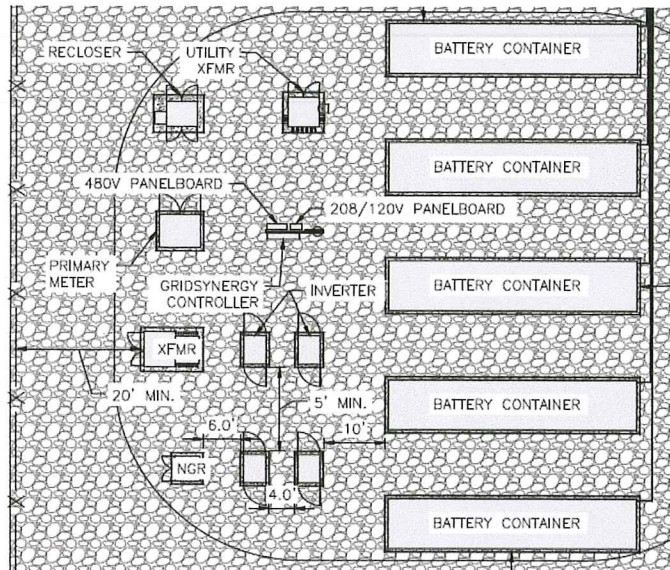
3.4 METER

A meter will read the amount of electricity that is used and taken off the distribution line. The meter reflects the total percentage of the load placed on the generating capacity of the electrical accessories and battery.



4.0 ENERGY STORAGE SYSTEM COMPONENTS

There are components of the ESS that are similar or the same as the components of interconnection, the reason for this is so that the project owner and utility company can simultaneously monitor the site. Components that make up the ESS system allow the user to create relay and time settings that provide further security and assurances that the system will be discharging and charging appropriately.



4.1 GRID SYNERGY (GS) CONTROLLER

The GS Controller monitors the entire ESS system. This controller monitors the battery management system for battery activity, charging and discharging. The GS controller also monitors the Fire Suppression System (FSS) as well as the HVAC components for the ESS. This is done by a data connection



4.2 INVERTER

An inverter is an electronic device that can turn Direct Current (DC) to Alternating Current (AC). The inverters that will be used in the ESS are Sungrow model SC1375UD-US. This Sungrow model has bidirectional power conversion system so that energy can be brought in off the distribution line as AC current and turned into DC current to be stored in the batteries then be discharged from the batteries as DC current and turned into AC current to go back into the distribution line. The inverter has a forced-air cooling system built in.



The Inverter has a sound rating of 80 Decibels (dB) at a distance of 1 meter. In a free field setting, where the sound is not bouncing off obstructions back towards the sound source, the sound level will decrease by 6 dB every time the distance from the sound source doubles. If the sound level at 1 meter is 80 dB then the at 2 meters the sound level would be 74 dB, at 4 meters the sound level would be 68 dB and so on. At a distance of 16 meters (about 53 feet) the sound level would be around 55 decibels.

Common outdoor sound pressure levels can vary significantly. It is common that day to night sound levels may vary a range of 50 dB in different areas. Outdoors in a wilderness sound levels may occur as low as 35-40 dB where in urban areas it could be 85-90 dB. In most cases urban dwellers live in areas with sound pressure levels more than 48 dB.

Night-time	Rural, no nearby traffic of concern	42
	Suburban, no nearby traffic of concern	47
	Urban, no nearby traffic of concern	52
	Business or commercial area	57
Daytime	Business or commercial area	62
	Industrial or manufacturing area	67
	Within 300 ft (91 m) of continuous heavy traffic	72

On an ESS site the inverters will not be in a free field setting, the inverters will be behind a fence, next to other equipment and will be screened with a natural buffer and/or plantings. Each of these obstructions will reduce the decibel level that is present at the distances stated above from the sound source.

System Type	SC1200UD-US	SC1375UD-US	SC1575UD-US	SC1725UD-US
DC side				
Max. DC voltage			500 V	
Min. DC voltage	700 V	800 V	95 V	1000 V
DC voltage range	700 ~ 1500 V	800 ~ 1500 V	95 ~ 1500 V	1000 ~ 1500 V
Max. DC current			80.5 A	
No. of DC inputs			1	
AC side (Grid)				
AC output power	000kVA @ 45°C (33°F) / 150kVA @ 50°C (86°F)	175kVA @ 45°C (33°F) / 232kVA @ 50°C (86°F)	175kVA @ 45°C (33°F) / 232kVA @ 50°C (86°F)	175kVA @ 45°C (33°F) / 232kVA @ 50°C (86°F)
Max. AC output current		1443 A @ 45°C (33°F) / 1887 A @ 50°C (86°F)		
Nominal AC voltage	480 V	550 V	630 V	690 V
AC voltage range	427 ~ 528 V	484 ~ 605 V	554 ~ 693 V	607 ~ 759 V
Nominal grid frequency / Grid frequency range			60 Hz / 50 ~ 65 Hz	
Harmonic (THD)			< 5% (at nominal power)	
Power factor at nominal power / Adjustable power factor			> 0.99 / leading ~ lagging	
Adjustable reactive power range			100 % ~ 100 %	
Feed-in phases / AC connection			3/3	
AC side (Off-Grid)				
Nominal AC voltage	480 V	550 V	630 V	690 V
AC voltage range	427 ~ 528 V	484 ~ 605 V	554 ~ 693 V	607 ~ 759 V
AC voltage distortion			< 3 % (unbalance load)	
DC voltage component			< 0.5 % (unbalance load)	
Unbalance load capacity			100 %	
Nominal Voltage frequency / Voltage frequency range			60 Hz / 50 ~ 65 Hz	
Efficiency				
Max. efficiency / CEC efficiency			99 % / 98.5 %	
Protection				
DC input protection			Line break switch + Fuse	
AC output protection			Circuit breaker	
Surge protection			DC Type II / AC Type II	
Grid monitoring / Ground fault monitoring			Yes / Yes	
Insulation monitoring			Yes	
Overheat protection			Yes	
General Data				
Dimensions (W*H*D)		1080*2400*1400 mm 42.5" * 94.5" * 55.1"		
Weight		1500 kg 3307 lbs		
Topology		Transformerless		
Degree of protection		NEMA 4X (Electronic) / NEMA 5R (Others)		
Operating ambient temperature range		-35 to 60 °C (-31 to 140 °F) (-31 to 140 °F) (-31 to 140 °F)		
Allowable relative humidity range		0 ~ 100 %		
Cooling method		Temperature controlled forced air cooling		
Max. operating altitude		4000 m (> 2000 m derating) 13123 ft (> 6561 ft derating)		
Display		LED, Web HMI		
Noise emission		< 60 dB @ 1m		
Communication		RS485, CAN, Ethernet		
Compliance		UL1741, UL1741 SA, IEC 61683, Rule 21, HECO 14H, CSA C22.2 No.107.1-01		
Grid support		LVRT, LVRT, active & reactive power control and power ramp rate control, Volt-var, Volt-watt, Frequency-watt		

CERTIFICATE OF COMPLIANCE

Certificate Number: SGSNA20GZ00180

Contract Number: 800504

Certificate Project Number: GZ-CERT201207412

Certified Product: Energy Storage Converter

Trademark: SUNGROW

Model(s): SC1725UD-US, SC1575UD-US, SC1375UD-US, SC1200UD-US

Technical Data: Software Version: MDSP_AMBER_B_V11_V1.A; GDSP_AMBER_B_V11_V1.A;

SC1725UD-US: AC side (On-Grid and Off-Grid); 600V(607~759V),

1443A/1725kVA@45°C, 3~; 60Hz (50.8Hz~60.5Hz), PF>0.99 (-1~1 adjustable),

Battery side: 1000Vdc~1500Vdc, 1760Amax@45°C,

SC1575UD-US: AC side (On-Grid and Off-Grid); 630V(554V~693V),

1443A/1575kVA@45°C, 3~; 60Hz (50.8Hz~60.5Hz), PF>0.99 (-1~1 adjustable),

Battery side: 800Vdc~1500Vdc, 1760Amax@45°C,

SC1375UD-US: AC side (On-Grid and Off-Grid); 600V(484V~605V),

1443A/1375kVA@45°C, 3~; 60Hz (50.8Hz~60.5Hz), PF>0.99 (-1~1 adjustable),

Battery side: 800Vdc~1500Vdc, 1760Amax@45°C,

SC1200UD-US: AC side (On-Grid and Off-Grid); 480V(427V~528V),

1443A/1200kVA@45°C, 3~; 60Hz (50.8Hz~60.5Hz), PF>0.99 (-1~1 adjustable),

Battery side: 700Vdc~1500Vdc, 1760Amax@45°C

Certificate Holder: Sungrow Power Supply Co., Ltd.

1690 Xiyu Road, New & High Technology Industrial Development Zone, Hefei,

230089, Anhui, China

This certificate supersedes previous certificates issued with the same certificate number. Certification is valid when products are indicated on the SGS directory of certified products of manufacturers or using the SGS logo. The product is certified according to IEC 61683, IEC 61683-1, and in accordance with:

UL 1741, 2nd Ed., Rev. February 15th, 2018

CSA C22.2 No. 107.1-18

UL 1741 Supplement SA, 2010 Ed 2 Rev Feb. 15, 2018

Compliance with UL1741, includes applicable requirements of IEEE 1547-2003 (R2008), CPUC Rule 21 (Effective on Jul 30, 2017).

SRD-UL-1741-SA-V1.1 (issued on September 26, 2017)

Authorized by:

Effective date: 30 December 2020

Jason Wei
Jason Wei
Certifier

Page 1 of 1



This certificate is issued by the company under its General Conditions for Certification. It is not valid if the certificate is altered, modified, or if the product is not in conformity with the requirements of the certificate. Any unauthorized alteration, forgery or falsification of the content or expiration of the certificate is strictly prohibited and may be prosecuted by the SGS Group of Companies.

Certification Body

Consumer and Retail Services, a division of SGS North America Inc.
620 Old Peachtree Road, Ste. 100, Suwanee, GA 30024, USA
T: +1 770 573 1800 F: +1 770 277 1240 www.sgs.com



4.3 TRANSFORMER (XFMR)

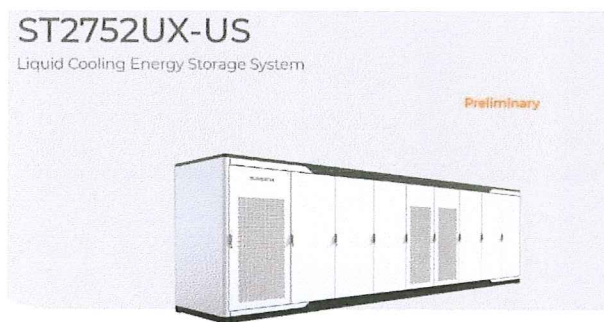
A transformer is designed to convert alternating current from one voltage to another. It can “step up” or “step down” voltages. The transformer consists of two magnetically coupled coils. Alternating current in one coil creates a changing magnetic field which induces a current in the second coil. When taking energy from the distribution line, the energy from the line will come into the transformer as medium voltage and be stepped down to a lower voltage that is acceptable for the inverters to operate. When discharging energy back into the distribution line the energy will go through the transformer as a lower voltage and be stepped up to match the voltage on the distribution line.



4.4 BATTERY CONTAINER

The ESS container is where the storage of energy takes place. Bringing energy from the distribution line through the necessary relay settings, clock settings, Recloser settings, inverters and transformers gets us to charging the batteries.

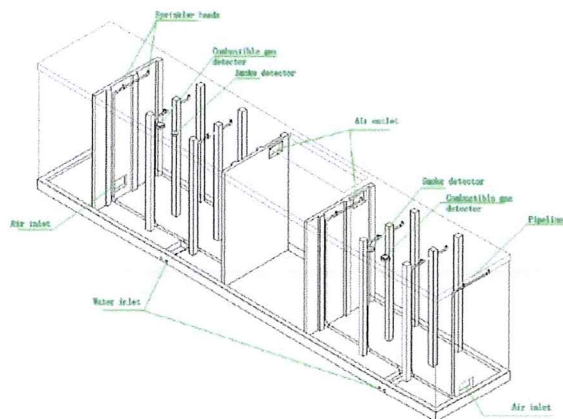
The ESS containers are white in color and placed on concrete slabs that extend a minimum of 6 inches past the edges of the container. The dimensions of the ESS container are 30.6ft x 8.27ft x 5.67ft (WxHxD). The ESS container weighs approximately 57,320 lbs. and comes as a fully assembled unit with the battery cells installed from the manufacturer.



Type designation	ST2752UX-US
Battery Data	
Cell type	LFP
Battery capacity (BOL)	2752 kWh
Battery voltage range	1300 ~ 1500 V
General Data	
Dimensions of battery unit (W * H * D)	9840*2520*1730mm
Weight of battery unit	26,000kg
Degree of protection	IP 25/NEMA 3R
Operating temperature range	-30 to 50 °C (-45 °C derating)
Relative humidity	0 ~ 95 % (non-condensing)
Max. working altitude	3000m
Cooling concept of battery chamber	Liquid cooling
Fire safety standard/Optional	Deluge sprinker heads (standard), Pused sprinker heads (optional)/NFPA10 explosion prevention and ventilation (ELV) gas (optional)
Communication interfaces	
Communication protocols	RS485, Ethernet
Compliance	Modbus RTU, Modbus TCP, UL3540/LI3540A/NFPA 855
2-HOURS APPLICATION: ST2752UX-9000UD-MV-US	
BOL kWh/DC/AC LV Side	11,008kWh DC/3,379kWh AC
ST2752UX Quantity	4
PCS Model	SC3000UD-MV-US
4-HOURS APPLICATION: ST2752UX-5000UD-MV-US	
BOL kWh/DC/AC LV Side	22,016kWh/21,448kWh
ST2752UX Quantity	8
PCS Model	SC3000UD-MV-US
Grid Conversion Data	
Max THD of current	< 3 % (at nominal power)
DC component	< 0.5 % (at nominal power)
Power factor	> 0.99 (at nominal power)
Adjustable power factor	1.0 leading ~ 1.0 lagging
Nominal grid frequency	60 Hz
Grid frequency range	55 ~ 65 Hz
Transformer	
Transformer rated power	5,000 kVA
LV/MV voltage	0.9 kV / 34.5 kV
Transformer cooling type	ONAN (Oil Natural Air Natural)
Oil type	Mineral oil (PCB free) or degradable oil on request

4.5 FIRE PROTECTION SYSTEM

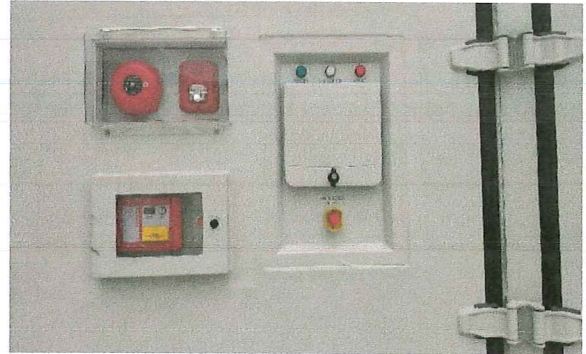
The ESS container has a standard equipped fire protection system, please refer to the Emergency Response Plan provided in this submission package for more detailed information regarding the fire protection. Within the container are smoke and heat sensors that are part of the fire protection system.



There is a fire protection system installed on all ESS sites includes dry pipes plumbed to the ESS container. These dry pipes get individually plumbed from each ESS container and continue underground to outside of the project fence line where they will be labeled, correlating

them to each individual container. The pipes outside the fence will have a pipe connection that the fire department can attach a water line on in order to flood a specific container if it happens to enter a thermal runaway.

There are both visual and audible alarms on each ESS container. There is a control panel on the outside of the ESS container that has status lights for the system.

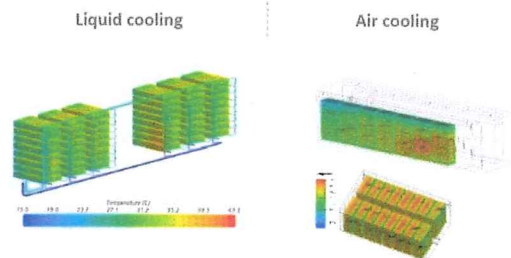


4.6 Liquid Cooling

The ESS container and battery modules is liquid cooled. The container is plumbed with piping to each battery module. The liquid that is being used as a coolant/ heat transfer medium is Sinopec. The liquid is made up of Water, Ethylene Glycol and an additive. The fluid will go through a compressor that brings the coolant back down to an operating temperature to then cycle back through the modules. Each battery module is equipped with a solenoid that will determine if the battery module needs more cooling or not. This increases the efficiency of the system and keeps a more consistent operating temperature.



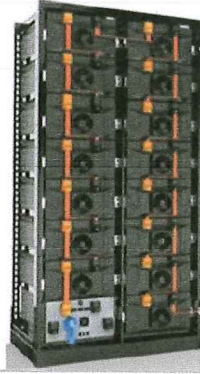
REDUCE CELL MISMATCH AND EXTEND LIFE SPAN



Items	Liquid cooled	Air cooled
Cell temperature delta	<3°C	<10°C


4.7 BATTERY RACKING

The batteries are held within the ESS container on a racking system, a Sungrow model E4L-R231. Through the racking system the batteries are hooked up to a monitoring system that monitors each battery module and each battery rack with heat sensors that monitor battery temperature. Each rack holds 15 battery modules and one (1) battery monitoring system.

NO.	Item	Specification
1	Image (reference)	
2	Model	E4L-R231
3	Charging & discharging rate	≤0.5C
4	Cell type	LFP 302Ah
5	Configuration	1P240S
6	Key component	PACK*15+SG*1
7	Capacity	302Ah
8	Nominal energy	231.9kWh
9	Charging & discharging power	≤112.8kW
10	Nominal voltage	768.0V
11	Operating voltage range	648.0V~876.0V
12	Dimensions (W*H*D)	1080mm×2000mm×800mm

4.8 LITHIUM-ION BATTERY

A Lithium-Ion Battery is a type of rechargeable battery most commonly used for portable electronics, tools and electric vehicles. Li-ion batteries do not require scheduled cycling to maintain their battery life. The Lithium-ion batteries being used in the ESS is a Sungrow E4L-M154 battery module. The battery is a Lithium iron phosphate (LFP) cell battery which have excellent safety, long lifecycle and are very durable.

NO.	Item	Specification
1	Image (reference)	
2	Model	E4L-M154
3	Charging & discharging rate	$\leq 0.5C$
4	Cell type	LFP 302Ah
5	Configuration	1P16S
6	Capacity	302Ah
7	Nominal energy	15.4kWh
8	Charging & discharging power	$\leq 7.5kW$
9	Nominal voltage	51.2V
10	Operating voltage range	43.2V~58.4V
11	Dimensions (W*H*D)	410mm×230mm×760mm
12	Weight	105kg

DECOMMISSIONING PLAN

ZPB-38 Energy Storage System

Map 26B, Lot A1

4.948 MWAC

1355 Main Street
Leicester, MA 01524

September 20, 2021

ZPBattery DevCo LLC
10 E Worcester St, Suite 3A, Worcester MA 01604

BACKGROUND

ZPBattery DevCo LLC ("ZPB") has prepared this Decommissioning Plan (the "Plan") for the Energy Storage System (the "System") located off 1355 Main Street, Leicester, MA 01524. The System will consist of a 4.948 MWac Energy Storage System located on approximately a third of acre of land owned by WR Enterprise.

The purpose of this Decommissioning Plan is to provide the general scope of decommissioning work as well as for a decommissioning assurance mechanism designed to satisfy the decommissioning assurance requirements under the Special Permit.

System Description:

The System will consist of a 4.948 MWac capacity energy storing operation secured within a chain-link fence surrounding the pad mounted equipment and accessed via Main Street. The System will include the following site features:

- Utility owned equipment:
 - One (1) Utility Pole
 - One (1) GOAB
 - One (1) Recloser
 - One (1) Transformer
 - Two (2) Meters
- ZPB Owned Equipment
 - One (1) GOAB
 - One (1) Recloser
 - One (1) Meter
 - One (1) Transformer
 - One (1) Neutral Ground Reactor
 - One (1) Controller
 - Four (2) Inverters
 - Five (8) Energy Storage Containers
- Seven (7)-foot chain-link security fence
- Underground conduit and wires

DECOMMISSIONING ACTIVITIES

The System will be decommissioned by completing the following major steps:

- Dismantlement and Demolition
- Disposal or Recycle
- Site Stabilization

Dismantlement, Demolition, and Disposal or Recycle:

A significant amount of the components of the System will include recyclable or re-saleable components, including copper, aluminum, galvanized steel, and batteries. Due to their resale monetary value, these components will be dismantled and disassembled rather than being demolished and disposed of.

Following coordination with the local utility company regarding timing and required procedures for disconnecting the System from the private utility, all electrical connections to the system will be disconnected and all connections will be tested locally to confirm that no electric current is running through them before proceeding. All electrical connections to the batteries will be cut at the panel and then removed from their framework by cutting or dismantling the connections to the supports. Batteries will be removed. Disposal of these materials at a recycling center will be permissible.

Finally, all associated structures will be demolished and removed from the site for recycling or disposal as required in the bylaws for Southbridge. This will include the site fence and gates, which will likely be reclaimed or recycled. Grade slabs will be broken and removed to a depth of one foot below grade, and clean concrete will be crushed and disposed of off-site or recycled (reused either on- or off-site). Sanitary facilities will be provided on-site for the workers conducting the decommissioning of the System.

Pad mounted interconnection equipment owned by the System will be completely removed and disposed of off-site in accordance with utility best practices. Overhead wires will be removed from the and terminated at the utility-owned point of common coupling.

A final site walkthrough will be conducted to remove debris and/or trash generated within the site during the decommissioning process, and will include removal and proper disposal of any debris that may have been wind-blown to areas outside the immediate footprint of the System being removed.

Site Stabilization:

The areas of the System that are disturbed (during decommissioning) will be re-graded to establish a uniform slope, stabilized as needed, and approved by the Building Inspector/Planning Board during the decommissioning process. The gravel access driveway from Main Street, including the portion within the perimeter fence, will remain intact and shall not be removed until site is fully stabilized.

Current Permitting Requirements for Decommissioning

Given the size and location of the System, several approvals are required prior to initiation of ground-disturbing activity. ZPB has provided a summary of the expected approvals if the decommissioning were to take place in September 2021. Noting, however, that because the decommissioning is expected to occur at a later date, the permitting requirements listed below will be reviewed and updated based on current local, state, and federal regulations at the time.

National Pollutant Discharge Elimination System (NPDES) General Permit for Discharges from Construction Activity

- U.S. Environmental Protection Agency - Ground disturbance of greater than 1 acre with discharge to wetlands or water bodies. Requires preparation of a storm Water Pollution Prevention Plan, including erosion and sedimentation controls.

Site Plan Approval

- Town of Leicester Planning Board - Anticipated decommissioning requirements listed in the Site Plan Approval conditions of approval.

Building Permit

- A building permit is required to construct the System. A building permit must also be obtained for any construction, alteration, repair, demolition, or change to the use or occupancy of a building.

Permitting Requirement Assumptions:

1. The access driveway will remain in place throughout the System until site is fully stabilized.
2. No ground disturbance, including temporary laydown areas, is required within areas subject to the Massachusetts Wetlands Protection Act.

Schedule

The decommissioning process is estimated to take approximately 3-6 weeks and is intended to occur outside of the winter season.

Decommissioning Cost

ZPB has estimated the decommissioning and land remediation costs. **Exhibit A** attached hereto shows the detail of ZPB's estimates of the foregoing costs.

DECOMMISSIONING ASSURANCE

Form of Decommissioning Assurance

During each year from the period of commencement of construction of the System through completion of decommissioning activities at the System, ZPB shall provide a performance guarantee in a form reasonably accepted by the Town of Leicester.

Amount of Decommissioning Assurance

The initial amounts of the decommissioning assurance shall be **\$86,653**. Please note that this amount is derived from estimates of the cost set forth in **Exhibit A**.

As of each five-year anniversary of the commercial operation date of the System, the decommission assurance shall be updated to reflect 110% of an updated reasonable estimate of decommissioning costs (net of salvage value). At least three (3) months prior to the five-year anniversary, ZPB shall provide an updated estimate of decommissioning costs to the Town of Leicester for its review and approval, not to be unreasonably withheld. (For avoidance of doubt, in disapproving an updated estimate of decommissioning costs, the Town of Leicester may reasonably require that an updated estimate be provided.) In connection with an update of the decommissioning assurance amount, ZPB shall provide the Town of Leicester with such supporting information as it reasonably requests.

USE OF DECOMMISSIONING ASSURANCE

In the event that ZPB fails to undertake decommissioning activities within one year of discontinued operations, the Town of Leicester shall have the right to undertake decommissioning activities and make a claim against the decommissioning assurance. ZPB agrees that in such circumstances that the Town of Leicester shall have such access to the site as may be necessary to allow its qualified contractors to conduct decommissioning activities. For purposes hereof, ZPB and the Town of Leicester agree that the "date of discontinued operations" shall be (i) the date of discontinued operations designed by ZPB in its notice to the Town of Leicester or (ii) in absence of such notice, the last day of a continuous period of nine (9) months in which the System has not operated and where such inactivity is not the result of a casualty, equipment problem, permitting matter, financial matter or other issue that ZPB or the owner/operator is in good faith attempting to remedy.

ZPB agrees to indemnify and hold the Town of Leicester harmless from and against all net loss, cost and expenses, including court costs and reasonable attorney's fees, related to and arising out of the Town of Leicester's decommissioning activities, except to the extent such loss, cost or expenses relate to or arise out of the negligence, willful misconduct or violation of the law by the Town of Leicester, its officials, employees, contractors or agents.

Submitted by:

ZPBattery DevCo LLC

By: _____

Name: Brendan Gove

Title: Authorized Person

ACKNOWLEDGEMENT AND APPROVAL

The Town of Leicester Planning Board hereby acknowledges receipt of this Decommissioning Plan and affirms that the Decommissioning Plan (assuming establishment of the escrow fund in the amount provided for above) satisfies the conditions of the Site Plan Approval relevant thereto.

Town of Leicester Planning Board

By: _____

Date: _____, 2021

Name:

Name:

Name:

Name:

Name:

Name:

Name:

EXHIBIT A – DECOMMISSIONING COST ESTIMATE

Decommissioning Estimate
ZP-38- Classic Auto Leicester MA

4948 kW

	Unit	Est. Qty.	Material/ Labor Cost	Salvage Labor	Material Recycle Val.	Net Salvage	Net Cost	Notes
Contractor Fees								
Supervisory/Management	LS	1	10,625	-	-	-	10,625	85 man hours @ \$125/hour
Electrical Disconnection	EA	1	1,600	-	-	-	1,600	20 hours @ \$80/hour to de-energize
Erosion Controls	LF	565	763	-	-	-	763	\$1.35/LF
Subtotal			12,988	-	-	-	12,988	
Sitework								
Access Roads & Gravel Area Removed	SF	1	1	-	-	-	1	
Restoration Seeding	AC	0.75	938	-	-	-	938	\$1250 per acre
Fence Removal and Recycling	LF	560	300	-	-	-	300	100 LF/hr @ \$53.5/hr
Site Cleanup	LS	1	1,000	-	-	-	1,000	Labor & Dumpster Rental
Subtotal			2,238	-	-	-	2,238	
AC & DC Wire Removal								
Interconnection pole removal	EA	1	240	-	-	-	240	Assume 3 hours per pole @ \$80/hour
AC overhead wire removal	LF	50	80	-	(10)	(10)	70	100'/hour removed/crewmember @ \$80/hr
MV direct burial wire removal	LF	560	80	-	(112)	(112)	(32)	600'/hour removed/crewmember @ \$80/hr
DC wire removal	LF	3,000	160	-	(300)	(300)	(140)	1500'/hour removed @ \$80/hour
Subtotal			560	-	(422)	(422)	138	
Equipment Removal								
IX Equipment removal	EA	5	4,267	-	-	-	4,267	Crew of 4 removes 3/day @ \$80/hour
Inverter removal	EA	2	1,707	-	-	-	1,707	Crew of 4 removes 3/day @ \$80/hour
Auxiliary Equip Removal	EA	2	1,707	-	-	-	1,707	Crew of 4 removes 3/day @ \$80/hour
Transformer removal	EA	1	853	-	-	-	853	Crew of 4 removes 3/day @ \$80/hour
Subtotal			8,533	-	-	-	8,533	
ESS Removal								
Disconnection	EA	8	20,480	-	-	-	20,480	Crew of 4 removes 1/day @ \$80/hour
Container removal	EA	8	25,360	-	-	-	25,360	200 ton Crane & Trucking
Subtotal			45,840	-	-	-	45,840	
Equipment Pad Removal								
Remove equipment pads	EA	10	3,000	-	-	-	3,000	\$6/sq ft
Remove ESS Footings	EA	8	6,000	-	-	-	6,000	\$6/sq ft
Subtotal			9,000	-	-	-	9,000	
Decommissioning Subtotal								
			79,159	-	-	-	79,159	
Subcontractor Markup								
	10%		7,916	-	-	-	-	
Total Decommissioning								
			87,075	-	(422)	(422)	86,653	
Cost/kW AC		\$	(17.60)				\$	(17.51)



Liquid Cooling System Preliminary Maintenance Guidelines

SUNGROW

1 Introduction

This document introduces the maintenance functions of Sungrow's liquid cooling system and gives some advice on maintenance.

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2 Intelligent O&M

Sungrow's energy storage system integrates a local controller. It integrates fault and alarm management functions. As showed in the following picture, the local controller collects and uploads the real-time information of PCSs, battery system and other equipment in the energy storage system through an Ethernet connection. The local controller can upload fault information to EMS and SCADA for remote monitoring and management.

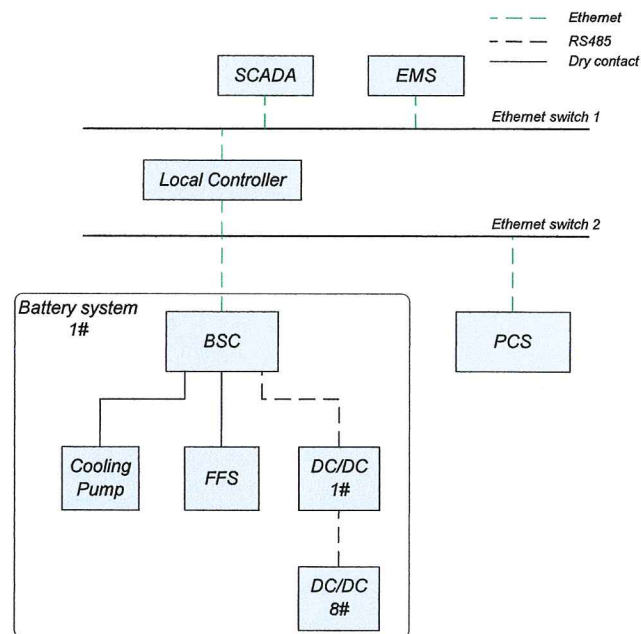


Fig.2-1: Communication Diagram of Liquid Cooling System

Sungrow's energy storage system has a three-level failure handling mechanism of alarm, derating and shutdown. The system has set up detection nodes in PCS, batteries and other equipment. When a fault is detected, the system will quickly locate the fault point and take corresponding measures. At the same time, the fault information will be uploaded to the EMS and SCADA through the local controller.

Table 2-1: System Failure Types

Devices	Failure types
Battery	Over/under voltage, over/under temperature, sampling fault, etc.
PCS	Over/under frequency, IGBT/ reactor over temperature, SPD fault, etc.

Other Devices(Cooling pump、FSS、 etc.)	Liquid leak, liquid over temperature, cooling pump failure, etc.
---------------------------------------	--

3 Routine Maintenance

During the course of life of the product, various parts age and wear as a function of vibration, corrosion, temperature, humidity and dust. To maintain the efficiency of the BESS, it is necessary to carry out routine and periodic maintenance on the liquid cooling system.

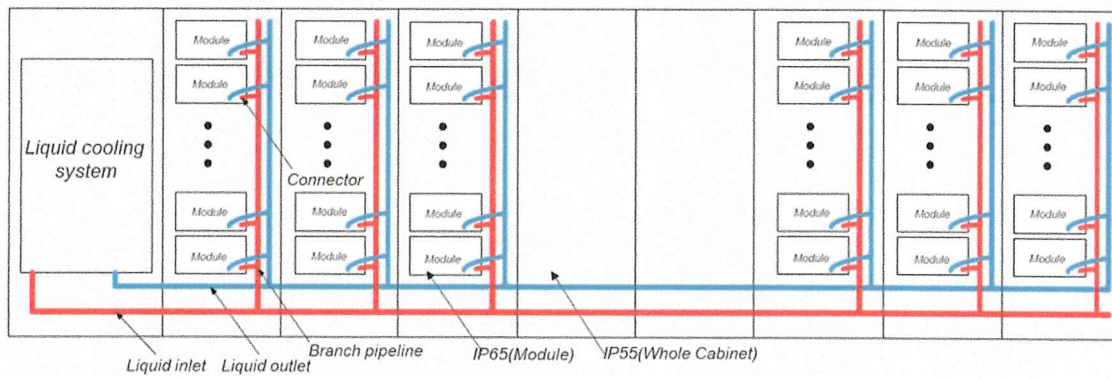


Fig.3-1: Liquid Cooling Fluid Circuit Overview

3.1 Safety Rules

Respect the following two rules during maintenance or service on the BESS to ensure the safety of the maintainer.

- Power off
- Follow the grounding procedure for servicing of the liquid cooling system pump bay.

3.2 General Maintenance

The following maintenance is recommended every year. The frequency of maintenance could be increased according to the use environment, especially when the environment is poor.

Table 3-1: General Maintenance Items

Maintenance Part	Content	Standard.	Tool	Professionals Required	Maintenance time (min.)
Air Filter Net	<p>1. When the area of the filter net at the bottom of the air-conditioning warehouse is more than 10% dirty, a high-pressure air gun needs to be used for cleaning;</p> <p>2. When the dirt and blocked area of the filter on the top of the air</p>	Dirty gap ratio <10%	High pressure air gun, steel brush	No	30

	conditioner reaches more than 10%, use a steel brush to clean it.				
Fan ¹	Checking whether the fan blades rotate normally and whether the fan blades are damaged. If the fan cannot be rotated or the fan blades are damaged, replace the fan.	1. The fan blades rotate smoothly and there is no abnormal noise; 2. The fan blades are not damaged.	Long handle screwdriver	No	30
Pump ¹	1. Check whether the dirty blockage area of the cooling air inlet of the water pump is more than 5%, if it exceeds, it needs to be cleaned with a brush; 2. Visually inspect the pump body (non-pipeline connection) for obvious dripping (except for condensed water). If there is obvious dripping, replace the pump sealing ring.	1. The pump runs smoothly without abnormal noise; 2. The pump body has no obvious dripping phenomenon (except for condensed water)	Brush	No	30
Electronic Control System ¹	1. Do an appearance inspection every six months to check whether the circuit connection is replaced and whether the circuit is corroded. 2. Check whether the pull-in of each contactor is flexible, and whether there are arcing and burn marks in the connection pull-in. 3. Use a brush or dry compressed air to remove dust from electrical and control components. 4. Fasten each electrical conductor.	1. The circuit connection shall not fall off or rust; 2. No dust on the surface of electrical components; 3. The electrical contactor has no arc and burn marks;	Brush, flat-blade screwdriver	No	30
Water System	Check the high and low pressure values of the water system through HMI, high pressure <2.5bar; low pressure>0.2bar. 1. If the high pressure is higher than 2.5bar, check whether the water system filter is dirty or blocked; 2. If the low pressure is lower than 0.2bar, the water system needs to be refilled.	High pressure<2.5bar low pressure>0.2bar	Slotted screwdriver, Phillips screwdriver, water pump, water pipe, clamp.	No	90
Cooling System ²	1. Check whether the refrigeration pipeline is worn or not, and whether the fixed structure is loose; 2. Check the compressor suction and discharge pressure values: Inhalation: 700kPa~1350kPa; Exhaust: 2300kPa~4000kPa.	/	Brush	Yes	60

	3. Check whether there is obvious dirty blockage on the inlet side of the condenser. When the dirty blockage area is more than 10%.				
¹ Estimated time to replace: 10 years					
² Estimated time to replace: 15 years					

3.3 Device Replacement

The corresponding equipment is recommended to be replaced if the following situations occur.

Table 3-2: Device Replacement

Change Object	Replacement standard	Period	Tool	Professionals are needed
Cooling Liquid	1. The antifreeze contains impurities above the recommended level. 2. The color of antifreeze changes from pink to deep red.	5-6 years	Water pump, hose, hose clamp, flat screwdriver	No



ST2752UX

Fire Suppression System

SUNGROW

1 Introduction

This document describes the fire suppression system of ST2752UX.

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2 System Configuration

The fire suppression system is composed of smoke detectors, fused sprinkler heads, pipe networks, water inlets, combustible gas detectors(optional) and ventilation exhaust system(optional). The layout diagram is shown in Figure 1.

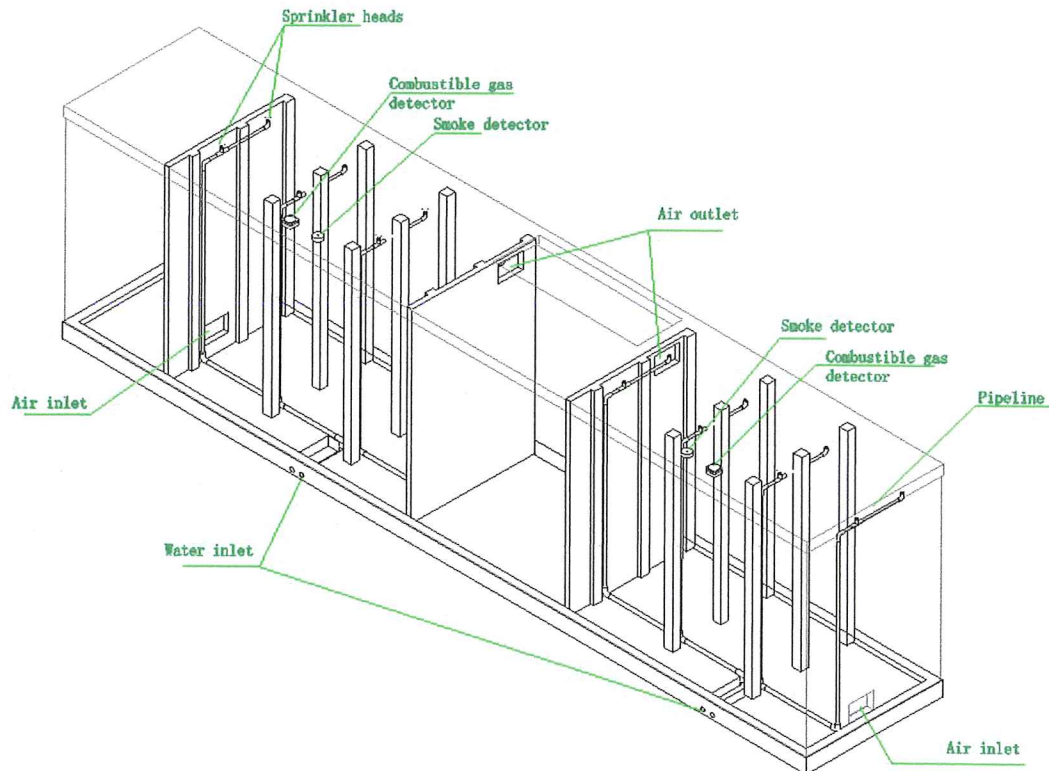


Fig. 1 Layout of Fire Suppression System

2.1 Fire Sprinkler System

The fire sprinkler system is the standard solution of the product fire protection. Under normal circumstances, the pipe shall not be filled with water.

Fire Suppression System

SUNGROW

As showed in figure 1, the batteries of the ST2752UX are distributed in two cabins, and water fire-fighting pipes are arranged in the two cabins. The water inlet is reserved for a quick-connect water inlet that meets local standards. The pipe network specification is designed according to hydraulic calculations, drawings and flow requirements. Sungrow will provide hydraulic calculations reports.

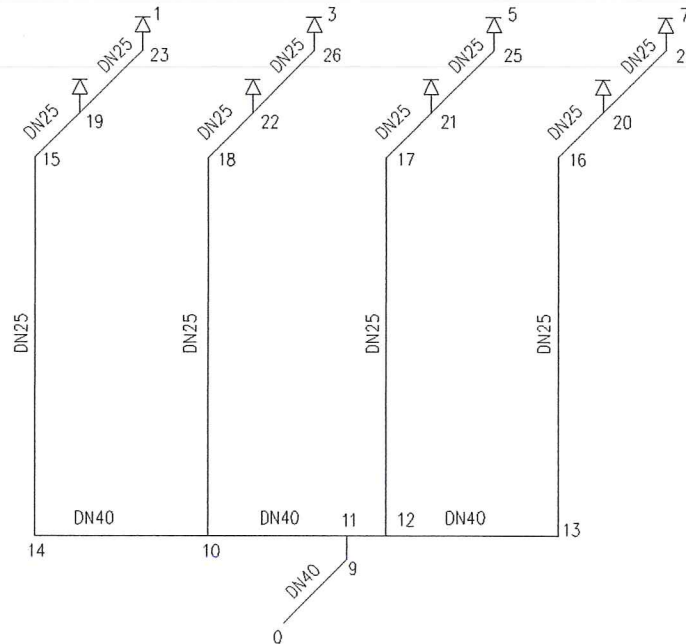


Fig. 2 Pipe Layout

The inlet flow rate is shown in Table 1. If the extinguishing time is calculated 2h, and the water consumption of the entire water fire fighting system is:

$$10.96 \times 2 \times 3,600 = 157,824\text{L}$$

Table 1 Inlet Flow

Head (mH ₂ O)	Flow (L/s)
25.49	10.9623

2.2 Fused Sprinkler Heads

Fused sprinklers are automatic sprinklers with heat sensitive components and sealing components. In the event of a fire, the heat-sensitive liquid in the glass bubble expands due to heat, and when it reaches the nominal operating temperature, the glass bubble will eventually burst and start the sprinkler to sprinkle water.



Fig. 3 Upright Sprinkler

2.3 Combustible Gas Detection and Ventilation Exhaust System (Optional)

Testing has shown that flammable gases are released during lithium-ion battery fires, overcharging, or other abuse situations. A buildup of these gases creates an explosion hazard. The combustible gas detection and ventilation exhaust system can control and reduce this hazard.

The combustible gas detection and ventilation exhaust system include two parts: the combustible gas detection system and the ventilation exhaust system. The ventilation exhaust system equipment mainly includes air inlet and exhaust fan windows. The inside of the inlet and exhaust windows should be equipped with electric shutters, which can be started and closed according to the needs of the system, and the outside should have a protective structure.

3. Working Principle of the System

The combustible gas detector detects whether the combustible gas exceeds the alarm value. When the combustible gas reaches 20% lower explosive limit (LEL), the system shuts down and the exhaust ventilation system is switched on. At the same time, system outputs a signal to EMS/SCADA or a third-party fire control controller.

When the smoke is activated, system outputs another signal to EMS/SCADA or a third-party fire control controller. The system should automatically or be confirmed by personnel to activate the fire extinguishing system.

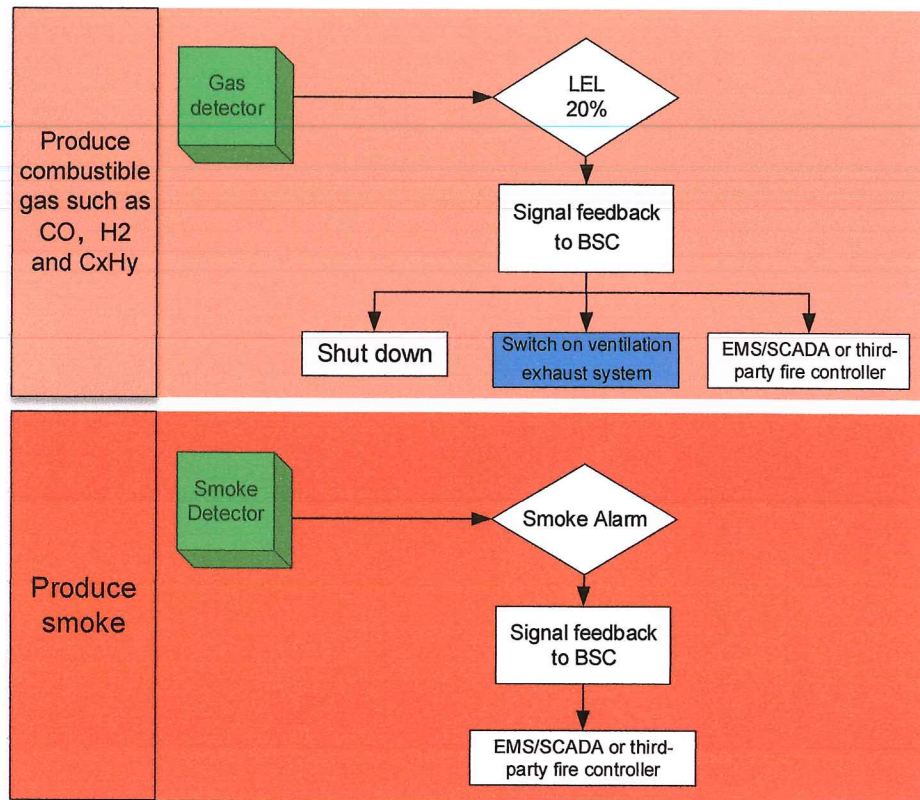
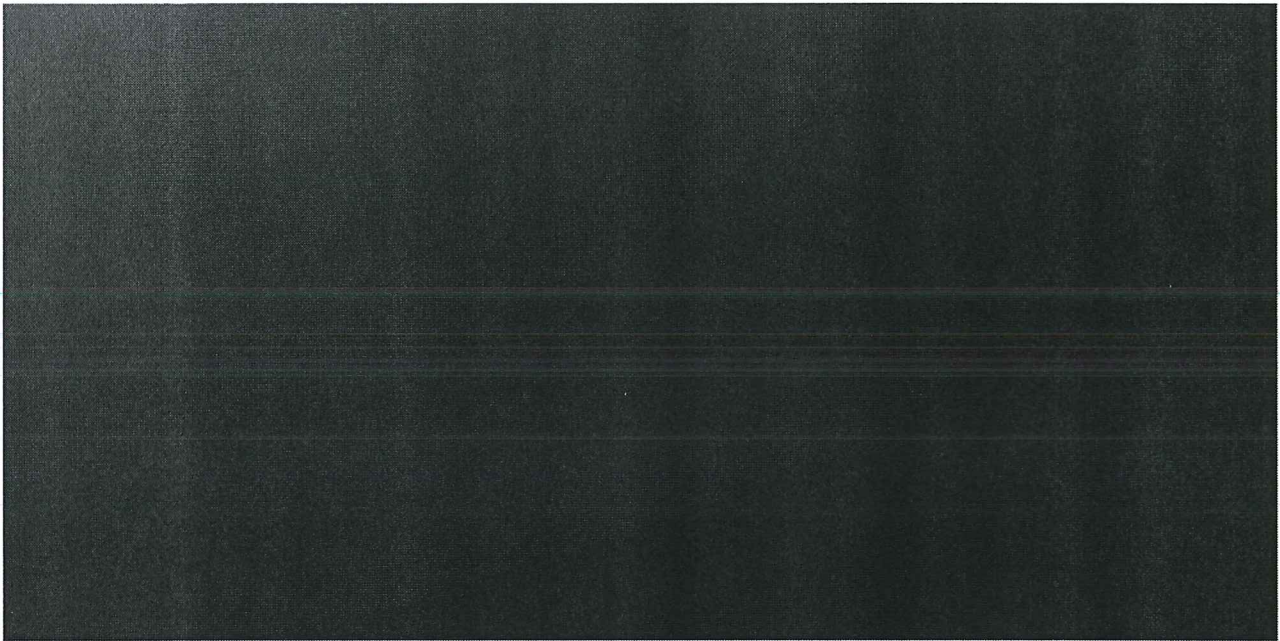


Fig. 4 Fire Fighting System Work Flow



M2L Series

Rack-mounted Battery Cluster

User Manual

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1 About This Manual

Dear customers, thank you for using the rack-mounted battery cluster developed and produced by Sungrow Power Supply Co., Ltd. We sincerely hope that this product can meet your needs. Your opinions and suggestions on the performance and functions of this product are also expected. We will continue improving the product quality.

1.1 Purpose

The purpose of this manual is to provide readers with the product details, and installation, operation and maintenance instructions.

1.2 Target Readers

This manual is applicable to professional and technical personnel who are engaged in installation, operation and maintenance of this product.

1.3 Use of this Manual

Before using this product, please read this manual carefully. Keep this manual ready for use by operation and maintenance personnel.

The contents, pictures, signs and symbols in this manual belong to Sungrow Power Supply Co., Ltd. Those who are not SUNGROW's employees shall not disclose or reprint this manual in full or part without the written authorization.

A large number of illustrations are applied to support the description in this manual. All figures are for reference only. The actual product shall prevail.

This manual will be continuously updated and revised, but there may still be errors or minor discrepancies between the descriptions in this manual and the actual product. The actual product shall prevail.

1.4 Symbols

In order to safeguard the personal and property safety of users or use this product efficiently and optimally, this manual contains relevant information, which is highlighted by the following symbols.

Below are the symbols that may be used in this manual. Please read them carefully for making better use of this manual.

DANGER

"DANGER" indicates a hazard with a high level of risk that, if not avoided, will result in death or serious injury.

! WARNING

"WARNING" indicates a hazard with a medium level of risk that, if not avoided, could result in death or serious injury.

! CAUTION

"CAUTION" indicates a hazard with a low level of risk that, if not avoided, could result in minor or moderate injury.

NOTICE


"NOTICE" indicates a situation that, if not avoided, could result in equipment or property damage.



"Note" is additional information in this manual, aiming to emphasize and supplement the relevant contents, describe the skills or tips for optimal use of this product, or help the user solve problems or save time.

Pay attention to the danger warning signs on the machine, as detailed below.

Sign	Meaning
	Pay attention to the danger. Do not operate this product in the live status!
	There is high voltage inside this product. Touching this product may result in electric shock!
	Pay attention to heavy objects. Lifting of heavy objects may lead to back injuries. Please lift heavy objects with appropriate tools.
	Pay attention to explosion.
	Pay attention to corrosion.
	Do not discard it together with domestic waste.
	No fire.
	There should be a medical center nearby.
	In case of contact with eyes, rinse the eyes immediately with running water or normal saline; and seek medical help in time.
	Read the manual before any operation of this product.
	It is required to wear goggles.

Sign	Meaning
	This is a protective grounding terminal, which should be grounded securely to protect the safety of operators.


1.5 Symbol Definitions

- BM (also known as PACK): Battery Module
- BC (also known as RACK): Battery Cluster
- BMU: Battery Management Unit
- BCMU (CMU for short): Battery Cluster Management Unit
- BSMU (SMU for short): Battery System Management Unit
- BMS: Battery Management System
- S/G: Switch Gear
- SOC: State Of Charge
- SOE: State Of Energy
- ESS: Energy Storage System
- PCS: Power Conversion System
- BCP: Battery Collection Panel

2 Safety Instructions

Always follow the safety instructions in this manual. In order to avoid personal injury and property damage that may occur during installation or operation, and extend the service life of this product, please carefully read all safety instructions.

Improper or incorrect use may result in:

- A threat to the life and personal safety of the operator or third parties;
 - Damage to the energy storage system or other property of the operator or third party.
- 
 - The safety precautions in this manual do not cover all specifications to be followed, and all operations should be performed based on the site conditions.
 - SUNGROW shall not be liable for any loss arising from failure to follow the safety precautions in the manual.

2.1 Before Installation

NOTICE

Upon receiving this product, please check whether it has been damaged during transportation. If any problem is found, please contact Sungrow Power Supply Co., Ltd. or the freight company immediately.

Before using this product, the operator must get familiar with all safety instructions and relevant requirements for installation, operation and maintenance in this manual.

Proper handling, loading/unloading, installation, operation and maintenance are the reliable guarantee for safe and reasonable use of this product.

2.2 During Installation



DANGER

Before installing this product, make sure of no electrical connection.



CAUTION

Poor ventilation in the installation environment will affect the system performance!

Ensure proper ventilation during the operation. The inlet and outlet of the fan must not be covered, in order to ensure full cooling inside this product.

NOTICE

This product shall be used only for the purposes specified in this manual. Unauthorized modification or use of the parts that are not sold or recommended by Sungrow may result in fire, electric shock and other hazards.

2.3 Repair and Replacement

WARNING

This product must be repaired by the professional and technical personnel with corresponding qualifications.

Users are forbidden to repair, maintain and replace modules or circuit boards without permission; otherwise, severe personal injury or major property loss may be caused!

CAUTION

Prevent irrelevant people from entering the maintenance site!

Affix the temporary warning sign or set an obstacle during electrical connection and maintenance, in order to prevent unrelated persons from entering the electrical connection or maintenance area.

NOTICE

If required during maintenance, replace the components and parts recommended and approved by our company; otherwise, losses will be borne by the user!

2.4 PACK Handling

When SOC is 100%, the fault current of PACK is up to 14000 A (maximum theoretical value). Although electric shock of PACK is relatively safe, attention should be paid to arc prevention during PACK handling. The positive and negative terminals of PACK must not be short-circuited. If a short circuit occurs, other PACKs must be immediately disconnected and kept in a safe place. The PACK must be handled carefully. If PACK falls off accidentally, other PACKs must not be connected without the verification by SUNGROW's technical personnel.

For safe use, technical personnel should carefully read and observe the following safety requirements:

- Do not remove the protective cover of the PACK.
- Do not use any metal object that may lead to a short circuit between the positive and negative terminals.
- Prevent the PACK from mechanical impact.
- Prevent the PACK from falling off. If it falls off accidentally, do not use it again, and dispose of it immediately.
- Do not disassemble and damage the PACK.
- Do not insert any foreign object into the PACK.
- Do not remove any screws from the PACK.
- Prevent the PACK from being exposed to water and high humidity.
- Prevent the PACK from heating and direct exposure to sunlight.
- Do not weld battery contacts directly.

- Do not use defective or deformed batteries. Dispose of them in accordance with local regulations.
 - Do not damage the protective cover of the cable or connector.
 - Do not use inappropriate equipment for charging and discharging.
 - Smoking is prohibited within 20m around the battery.
 - Do not place any objects on the PACK and switch gear.
 - Do not eat or drink near the battery.
 - The PACK should be handled by at least four installers. It is recommended to comply with local regulations.
 - The battery must not be stored together with flammable/explosive materials.
- If the PACK falls off or is subject to impact, it must be taken out of the battery system and moved into a safe place.
- Observe it carefully for 20 min or more in a safe place to check abnormal smoke, smell or heat.
 - Wear Class 1 personal protective equipment and measure the voltage and insulation resistance of the PACK. If the voltage or insulation resistance is abnormal, mark the corresponding information on the PACK and its package.
 - Do not use the PACK. Contact SUNGROW.

2.5 Organic Solvent Electrolyte

The lithium iron phosphate battery module contains organic solvent electrolyte. A ruptured battery module may release some electrolyte. Direct exposure to electrolyte can cause skin irritation. The electrolyte vapor has a sour taste.

In case of accidental exposure to electrolyte, follow the instructions below to reduce risks and injuries.

- Immediately rinse the eyes with running cold water for at least 15 min.
- Immediately rinse the skin with clean water for at least 15 min.
- Immediately take off clothing contaminated with electrolyte.
- Seek medical help immediately

2.6 Pressure Relief Valve

Although the battery system has a number of safety measures, accidents may still occur. When the cell is misused, damaged or abused, the pressure relief valve on the top of the battery may burst in order to prevent a severe explosion. In this case, the internal pressure decreases, but the external electrolyte may be decomposed.

- Opening of the pressure relief valve is a serious problem. Therefore, all actions must be taken cautiously.
- Turn off the entire system except for the auxiliary power supply.
- Contact SUNGROW.

- Check the temperature and voltage of each cell. Technical personnel must not get close to the battery for inspection until its temperature is below 40°C. If the temperature and voltage cannot be measured accurately, stay away from the battery for at least 24 h. In case of no changes within 24 h, take further actions.
- Avoid any type of spark or flame, to prevent the ignition of leaking electrolyte.

2.7 First Aid Measures

In an emergency, take the following first aid measures for personal safety.

Inhalation

In case of accidental inhalation of the gas leaking out of the battery, please breathe fresh air immediately. If necessary, consult a doctor.

Contact with skin

In case of accidental exposure of the skin to electrolyte, immediately rinse off electrolyte with plenty of water. If necessary, consult a doctor.

Contact with eyes

In case of accidental exposure of the eyes to the battery electrolyte or smoke, please rinse with plenty of water for at least 15 min. If you have any concerns, please contact a doctor or specialized ophthalmologist.

Accidental swallowing

In case of accidental swallowing of the leaked electrolyte, drink a lot of water and contact a doctor immediately.

2.8 Recommended Personal Protective Equipment

Note that the battery contains high short-circuit current, involving risks of electric shock. Please observe all safety measures during battery operation.

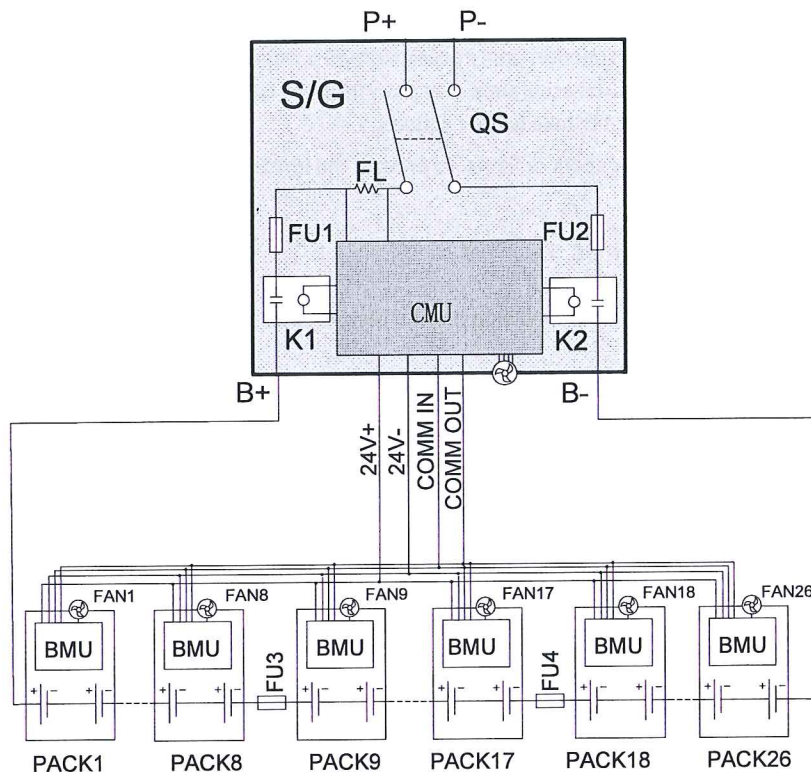


Fig. 2-1 RACK Electrical Schematic Diagram

When installing or maintaining the battery system, technical personnel should wear appropriate personal protective equipment as shown in the table below.

Table 2-1 Requirements for personal protective equipment

Parameter	Static		Dynamic	
	RACK (no S/G)	RACK	RACK (no S/G)	RACK
V_{sys} (V)	1331.2	1331.2	1497.6	1497.6
R_{sys} (Ω)	0.1157	0.1184	0.1199	0.1237
I_{bf} (A)	11505.6	11243.2	12490.4	12106.71
I_{arc} (A)	5752.8	5621.6	6245.2	6053.3
I^2t coefficient of fuse	409300	168000	409300	168000
Arcing time T_{arc} (s)	0.01236	0.00531	0.01049	0.00458
Arcing energy at a distance of 18 inches (cal/cm ²)	0.44759	0.18800	0.46384	0.19642
Hazard level	1	1	1	1

2.9 Others

DANGER

Failure to comply with the safety regulations or operation requirements of this manual may cause serious personal injury or major property damage or even death!

WARNING

All safety signs, warning labels and nameplates on the product must be:

- Legible.
- Not removed or covered.

NOTICE

Do not rinse the product directly with water.

Unless it is absolutely necessary, users must not open the shell of this product.

CAUTION

Prevent children and the general public from direct contact with this product!

3 Product Description

3.1 Features

Taking the battery cluster M2L-R200A-280-U as an example, Fig. 3-1 shows the typical system architecture of lithium-iron batteries. Standardized and unitized battery modules are developed based on lithium-iron cells, and connected in series with the switch gears to constitute battery clusters. The battery clusters are connected in parallel, combined through the BCP, and connected to the supporting power conversion system (PCS) to form energy storage systems (ESS) and store and release electric energy.

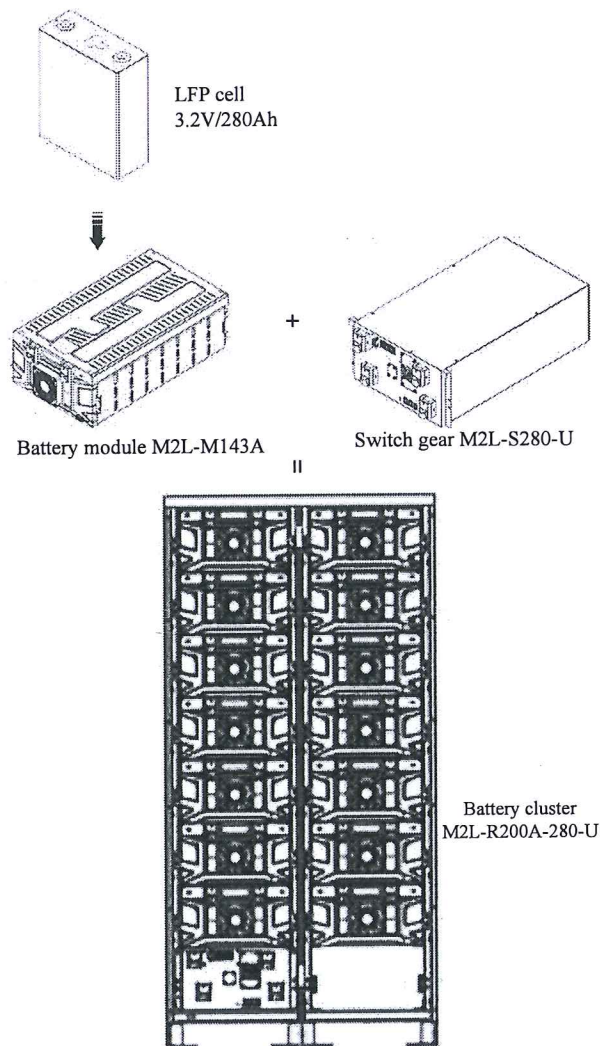
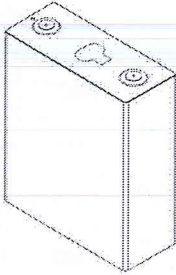


Fig. 3-1 System Architecture

3.2 Cell

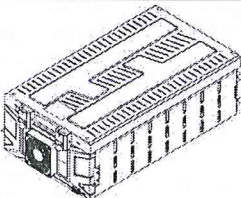
Table 3-1 Cell parameters

Cell	Parameter	Value
	Size (thickness * height * width)	71.7mm*207.2mm*174mm
	Weight	5.7 kg
	Rated capacity	280 Ah
	Rated energy	896 Wh
	Rated voltage	3.2 V
	Voltage range	2.5 V to 3.65 V

3.3 LFP Battery Module

The LFP battery module is mainly composed of cells in series, and has the functions of voltage and temperature acquisition and balance control of all individual cells. The dedicated cells are used for battery management. Control commands are received by means of daisy chain communication, and the collected data is reported.

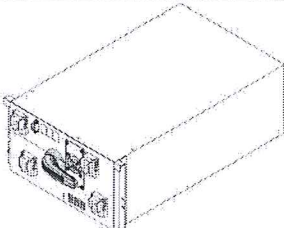
Table 3-2 LFP battery parameters

LFP battery module	Parameter	Value
	Model	M2L-M143A
	Multiplying power	≤1C
	Cell type	Square aluminum shell LFP
	Combination	1P16S
	Key components	16 cells and one BMU
	Weight	105±3 .2kg

3.4 Switch Gear

The switch gear contains the fuse, relay and battery cluster management unit (BCMU). It is mainly used for the overall monitoring of battery clusters.

Table 3-3 Switch gear parameters

Switch gear	Parameter	Value
	Model	M2L-S280-U/E(-M)
	Size (D*W*H)	693.5mm*405mm*230mm
	Weight	24.2 kg
	Current range	-400A ~ +400 A
	Voltage range	≤ 1500 V

Note: "U/E" models are applicable to UL and IEC regions.

The "M" model means that the S/G contains a disconnecter.

3.5 Battery Cluster

The battery cluster is composed of multiple PACKs in series, S/G, battery racks, etc.


Table 3-4 Battery cluster parameters

Battery cluster model	Combination	Voltage range (V)	Size (mm)	Weight (kg)	Control circuit current (A)
M2L-R172A-28 0-U/E(-M)	IFpP73/175/206[(1P16 S)12S]M/10+50/90	518.4~700.8	1010×1825×76 0	1455	15.6
M2L-R186A-28 0-U/E(-M)	IFpP73/175/206[(1P16 S)13S]M/10+50/90	561.6~759.2	1010×1825×76 0	1560	16.8
M2L-R200A-28 0-U/E(-M)	IFpP73/175/206[(1P16 S)14S]M/10+50/90	604.8~817.6	1010×2055×76 0	1680	18
M2L-R215A-28 0-U/E(-M)	IFpP73/175/206[(1P16 S)15S]M/10+50/90	648~876	1010×2055×76 0	1785	19.2
M2L-R229A-28 0-U/E(-M)	IFpP73/175/206[(1P16 S)16S]M/10+50/90	691.2~934.4	1010×2285×76 0	1905	20.4
M2L-R243A-28 0-U/E(-M))	IFpP73/175/206[(1P16 S)17S]M/10+50/90	734.4~992.8	1010×2285×76 0	2010	21.6
M2L-R258A-28 0H-U/E(-M)	IFpP73/175/206[(1P16 S)18S]M/10+50/90	777.6~1051.2	1500×1825×76 0	2120	22.8
M2L-R272A-28 0H-U/E(-M)	IFpP73/175/206[(1P16 S)19S]M/10+50/90	820.8~1109.6	1500×1825×76 0	2225	24
M2L-R286A-28 0H-U/E(-M)	IFpP73/175/206[(1P16 S)20S]M/10+50/90	864~1168	1500×1825×76 0	2330	25.2
M2L-R301A-28 0H-U/E(-M)	IFpP73/175/206[(1P16 S)21S]M/10+50/90	907.2~1226.4	1500×2055×76 0	2455	26.4
M2L-R315A-28 0H-U/E(-M))	IFpP73/175/206[(1P16 S)22S]M/10+50/90	950.4~1284.8	1500×2055×76 0	2560	27.6
M2L-R329A-28 0H-U/E(-M)	IFpP73/175/206[(1P16 S)23S]M/10+50/90	993.6~1343.2	1500×2055×76 0	2665	28.8
M2L-R344A-28 0H-U/E(-M)	IFpP73/175/206[(1P16 S)24S]M/10+50/90	1036.8~1401. 6	1500×2285×76 0	2790	30
M2L-R358A-28 0H-U/E(-M)	IFpP73/175/206[(1P16 S)25S]M/10+50/90	1080~1460	1500×2285×76 0	2895	31.2
M2L-R372A-28 0H-U/E(-M)	IFpP73/175/206[(1P16 S)26S]M/10+50/90	1123.2~1497. 6	1500×2285×76 0	3000	32.4

Note: - "U/E" models are applicable to UL and IEC regions.

- The "M" model means that the S/G contains a disconnecter.

Table 3-5 Battery cluster stacking method

Model	Stacking method		Model	Stacking method	
M2L-R172A-280-U/ E(-M)	PACK	PACK	M2L-R186A-280-U/ E(-M)	PACK	PACK
	PACK	PACK		PACK	PACK
	PACK	PACK		PACK	PACK
	PACK	PACK		PACK	PACK
	PACK	PACK		PACK	PACK
	PACK	PACK		PACK	PACK
	S/G			S/G	PACK
M2L-R200A-280-U/ E(-M)	PACK	PACK	M2L-R215A-280-U/ E(-M)	PACK	PACK
	PACK	PACK		PACK	PACK
	PACK	PACK		PACK	PACK
	PACK	PACK		PACK	PACK
	PACK	PACK		PACK	PACK
	PACK	PACK		PACK	PACK
	PACK	PACK		PACK	PACK
M2L-R229A-280-U/ E(-M)	PACK	PACK	M2L-R243A-280-U/E (-M)	PACK	PACK
	PACK	PACK		PACK	PACK
	PACK	PACK		PACK	PACK
	PACK	PACK		PACK	PACK
	PACK	PACK		PACK	PACK
	PACK	PACK		PACK	PACK
	PACK	PACK		PACK	PACK
M2L-R258A-280H- U/E(-M)	PACK	PACK	M2L-R272A-280H-U /E(-M)	PACK	PACK
	PACK	PACK		PACK	PACK
	PACK	PACK		PACK	PACK
	PACK	PACK		PACK	PACK
	PACK	PACK		PACK	PACK
	PACK	PACK		PACK	PACK
	S/G	PACK		S/G	PACK

Model	Stacking method	Model	Stacking method
M2L-R286A-280H-U/E(-M)	PACK	PACK	PACK
	PACK	PACK	PACK
	PACK	PACK	PACK
	PACK	PACK	PACK
	PACK	PACK	PACK
	PACK	PACK	PACK
	PACK	PACK	PACK
	S/G	PACK	PACK
M2L-R301A-280H-U/E(-M)	PACK	PACK	PACK
	PACK	PACK	PACK
	PACK	PACK	PACK
	PACK	PACK	PACK
	PACK	PACK	PACK
	PACK	PACK	PACK
	PACK	PACK	PACK
	S/G	PACK	PACK
M2L-R315A-280H-U/E(-M)	PACK	PACK	PACK
	PACK	PACK	PACK
	PACK	PACK	PACK
	PACK	PACK	PACK
	PACK	PACK	PACK
	PACK	PACK	PACK
	PACK	PACK	PACK
	S/G	PACK	PACK
M2L-R329A-280H-U/E(-M)	PACK	PACK	PACK
	PACK	PACK	PACK
	PACK	PACK	PACK
	PACK	PACK	PACK
	PACK	PACK	PACK
	PACK	PACK	PACK
	PACK	PACK	PACK
	S/G	PACK	PACK
M2L-R344A-280H-U/E(-M)	PACK	PACK	PACK
	PACK	PACK	PACK
	PACK	PACK	PACK
	PACK	PACK	PACK
	PACK	PACK	PACK
	PACK	PACK	PACK
	PACK	PACK	PACK
	S/G	PACK	PACK
M2L-R358A-280H-U/E(-M)	PACK	PACK	PACK
	PACK	PACK	PACK
	PACK	PACK	PACK
	PACK	PACK	PACK
	PACK	PACK	PACK
	PACK	PACK	PACK
	PACK	PACK	PACK
	S/G	PACK	PACK
M2L-R372A-280H-U/E(-M)	PACK	PACK	PACK
	PACK	PACK	PACK
	PACK	PACK	PACK
	PACK	PACK	PACK
	PACK	PACK	PACK
	PACK	PACK	PACK
	PACK	PACK	PACK
	S/G	PACK	PACK

Note: "x" represents no device, "S/G" represents the switch gear, and "PACK" represents the battery module.

4 Delivery

4.1 Scope of Supply

The packing box should include:

- Battery cluster (1 set)
- Factory inspection report (1 copy)
- User manual (1 copy)
- Certificate of conformity (1 copy)
- Warranty card (1 copy)
- Supporting parts of the product and other accessories specified in the order

4.2 Unpacking and Inspection

Before delivery, this product has been fully tested and strictly inspected. However, it may be damaged during transportation.

Please perform a detailed inspection before signing for the product. Carefully check the product before signing the receipt.

- Check whether the packing box is damaged.
- According to the packing list, check this product for integrity and consistency with the order.
- Unpack this product and check whether its internal parts are intact.

If any damage is found, please contact the transportation company or Sungrow Power Co., Ltd. directly, and provide photos of damage to facilitate services.

4.3 Storage

If the RACK is not installed and operated on the site immediately after delivery and acceptance, the PACK should be stored. Pay attention to the following items during storage:

Restore the package to its original state.

Storage temperature: -20°C to 45°C ; temperature change rate: $<1^{\circ}\text{C}/\text{min}$; relative humidity of storage: 10% to 98%; absolute humidity of storage: $<35\text{g}/\text{m}^3$, with no condensation.

The number of stacking layers of PACKs with package must not exceed 5. It is strictly forbidden to directly stack PACKs without package.

Store the PACK in a clean and dry place, without exposure to sunlight and rain. The storage location must be free of harmful gases, flammable/explosive products and corrosive chemicals. The PACK should be prevented from mechanical impact, high pressure, high-intensity magnetic field and direct exposure to sunlight.

Pay attention to the harsh environment, such as sudden cooling/heating and collision, to avoid damage to the PACK.

Regularly inspect the package for damage and insect bites. If any damage is found, the product should be replaced immediately.

The package must not be tilted or turned upside down.

If stored for more than 6 months under the specified conditions, the PACK needs to be charged once, until the system SOC is 50% to 80%.

5 Installation

WARNING

This product or system must be operated by professionals!

Failure to follow the safety instructions in this manual or operation of this product or system by non-professionals may cause severe personal injury or major property damage.

WARNING

Strictly follow local relevant standards and requirements in the whole process of mechanical installation.

5.1 Installation Notes

Please place the battery cluster securely on a level ground, without shaking or tilting.

Consider the bearing capacity and load capacity of the installation ground and floor during the installation of the battery cluster (according to the architectural drawings).

Never cover the vents, in order to avoid the influence heat dissipation of the battery cluster, temperature rise inside the system and impact on the battery safety and life.

Please keep the battery cluster installation environment well ventilated. Do not install this product in a too hot or cold place or a place with high humidity. Keep the product away from water, flammable gas or corrosives, heat sources, or direct exposure to sunlight. Minimize dust at the air inlet/outlet.

Do not use this product in a place with dust, volatile gas, corrosive gas or high salt content, or keep flammables or explosives around the battery cluster.

In order to reduce the possibility of fire and corresponding damage, the walls, ceiling and floor of the battery cluster room should be made of fireproof material wherever possible, and fire extinguishers should be available.

5.2 Mechanical Installation

DANGER

This system is a high-voltage energy storage device, which is hazardous. Non-professional or improper operation may lead to severe consequences such as electric shock, combustion, and explosion. The battery system must be installed and maintained by professional and technical personnel, and operated in strict accordance with relevant safety regulations.

Taking the battery cluster M2L-R200A-280-U as an example, the recommended installation method is as follows.

Step 1 Count the components. Remove the battery module (PACK for short), as well as packages of the

switch gear, rack and accessories, and check structural parts.

Component	Quantity	Unit
Battery rack	1	Nos.
PACK	14	Nos.
Switch gear	1	Nos.
M6X20 cross recessed hex bolt and flat/spring washer combination	64	Nos.
Large M6 washer	64	Nos.

Step 2 Anchor the battery rack.

1. Fasten the bottom of the battery rack. Transfer the battery rack to the designated installation site. Level the battery rack with an inclinometer, and fasten the eight bottom holes with M12 bolts onto the floor (recommended torque: 60N·m), to ensure that the battery rack is horizontally secured on the floor.
2. After installing the battery rack, check whether all bolts are installed correctly, and make riveting marks with the marker pen.

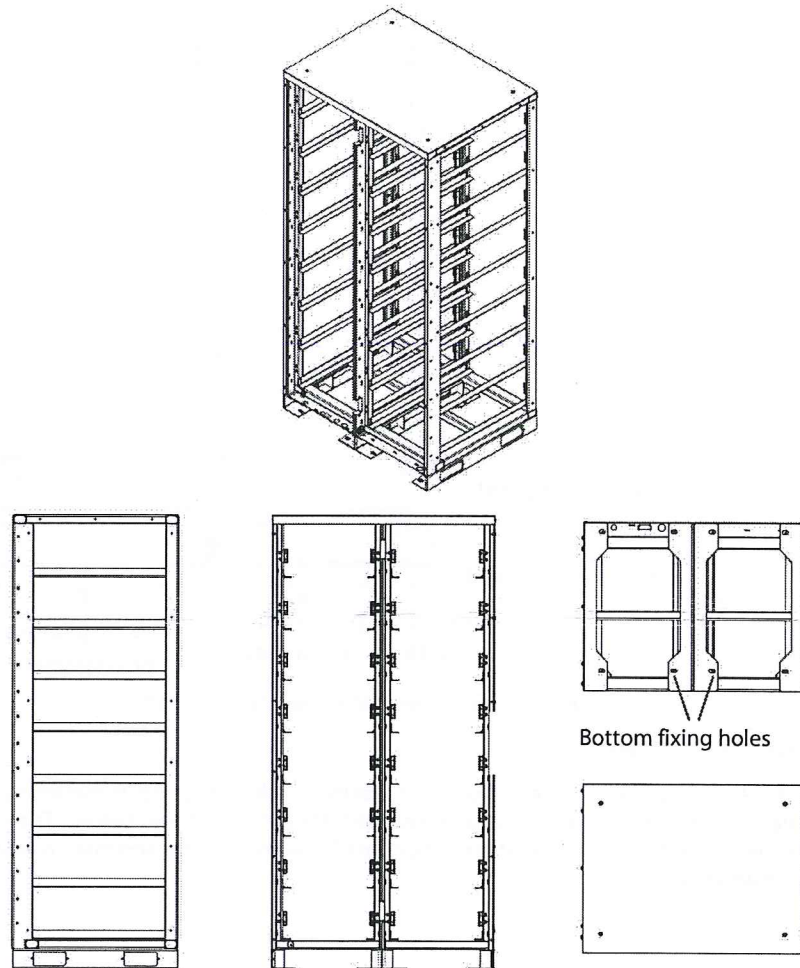


Fig. 5-1 Battery rack installation diagram

Step 3 Connect the ground cable.

Fix one end of the ground cable at the grounding point of the battery rack and the other end at the grounding point of the bottom platform of the container through M8 bolts (recommended

torque: $16 \pm 1 \text{ N}\cdot\text{m}$).

Table 5-1 Ground cable specifications

Material	Color	Cross-sectional area
XLPE	Yellow-green	5AWG (16.8mm ²)

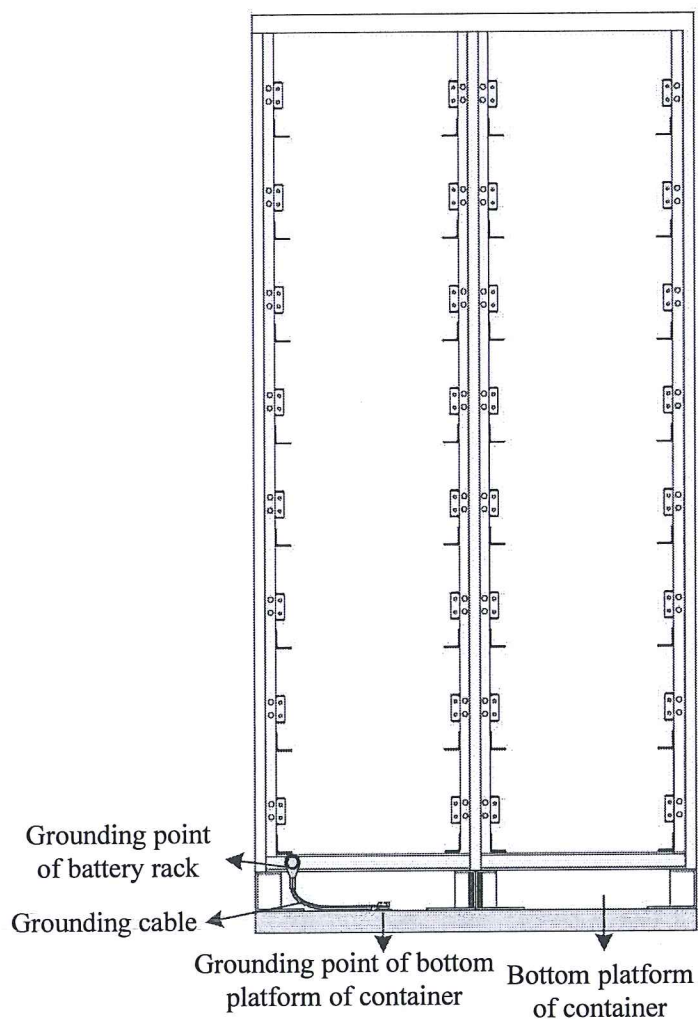


Fig. 5-2 Grounding cable connection diagram

Step 4 Install the switch gear.

Install the switch gear at the bottom of the battery rack by aligning its mounting hole with the hole of the fixing plate and then fastening with M6 bolts (as shown below). The recommended torque is $6 \pm 0.5 \text{ N}\cdot\text{m}$. Check whether all bolts are installed correctly, and make riveting marks with the marker pen.

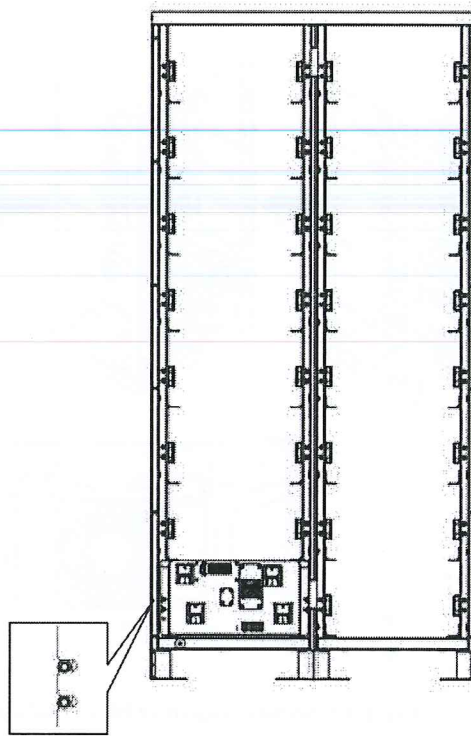


Fig. 5-3 Switch gear installation diagram

Step 5 Install the PACK.

3. Installation and pre-tightening. Install the PACK from bottom to top into the battery rack via the battery lift. Align the side hole of the PACK with the hole of the fixing plate of the battery rack, and pre-tighten them with M6 assembly bolts (as shown below).
4. Install and pre-tighten all PACKs in the same battery rack.
5. Bolt fixing. After pre-tightening all PACKs, fix the M6 bolts via the fixing tool, and make marks with the marker pen (recommended torque: $6 \pm 0.5 \text{ N} \cdot \text{m}$).
6. After all PACKs are installed in the system, check whether all bolts are installed correctly, and make riveting marks with the marker pen.

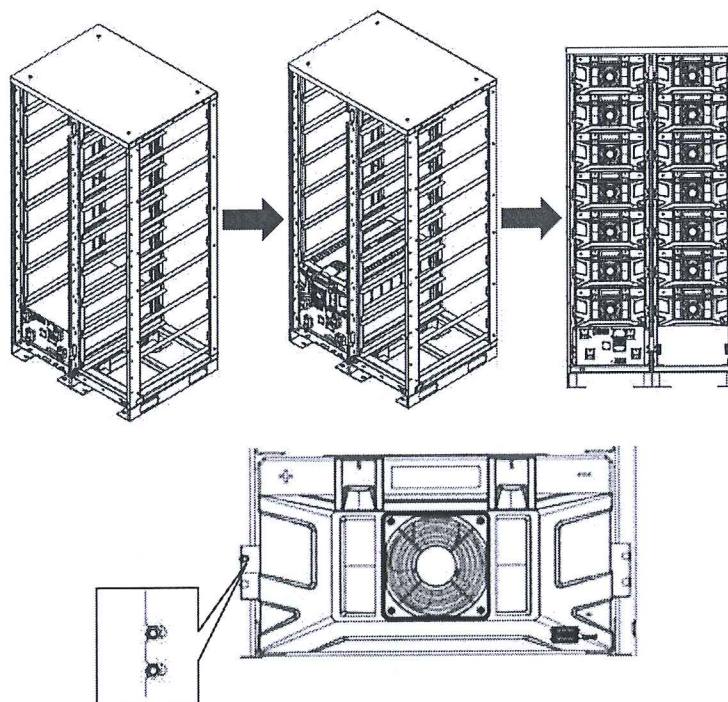


Fig. 5-4 Schematic diagram of PACK installation

Step 6 To facilitate the description of electrical wiring, different battery racks in the same battery cluster can be numbered. The beams on the left side of the battery cluster are defined as the beams 1-8 from bottom to top, and those above the battery cluster are defined as the beams A-B from left to right. Thus, the S/G is on the A1 layer; the PACK on the S/G is PACK A2, and the PACK on the right side of the S/G is PACK B1. The subsequent electrical connections are defined accordingly.

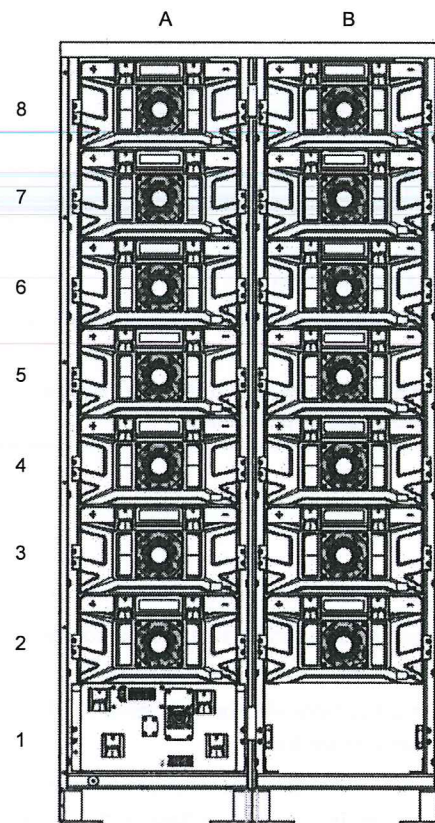


Fig. 5-5 Numbering diagram

Step 7 Inspection and confirmation. Carefully check whether the battery rack, switch gear and PACK are installed correctly, whether the bolts are completely and correctly installed, riveted and marked with the marker pen.

6 Electrical Connection



WARNING

While installing the device with hazardous voltage, follow relevant regulations and local installation safety guidelines.

Please observe the regulations on the correct use of tools and personal protective equipment.

All connections must be carried out with distinctive guidance. Any guess and ambiguous attempts must be prohibited.

6.1 Precautions

- Connecting cables should meet the voltage and current requirements.
- All connectors must be safe and reliable to avoid loosening or virtual contact. They must be corrosion-resistant, wear-resistant and shock-proof.
- All connections must comply with the requirements of relevant national standards to prevent arc discharge in any form.
- The connections of internal batteries must be equipped with anti-vibration and anti-loosening devices. Temperature, voltage and current sensors must be connected safely and reliably, to prevent loosening, ageing and extrusion. All sensor cables must be free of metal exposure.
- Any type of short circuit should be prevented in the connection process.
- Operators must use this product with personal protective equipment.
- All connections must be carried out with distinctive guidance. Any guess and ambiguous attempts must be prohibited.
- Key connections must be correct, reliable (without loosening) and in good contact, without short-circuits.
- All the finished connections must be measured and confirmed one by one.
- All connections must not be in contact with the casing or other components or short-circuited.
- If there are other uncertain factors, please consult SUNGROW's after-sales technicians before any operation.

6.2 Cable Connection

6.2.1 M2L-R200A-280-U-M Battery Cluster

Taking the M2L-R200A-280-U-M battery cluster as an example, the recommended electrical connection is as follows.

In order to clearly illustrate the wiring, the PACK graphic is simplified, and only the terminals to

be connected are retained. This diagram is for reference only.

Step 1 Count the components. Before the electrical connection, remove all debris on the site and count the electrical components. The battery cluster list is as follows.

Table 6-1 Battery cluster list

No.	Name	Quantity	Description
1	Series copper busbar 1	12	PACK connection Material: T2 copper + CELANESE PA66+GF; Color: Black; Cross-sectional area: 100mm ²
2	Series copper busbar 2	1	Connect one end to the fuse side of RACK and the other end to PACK
3	Series copper busbar 3	1	Connect one end opposite to the fuse side of RACK and the other end to PACK
4	Series copper busbar 4	1	Connect one end to the B+ terminal of S/G and the other end to the positive electrode of PACK A2
5	Fuse	1	RACK fuse protection
6	Negative power cable	1	Connect one end of the B- terminal of S/G and the other end to the negative electrode of PACK B2
7	Protective cover 1	1	External protection of fuse
8	Protective cover 2	1	External protection of fuse
9	Assembly bolt M8x16	34	-
10	Disc spring washer M8	34	-
11	Hex bolt M8x25	1	-
12	Hex bolt M10x25	1	-
13	Hex nut M8	1	-
14	Hex nut M10	1	-
15	Disc spring washer M10	2	-
16	PACK communication cable 1	12	Short vertical connecting cable between PACKs
17	SG-PACK short communication cable 1	1	S/G COMMA_1 port to PACK A2 COMM input side
18	SG-PACK long communication cable 1	1	S/G COMMA_2 port to PACK A8 COMM output side
19	SG-PACK short communication cable 2	1	S/G COMMB_1 port to PACK B2 COMM input side
20	SG-PACK long communication cable 2	1	S/G COMMB_2 port to PACK B8 COMM output side
21	Short communication cable	1	S/G COMMC_1 port to S/G COMMC_2

Table 6-2 Cable specifications

Name	Material	Color	Cross-sectional area
Series copper busbar 1/2/3/4	T2 copper + CELANESE PA66+GF	Black	100mm ²

Name	Material	Color	Cross-sectional area
Negative power cable	SOFT-PVC	Black	4/0AWG (107.22mm ²)

Step 2 Assemble the fuse busbar. Pre-tighten the copper busbar of the fuse with M8 and M10 bolts, as shown in Fig. A. Then fix the tightened bolts via the fixing tool. (Recommended torque: $16\pm1\text{N}\cdot\text{m}$ for M8 bolts and $26\pm1\text{N}\cdot\text{m}$ for M10 bolts)

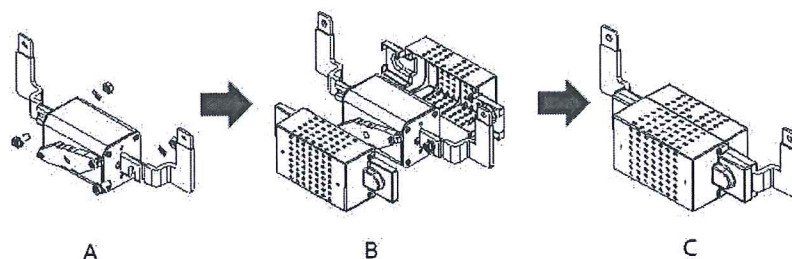


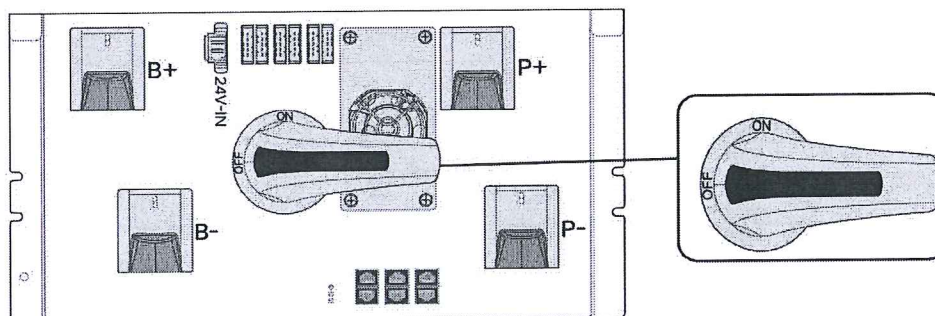
Fig. 6-1 Fuse busbar assembly

Step 3 Confirm the S/G status (optional).

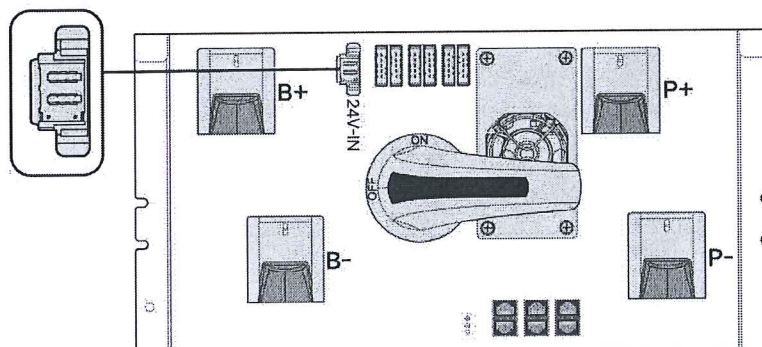


It is suitable for the "-M" model.

1. Before connecting the battery system, make sure that the S/G disconnecter is OFF.



2. Before connecting the battery system, make sure that the connector on the 24V_IN power input side of the S/G has been removed. That is, there is no 24V power input.



Step 4 Remove and install the protective covers of two electrodes of the PACK and S/G.

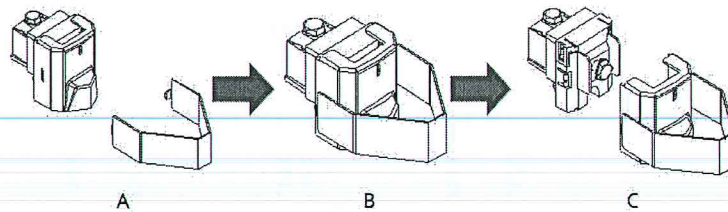


Fig. 6-2 Removal of protective covers from two electrodes of PACK and S/G

Installation of the protective covers: Press the protective covers on both sides until a click sound is heard. Confirm that the protective covers are properly installed. The removal and installation of protective covers in subsequent operations should be performed similarly.

Step 5 Connect the main circuit.

1. Install the copper busbar assembly of the fuse.
 - a) Remove the protective covers of the negative electrode of PACK A8 and positive electrode of PACK B8.
 - b) Pre-tighten the series copper busbar 2 with the negative electrode of PACK A8 via the M8 bolt, and the series copper busbar 3 with the positive electrode of PACK B8 via the M8 bolt.
2. Install the series copper busbar 1 between PACKs.
 - a) Remove the remaining protective covers of PACK.
 - b) Pre-tighten the series copper busbar 1 between two vertical adjacent layers of PACK with M8 bolts from top to bottom.
 - c) Check whether the copper busbars are connected correctly. Pay attention to the connection direction of copper busbars in the lines A and B of the RACK system.
3. Connect the negative power cable.
 - a) Remove the protective cover of the B- terminal of S/G.
 - b) Pre-tighten the negative power cable with the M8 bolt. First, connect the B- terminal of S/G and the negative cathode of PACK B2.
 - c) Fix the negative power cable on the battery rack via the cable tie. Make sure that the cable is tied neatly.
4. Connect the series copper busbar 4.
 - a) Remove the protective cover of the B+ terminal of S/G.
 - b) Pre-tighten the series copper busbar 4 with the M8 bolt, and connect the positive electrode of PACK A2 and B+ terminal of S/G.
5. Check the line and fix the fastener.
 - a) Check and confirm that the aforesaid copper busbars and cables have been installed correctly.
 - b) Fix the M8 bolts with the fixing tool (recommended torque: $16 \pm 1 \text{ N} \cdot \text{m}$), and make marks at the fixed bolts via the marker pen.
 - c) Check the torque of the fixed M8 bolts, and make secondary riveting marks via the marker pen of different color.
 - d) Install the protective covers of the positive and negative electrodes of PACK and S/G.

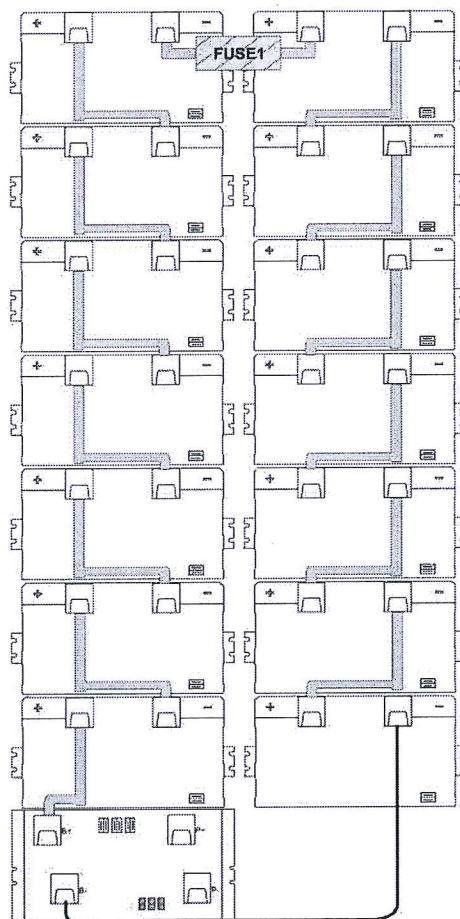


Fig. 6-3 Schematic diagram of main circuit connection

Step 6 Connect the communication circuit.

1. Connect 12 communication cables of PACKs in order from bottom to top.
2. Connect four SG-PACK long communication cables and one short communication cable in sequence, as shown in the table below.

No.	Definition	Corresponding port
1	COMM A_1	PACK A2 COMM input side
2	COMM A_2	PACK A8 COMM output side
3	COMM B_1	PACK B2 COMM input side
4	COMM B_2	PACK B8 COMM output side
5	COMM C_1	COMM C_1 port connection to COMM C_2
6	COMM C_2	

3. After connecting the communication cables, carry out the communication test, and read the battery voltage, temperature and other data. Make sure that all communication cables are connected correctly.

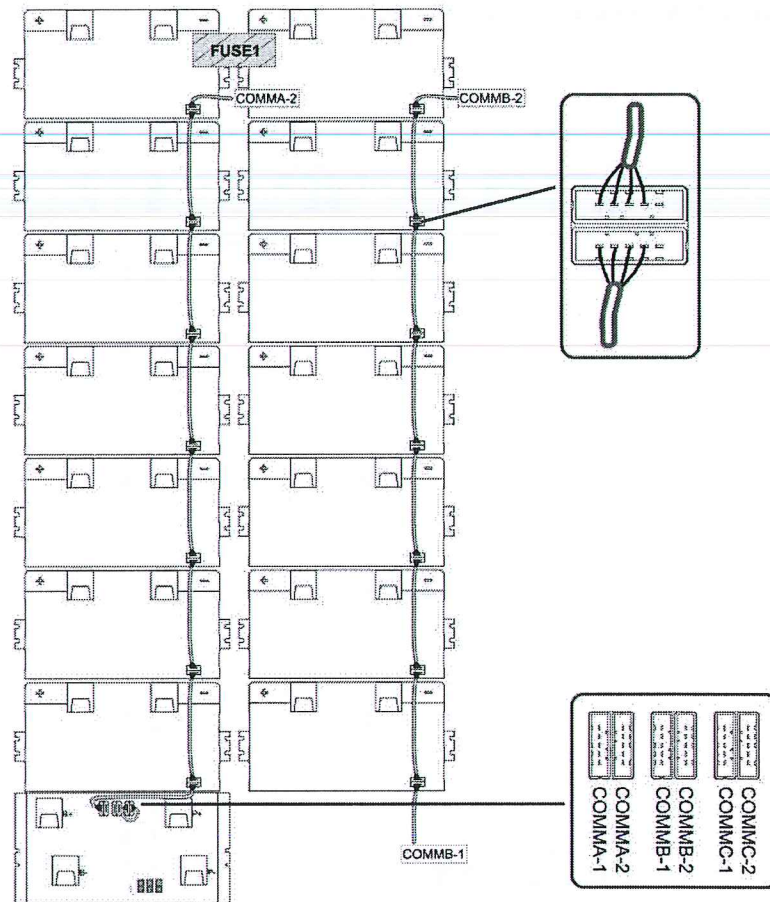
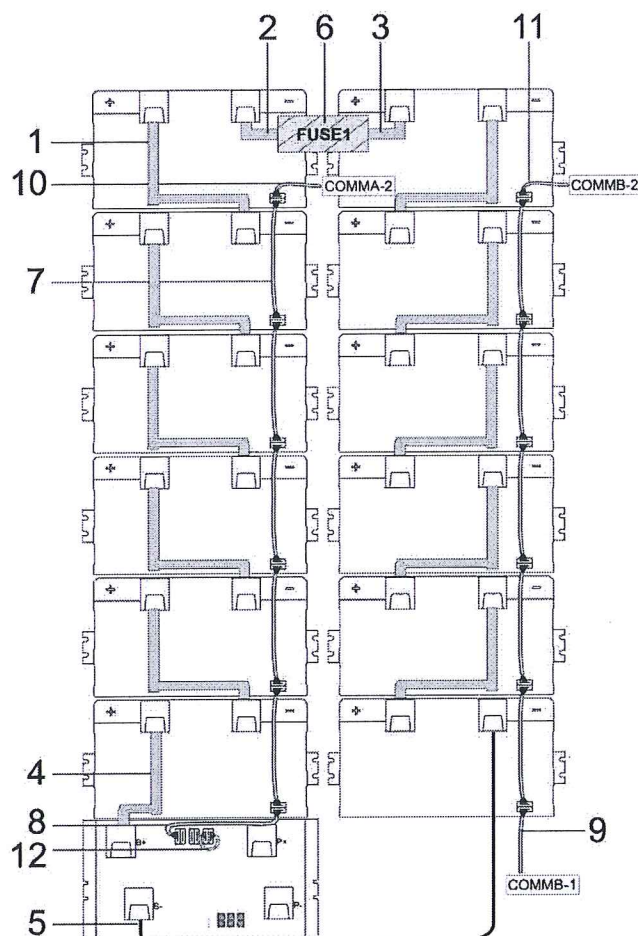


Fig. 6-4 Communication cable connection and partial enlarged view

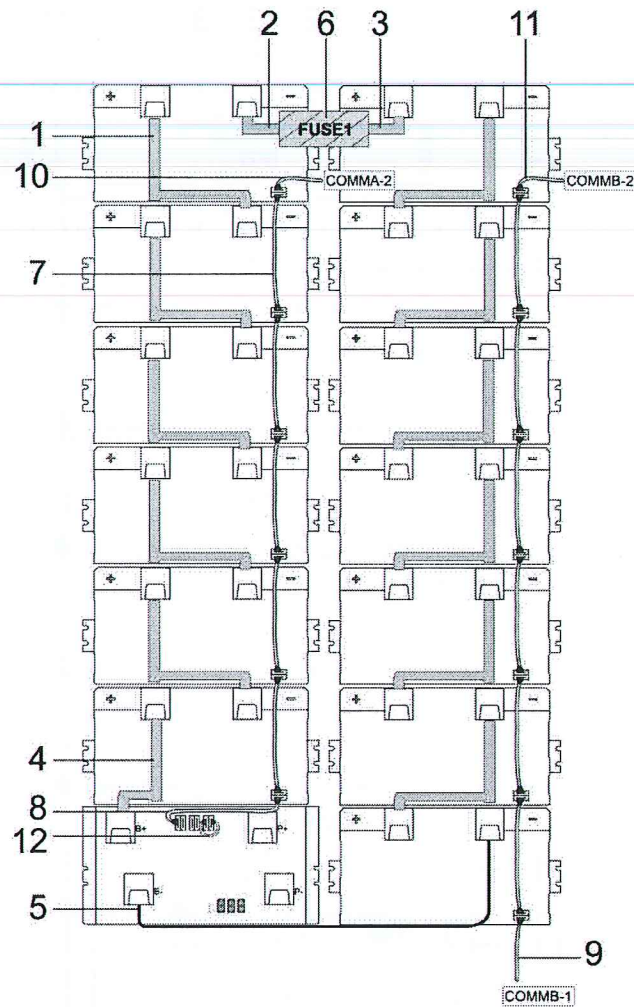
Step 7 Check and confirm that all wiring harnesses and connection terminals of the battery cluster are connected tightly and reliably. Check whether the data uploaded by the system via the upper computer software are correct, such as the cell voltage, total voltage, temperature, and insulation resistance. The battery cluster must not be powered on until all check items are conforming.

6.2.2 Cable Connection Diagram

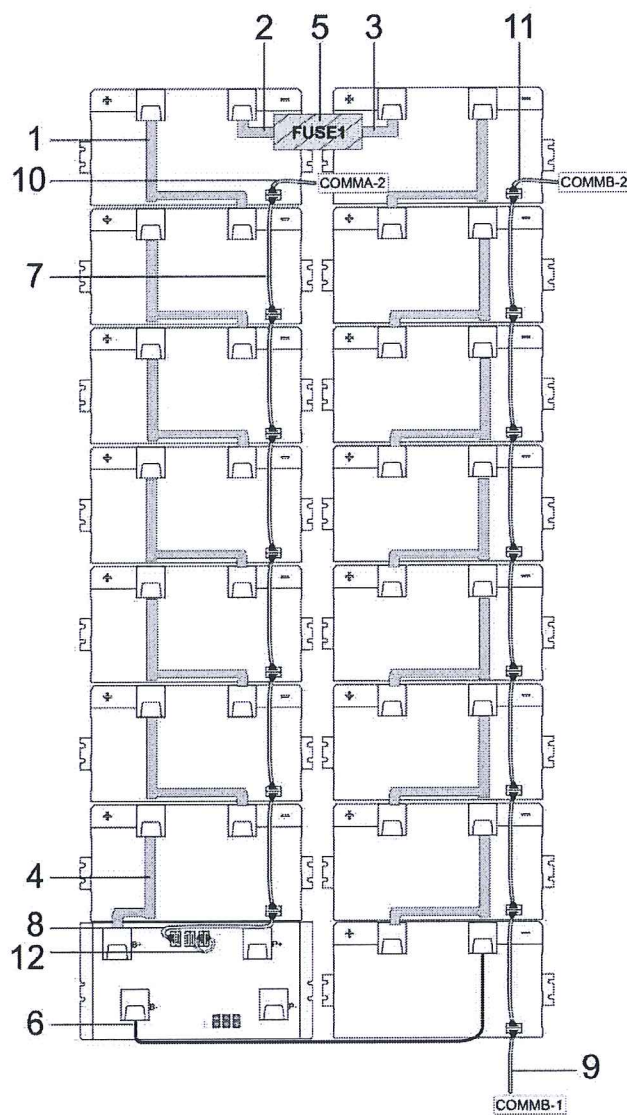
Refer to "6.2.1 M2L-R200A-280-U-M Battery Cluster" for cable connections of other battery clusters.

M2L-R172A-280-U/E(-M) cable connection diagram

No.	Name	Quantity
1	Series copper busbar 1	10
2	Series copper busbar 2	1
3	Series copper busbar 3	1
4	Series copper busbar 4	1
5	Negative power cable	1
6	Fuse	1
7	PACK communication cable 1	10
8	SG-PACK short communication cable 1	1
9	SG-PACK short communication cable 2	1
10	SG-PACK long communication cable 1	1
11	SG-PACK long communication cable 2	1
12	Short communication cable	1

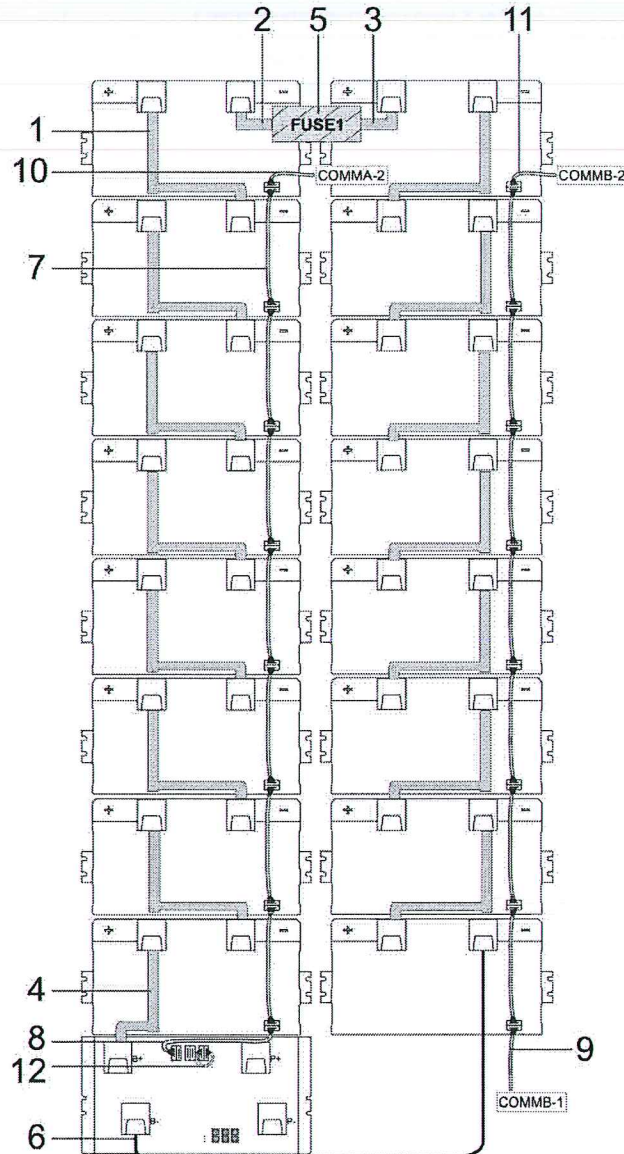
M2L-R186A-280-U/E(-M) cable connection diagram

No.	Name	Quantity
1	Series copper busbar 1	11
2	Series copper busbar 2	1
3	Series copper busbar 3	1
4	Series copper busbar 4	1
5	Negative power cable	1
6	Fuse	1
7	PACK communication cable 1	11
8	SG-PACK short communication cable 1	1
9	SG-PACK short communication cable 2	1
10	SG-PACK long communication cable 1	1
11	SG-PACK long communication cable 2	1
12	Short communication cable	1

M2L-R215A-280-U/E(-M) cable connection diagram

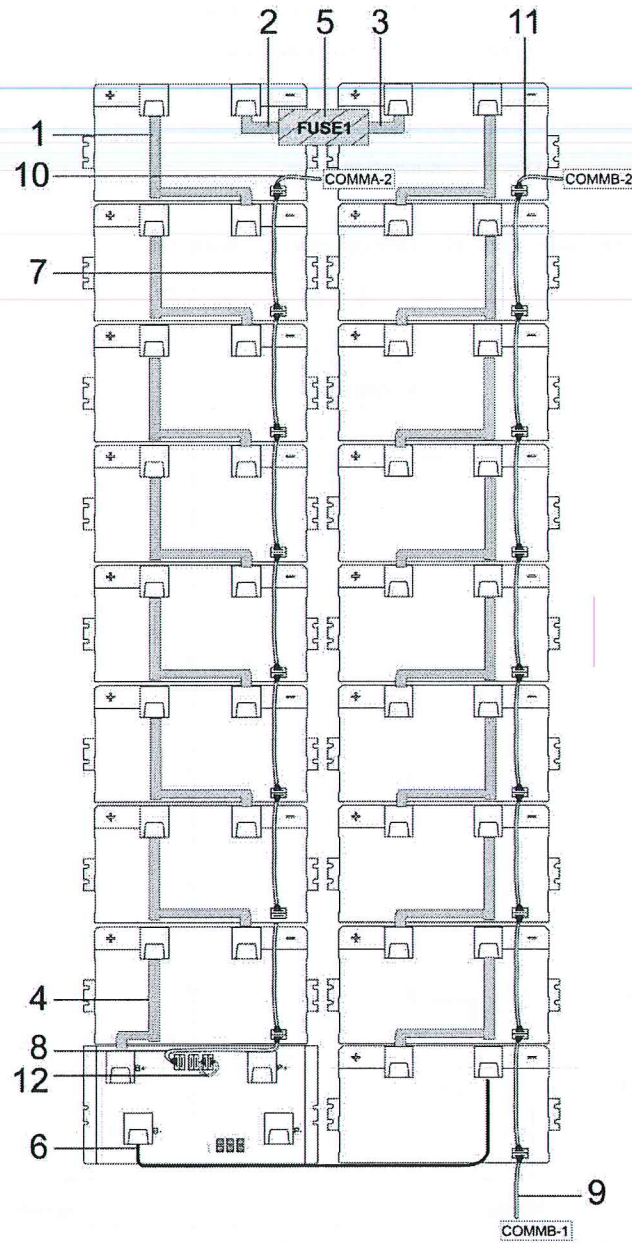
No.	Name	Quantity
1	Series copper busbar 1	13
2	Series copper busbar 2	1
3	Series copper busbar 3	1
4	Series copper busbar 4	1
5	Fuse	1
6	Negative power cable	1
7	PACK communication cable 1	13
8	SG-PACK short communication cable 1	1
9	SG-PACK short communication cable 2	1
10	SG-PACK long communication cable 1	1

No.	Name	Quantity
11	SG-PACK long communication cable 2	1
12	Short communication cable	1

M2L-R229A-280-U/E(-M) cable connection diagram

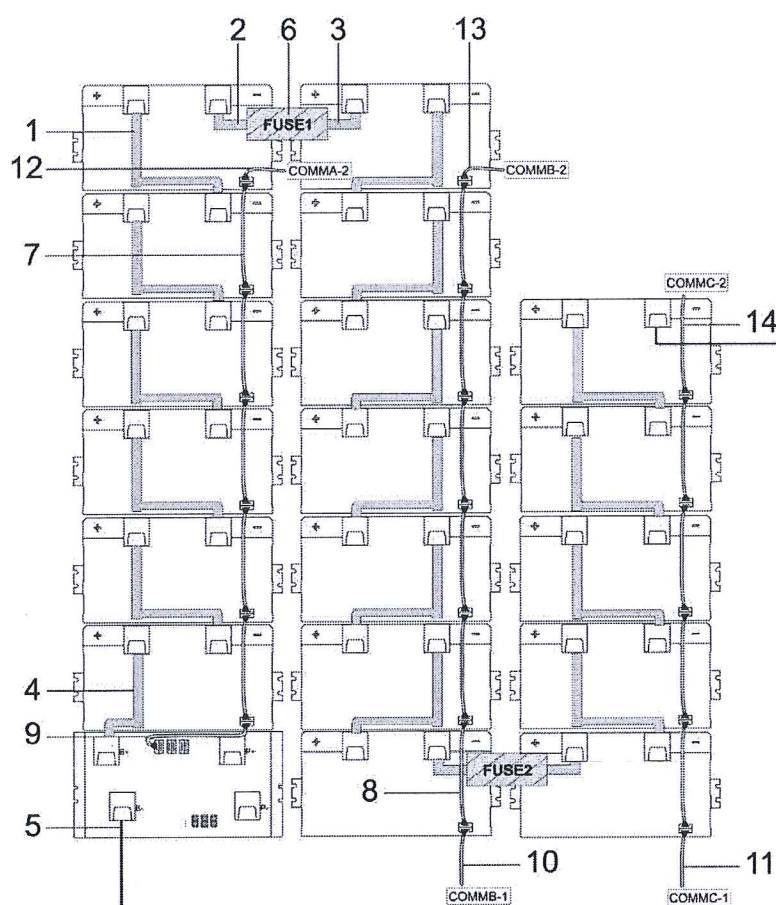
No.	Name	Quantity
1	Series copper busbar 1	14
2	Series copper busbar 2	1
3	Series copper busbar 3	1
4	Series copper busbar 4	1
5	Fuse	1

No.	Name	Quantity
6	Negative power cable	1
7	PACK communication cable 1	14
8	SG-PACK short communication cable 1	1
9	SG-PACK short communication cable 2	1
10	SG-PACK long communication cable 1	1
11	SG-PACK long communication cable 2	1
12	Short communication cable	1

M2L-R243A-280-U/E(-M) cable connection diagram

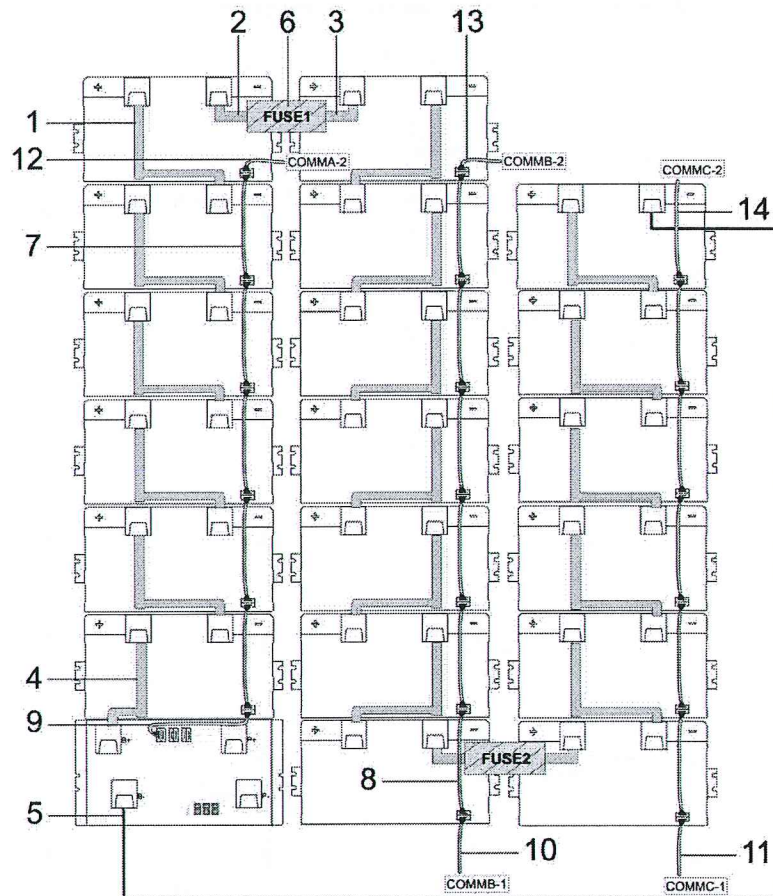
No.	Name	Quantity
1	Series copper busbar 1	15
2	Series copper busbar 2	1
3	Series copper busbar 3	1
4	Series copper busbar 4	1
5	Fuse	1
6	Negative power cable	1
7	PACK communication cable 1	15

No.	Name	Quantity
8	SG-PACK short communication cable 1	1
9	SG-PACK short communication cable 2	1
10	SG-PACK long communication cable 1	1
11	SG-PACK long communication cable 2	1
12	Short communication cable	1

M2L-R258A-280H-U/E(-M) cable connection diagram

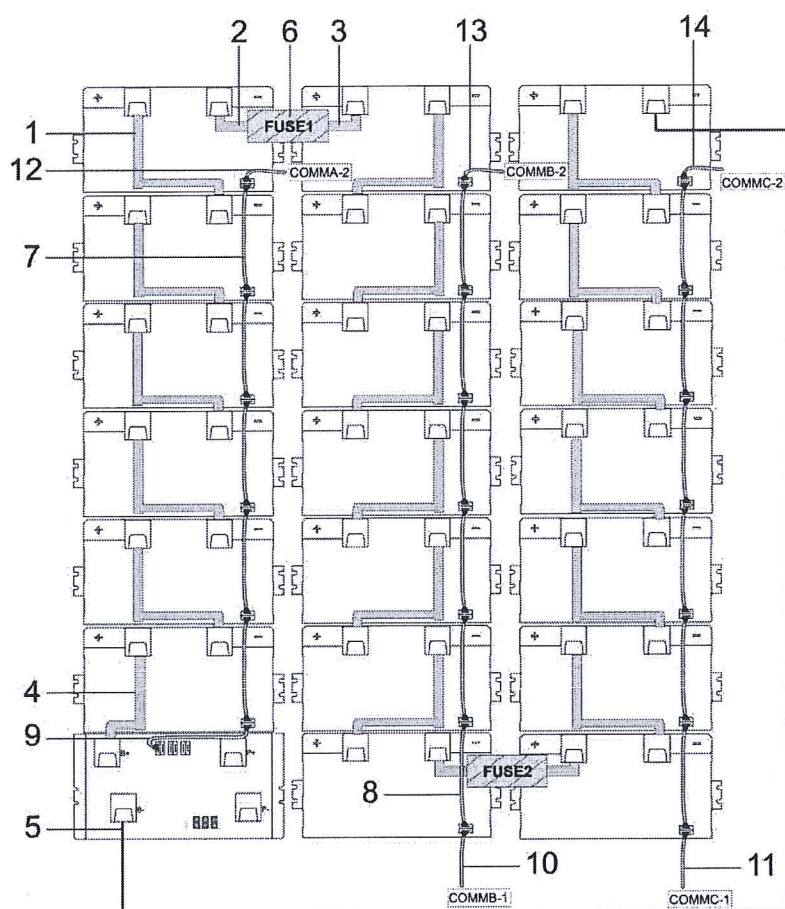
No.	Name	Quantity
1	Series copper busbar 1	15
2	Series copper busbar 2	2
3	Series copper busbar 3	2
4	Series copper busbar 4	1
5	Negative power cable	1
6	Fuse	2
7	PACK communication cable 1	14
8	PACK communication cable 2	1

No.	Name	Quantity
9	SG-PACK short communication cable 1	1
10	SG-PACK short communication cable 2	1
11	SG-PACK short communication cable 3	1
12	SG-PACK long communication cable 1	1
13	SG-PACK long communication cable 2	1
14	SG-PACK long communication cable 3	1

M2L-R272A-280H-U/E(-M) cable connection diagram

No.	Name	Quantity
1	Series copper busbar 1	16
2	Series copper busbar 2	2
3	Series copper busbar 3	2
4	Series copper busbar 4	1
5	Negative power cable	1
6	Fuse	2
7	PACK communication cable 1	15

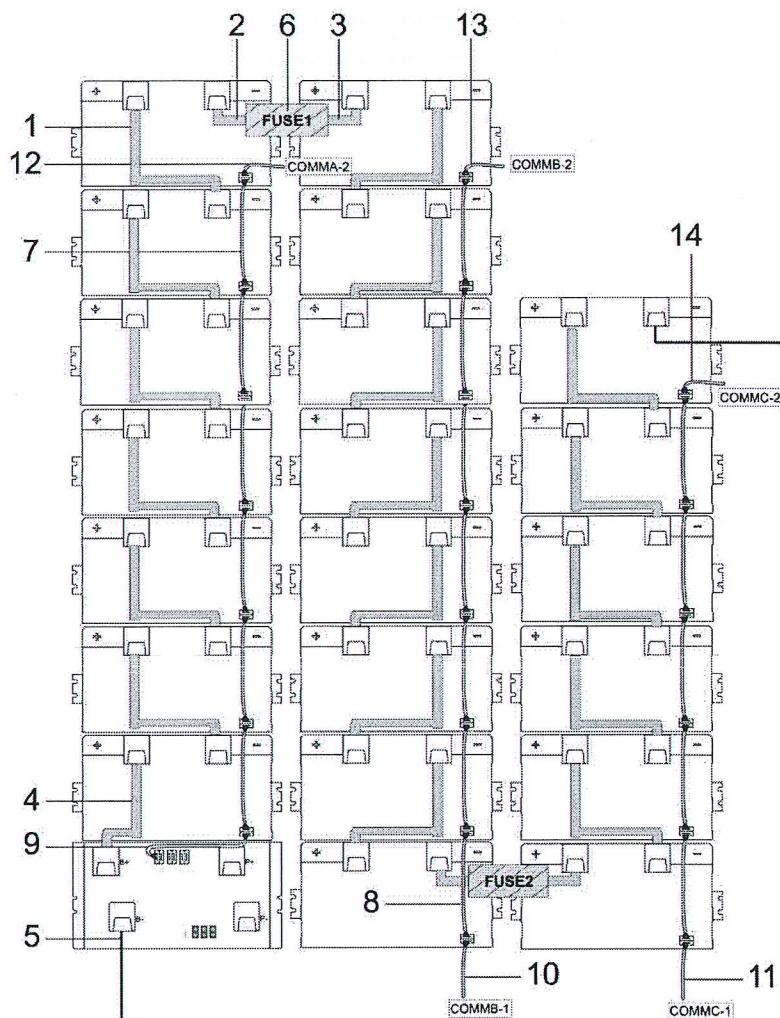
No.	Name	Quantity
8	PACK communication cable 2	1
9	SG-PACK short communication cable 1	1
10	SG-PACK short communication cable 2	1
11	SG-PACK short communication cable 3	1
12	SG-PACK long communication cable 1	1
13	SG-PACK long communication cable 2	1
14	SG-PACK long communication cable 3	1

M2L-R286A-280H-U/E(-M) cable connection diagram

No.	Name	Quantity
1	Series copper busbar 1	17
2	Series copper busbar 2	2
3	Series copper busbar 3	2
4	Series copper busbar 4	1
5	Negative power cable	1
6	Fuse	2

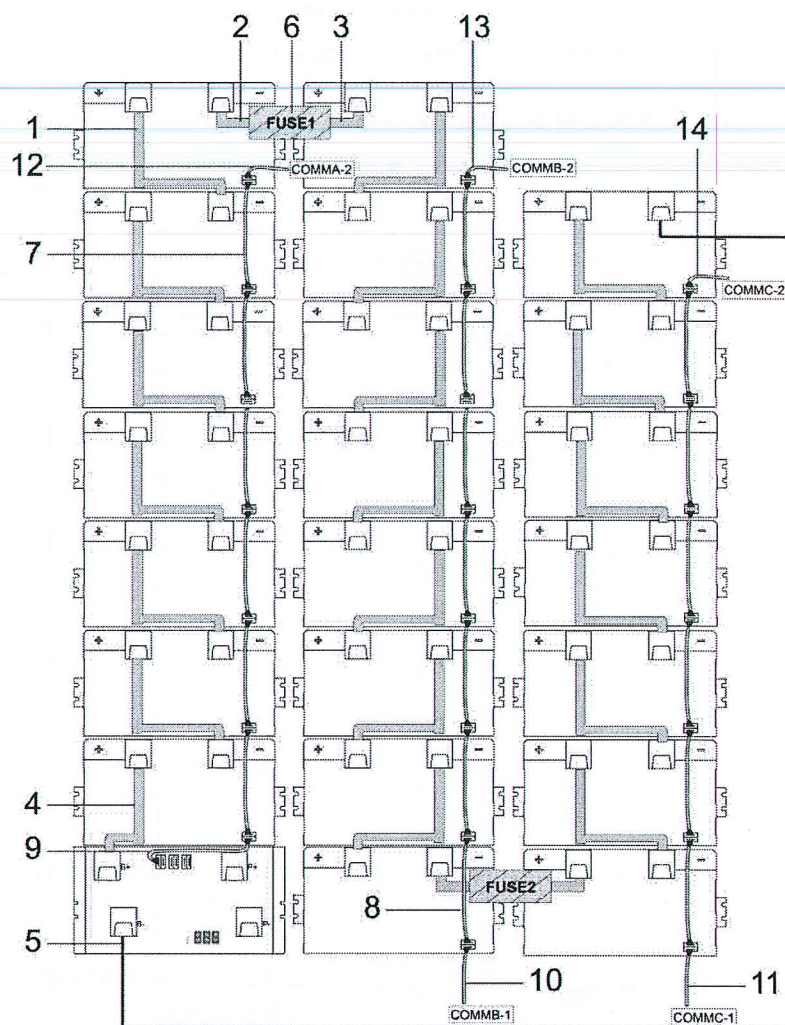
No.	Name	Quantity
7	PACK communication cable 1	16
8	PACK communication cable 2	1
9	SG-PACK short communication cable 1	1
10	SG-PACK short communication cable 2	1
11	SG-PACK short communication cable 3	1
12	SG-PACK long communication cable 1	1
13	SG-PACK long communication cable 2	1
14	SG-PACK long communication cable 3	1

M2L-R301A-280H-U/E(-M) cable connection diagram



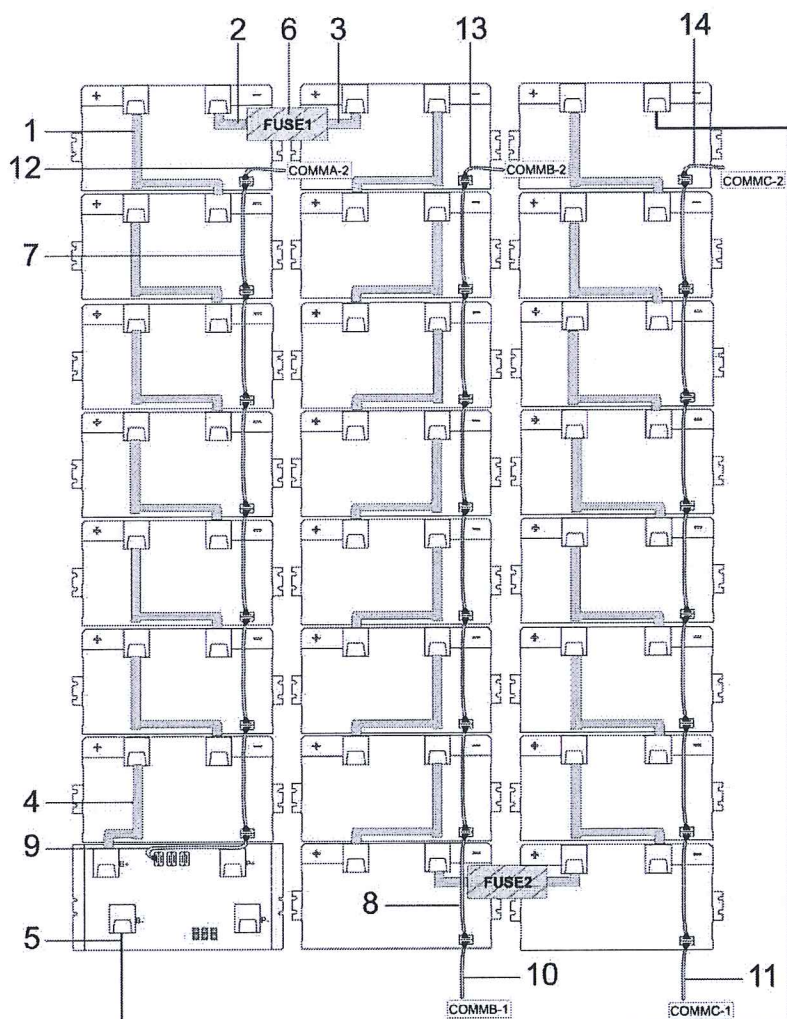
No.	Name	Quantity
1	Series copper busbar 1	18
2	Series copper busbar 2	2

No.	Name	Quantity
3	Series copper busbar 3	2
4	Series copper busbar 4	1
5	Negative power cable	1
6	Fuse	2
7	PACK communication cable 1	17
8	PACK communication cable 2	1
9	SG-PACK short communication cable 1	1
10	SG-PACK short communication cable 2	1
11	SG-PACK short communication cable 3	1
12	SG-PACK long communication cable 1	1
13	SG-PACK long communication cable 2	1
14	SG-PACK long communication cable 3	1

M2L-R315A-280H-U/E(-M) cable connection diagram

No.	Name	Quantity
1	Series copper busbar 1	19
2	Series copper busbar 2	2
3	Series copper busbar 3	2
4	Series copper busbar 4	1
5	Negative power cable	1
6	Fuse	2
7	PACK communication cable 1	18
8	PACK communication cable 2	1
9	SG-PACK short communication cable 1	1
10	SG-PACK short communication cable 2	1
11	SG-PACK short communication cable 3	1
12	SG-PACK long communication cable 1	1

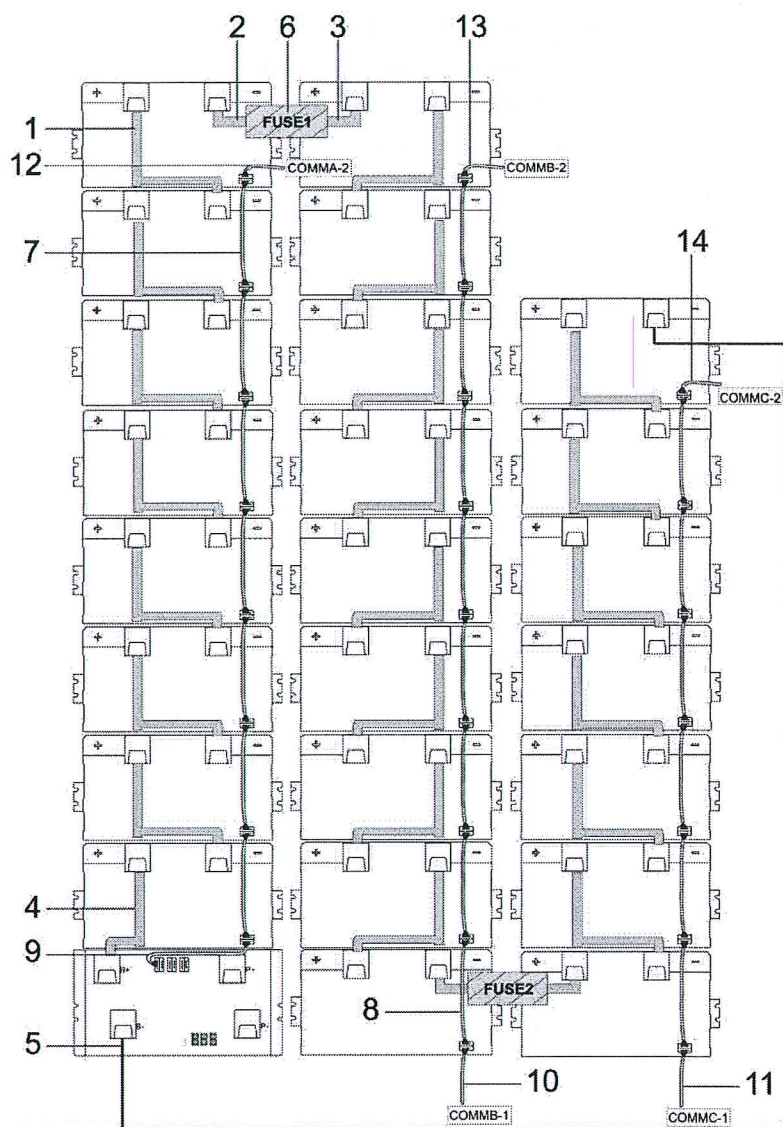
No.	Name	Quantity
13	SG-PACK long communication cable 2	1
14	SG-PACK long communication cable 3	1

M2L-R329A-280H-U/E(-M) cable connection diagram

No.	Name	Quantity
1	Series copper busbar 1	20
2	Series copper busbar 2	2
3	Series copper busbar 3	2
4	Series copper busbar 4	1
5	Negative power cable	1
6	Fuse	2
7	PACK communication cable 1	19
8	PACK communication cable 2	1

No.	Name	Quantity
9	SG-PACK short communication cable 1	1
10	SG-PACK short communication cable 2	1
11	SG-PACK short communication cable 3	1
12	SG-PACK long communication cable 1	1
13	SG-PACK long communication cable 2	1
14	SG-PACK long communication cable 3	1

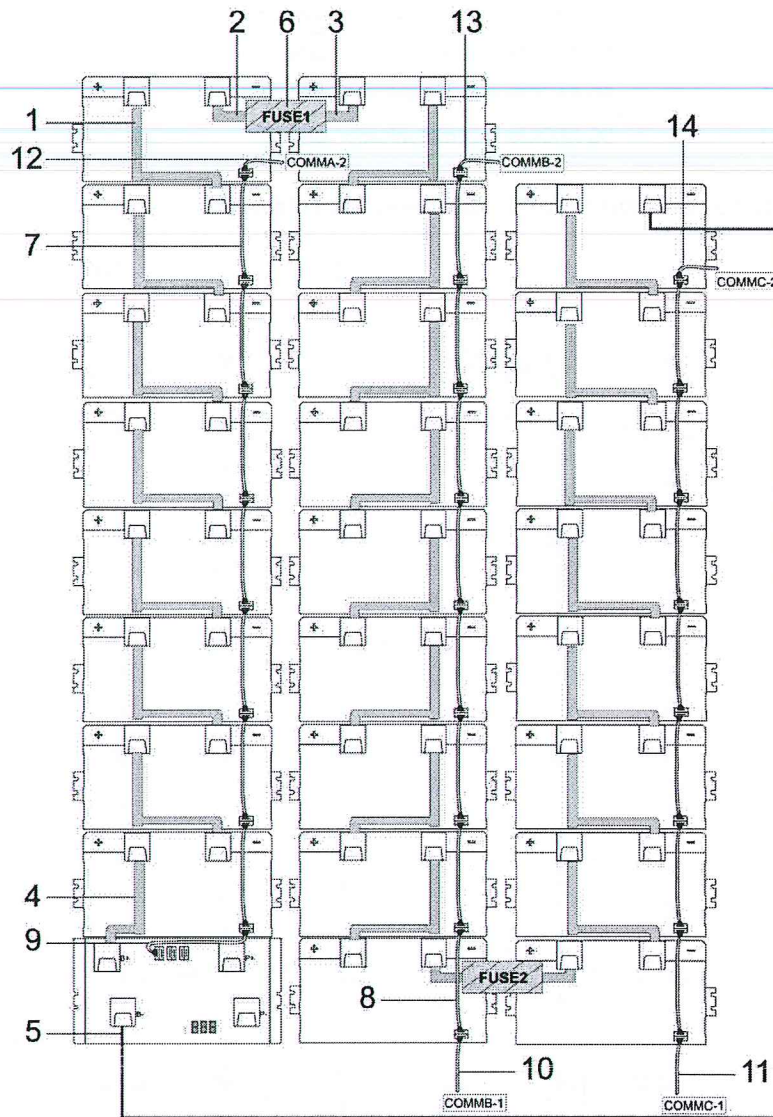
M2L-R344A-280H-U/E(-M) cable connection diagram



No.	Name	Quantity
1	Series copper busbar 1	21

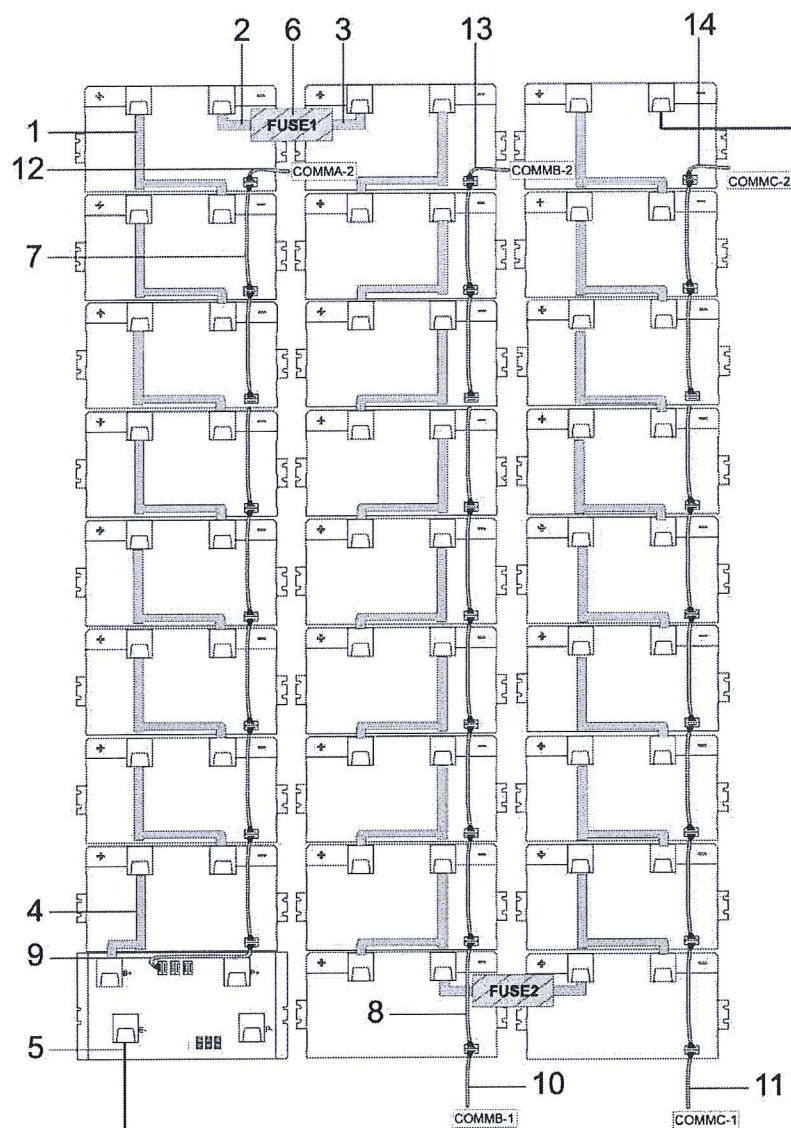
No.	Name	Quantity
2	Series copper busbar 2	2
3	Series copper busbar 3	2
4	Series copper busbar 4	1
5	Negative power cable	1
6	Fuse	2
7	PACK communication cable 1	20
8	PACK communication cable 2	1
9	SG-PACK short communication cable 1	1
10	SG-PACK short communication cable 2	1
11	SG-PACK short communication cable 3	1
12	SG-PACK long communication cable 1	1
13	SG-PACK long communication cable 2	1
14	SG-PACK long communication cable 3	1

M2L-R358A-280H-U/E(-M) cable connection diagram



No.	Name	Quantity
1	Series copper busbar 1	22
2	Series copper busbar 2	2
3	Series copper busbar 3	2
4	Series copper busbar 4	1
5	Negative power cable	1
6	Fuse	2
7	PACK communication cable 1	21
8	PACK communication cable 2	1
9	SG-PACK short communication cable 1	1
10	SG-PACK short communication cable 2	1

No.	Name	Quantity
11	SG-PACK short communication cable 3	1
12	SG-PACK long communication cable 1	1
13	SG-PACK long communication cable 2	1
14	SG-PACK long communication cable 3	1

M2L-R372A-280H-U/E(-M) cable connection diagram

No.	Name	Quantity
1	Series copper busbar 1	23
2	Series copper busbar 2	2
3	Series copper busbar 3	2

No.	Name	Quantity
4	Series copper busbar 4	1
5	Negative power cable	1
6	Fuse	2
7	PACK communication cable 1	22
8	PACK communication cable 2	1
9	SG-PACK short communication cable 1	1
10	SG-PACK short communication cable 2	1
11	SG-PACK short communication cable 3	1
12	SG-PACK long communication cable 1	1
13	SG-PACK long communication cable 2	1
14	SG-PACK long communication cable 3	1

7 Test Run

7.1 Inspection of Operating Environment

7.1.1 Principle of Switch Gear Debugging Interface

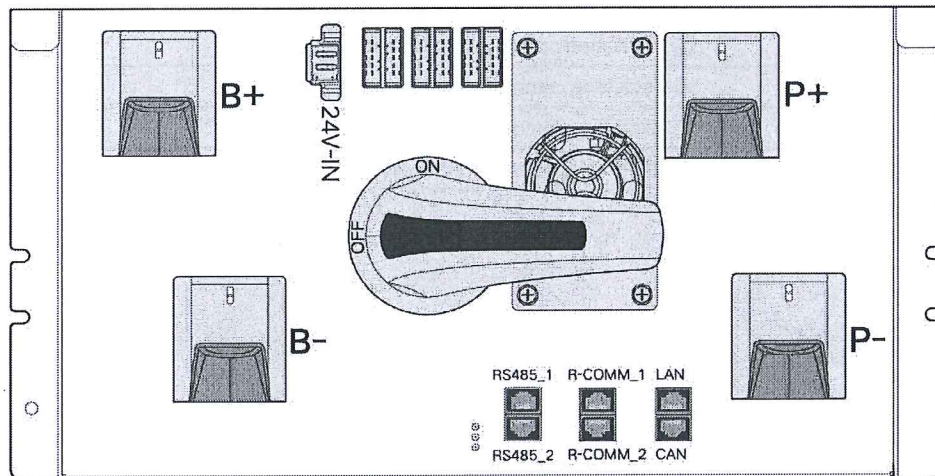


Fig. 7-1 Switch gear panel

The pin definitions and functions of the RJ45 port of the switch gear are as follows:

"R_COMM_1" and "R_COMM_2" are CAN bus ports for external communication.

"RS485_1" and "RS485_2" ports are the IAP upgrade port and production debugging port, respectively.

"LAN" and "CAN" are reserved ports.

7.1.2 Inspection of Communication Harness

Mainly check the reliability of communication between the switch gear and battery module.

- Check whether the daisy chain communication harness between BMUs is loose or missing.
- Check the fastening bolts of the connecting busbars of BMUs for missing, loosening and fixing failure.
- Check whether the fan harness on the front panel of the BMU is connected reliably.
- Check whether the external communication busbar is connected correctly and reliably.

7.1.3 Inspection of Power Harness

- Check whether the power cables (P+, P-, B+, B-) are connected correctly and reliably.
- Check whether the positive and negative electrodes of the auxiliary power supply for the switch gear and fan are consistent with the silk screen and connected securely and reliably. It is recommended to install an overcurrent protection device (e.g. DC miniature circuit breaker, with the protection current equivalent to 1.2 times the control circuit current) in the

power supply circuit of the auxiliary power supply, to ensure the safe operation of the system.

7.2 Check of Operating Parameters of Battery Cluster Unit

- Port connection: Connect the CAN analyzer to the CAN bus port of the switch gear.
- Parameter setting: baud rate 500Kbps.
- Software connection: Select "RACK ID" and click "Start CAN".

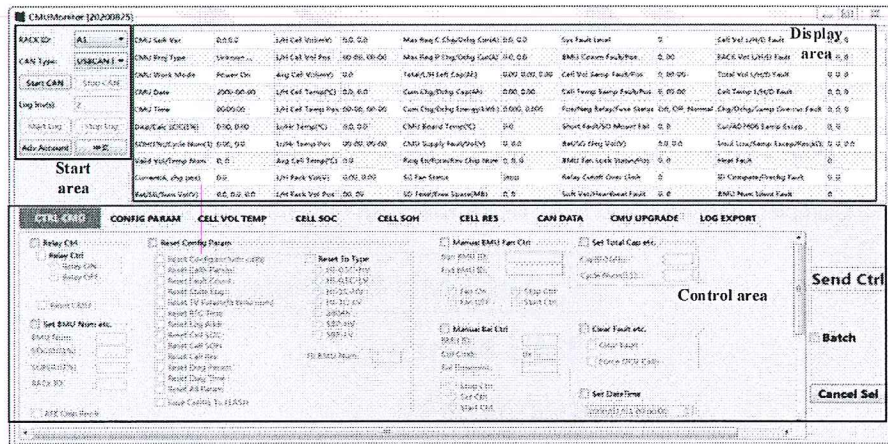


Fig. 7-2 Upper computer interface

The upper computer displays the general information of the battery cluster, such as the voltage and temperature of all cells, ambient temperature, total voltage, charge and discharge current, fault information, configuration parameters, CMU upgrade, CMU log export, etc.

7.3 System Parameter Setting

For the maintenance of the battery cluster, use the upper computer software "CMUMonitor". The user can log in the advanced account to obtain advanced permissions and set RACK parameters.

7.3.1 Setting of the Number of BMUs

Example: Set the default number of BMUs to 26.

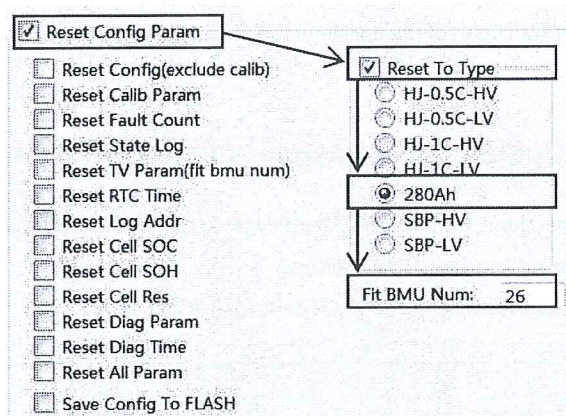


Fig. 7-3 Quick connection parameters of system

7.3.2 RACK ID Setting

Example: Change RACK ID to A1, i.e. RACK ID = 0xA1 + 0.

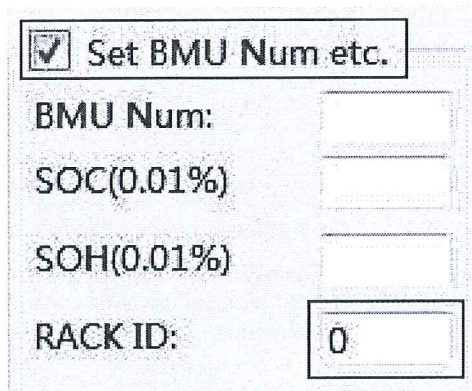


Fig. 7-4 RACK ID setting

7.3.3 Insulation Parameter Setting

Set "Detect ON", "Detect OFF", "Force Once", etc.

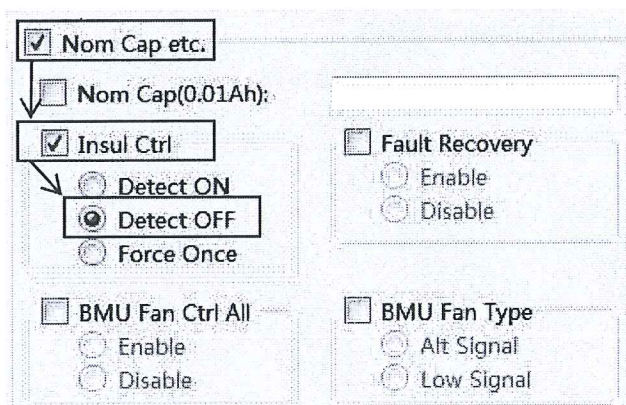


Fig. 7-5 Insulation parameter setting

7.3.4 CMU Restart



Fig. 7-6 Software restart

7.3.5 Configuration Parameters

Configure the data by "Read Param", "Set Param" and "Clear Disp". The system supports the parameter import and export in the form of files.

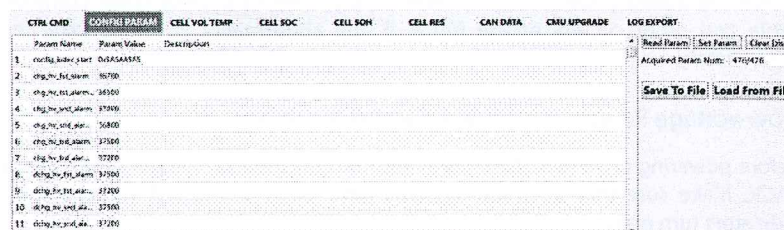


Fig. 7-7 Parameter configuration

7.3.6 Software Upgrade

Add the CMU software to be upgraded by clicking "Add File" (format: *.SGU). Click "Batch Upgrade" for upgrading in batches. The upgrade time of each CMU is approximately 1min.

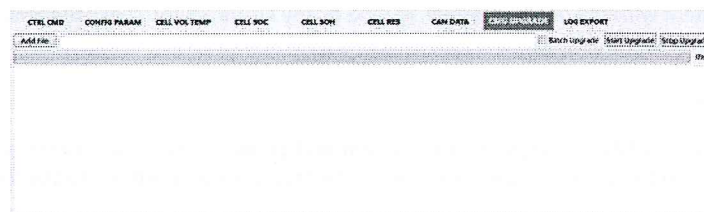


Fig. 7-8 CMU upgrade

7.3.7 Log Data Export

The log data to be exported includes: logs, faults, events, fault records, and all files (reserved).

Set the start and end time of data export, and click "Start" to export the data.

The fault data is shown in the right window. Click "Clear Disp" to clear the data.

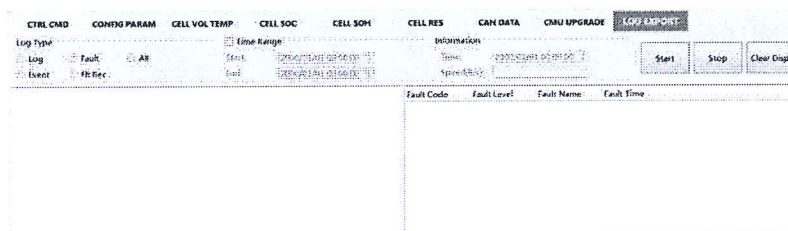


Fig. 7-9 Log export

7.4 Suggestions on Parallel Test Run and Debugging of RACK System

7.4.1 Preparation for Power-on of RACK System

If the insulation detection function is enabled by default in the RACK configuration, the RACK will be subject to insulation detection. This may mutually interfere with the insulation detection of external devices (e.g. PCS). To avoid mutual interference, it is recommended to disable the insulation detection of the RACK.

Check the auxiliary low-voltage power supply, CAN bus, daisy chain communication, power cable and other circuits of the RACK. If any abnormality is found, take corrective actions immediately.

7.4.2 Low-voltage Power-on of RACK Parallel System

Before powering on, check the system and turn off the low-voltage power supply switch of the RACK. Make sure that all RACK systems have been self-tested without failure and that all indicators turn green.

7.4.3 Power-on and Power-off of High-voltage Circuit

After the RACK is powered on at low voltage, and all RACKs in the energy storage system have been self-tested successfully, the SMU can control the DC contactors of all RACKs in the system, such as power-on and power-off. Then check whether the number of RACKs in the system is consistent with the online number. In case of any abnormality, check the SMU parameter setting errors, system faults, etc.

7.4.4 Test Run

The parallel RACK energy storage system and power conversion system are mainly used for energy exchange on the grid side during the test run. Pay attention to the following during the test run.

Capacity calibration: Make sure of the complete and normal charge and discharge cycle of batteries. By default, the rated capacity is corrected in the first ten test runs during the initial operation of the system. Insufficient charging and discharging should be avoided during the test run and joint debugging.

It is recommended to calibrate the capacity once during the test run. The charge and discharge depth DOD should be 100%. This product should be tested based on its rated power. The default process consists of "full discharge + standing (2h) + full charge", as detailed below.

- Discharge: Test the discharge of RACK, until it is discharged to SOC=0%.
- Standing: Keep the product standing for more than 2h (for SOC correction) without the charge and discharge current but no requirements for the auxiliary power supply of the switch gear.

- Charge: After the standing time is up, test this product by charging to SOC=100%.

Depending on the site conditions, the capacity calibration process can be adjusted to "full charge + standing (2h) + full discharge". The energy storage battery should be charged in time if not used in a long term.

Operational stability: The busbar, communication, acquisition and other components should be operated at the rated power under appropriate conditions during debugging, to identify abnormalities at each phase of system installation. In particular, abnormalities (e.g. over-temperature, over-current, overvoltage and over-discharge) should be handled in time to avoid safety hazards.

8 Troubleshooting and Maintenance

8.1 Troubleshooting

No.	Fault name	Common cause	Solution
1	Charge over-temperature Discharge over-temperature	<ul style="list-style-type: none"> Damaged fan of BMU; Loosening of PACK; Fault of the cable of temperature sensor; Abnormality of the air-conditioning system of the container. 	<ul style="list-style-type: none"> Replace the fan of the BMU; Check the bolt connection of the power cable; Repair the cable of the temperature sensor; Optimize the temperature setting of the air-conditioning system in the container.
2	Low temperature in charging Low temperature in discharging	<ul style="list-style-type: none"> Abnormality of the air-conditioning system of the container; Fault of the cable of temperature sensor. 	<ul style="list-style-type: none"> Optimize the temperature setting of the air-conditioning system in the container; Repair the cable of the temperature sensor.
3	Temperature difference in charging Temperature difference in discharging	Abnormality of the air-conditioning system of the container	Optimize the temperature setting of the air-conditioning system in the container.
4	Cell overvoltage in charging Cell overvoltage in discharging Cell undervoltage in charging Cell undervoltage in discharging	<ul style="list-style-type: none"> Cell abnormality; Failure of the power conversion system to receive BMS request or abnormality in communication; Abnormality of the voltage collection cable. 	<ul style="list-style-type: none"> Analyze charge and discharge data and replace PACK; Check the power response reliability of the communication busbar and power conversion system; Repair the voltage collection cable.
5	Total overvoltage in charging Total overvoltage in discharging	Failure of the output power of converter in timely response to BMS request	View the converter operation log and BMS communication message. Check the output response logic of the converter for abnormality and perform overhaul.
6	Total undervoltage in charging Total undervoltage in discharging	<ul style="list-style-type: none"> Unreliable connection of the power cable; Failure of the high-voltage acquisition circuit of CMU motherboard. 	<ul style="list-style-type: none"> Connect the power cable correctly; Replace the CMU motherboard.
7	Charging voltage difference Discharging voltage difference	<ul style="list-style-type: none"> Long-term temperature unevenness of the cell due to abnormality of the air-conditioning system in the container; Cell abnormality. 	<ul style="list-style-type: none"> Optimize the control strategy of the air-conditioning system; Replace the defective PACK or recharge the cell in the abnormal status.

No.	Fault name	Common cause	Solution
8	Discharging overcurrent Charging overcurrent	Failure of the power conversion system in response to BMS request	View the converter operation log and BMS communication message. Check the output response logic of the converter for abnormality.
9	Insulation failure	<ul style="list-style-type: none"> • Mutual influence of insulation modules in the parallel system; • Safety hazards of insulation. 	<ul style="list-style-type: none"> • Reserve one insulation module in the parallel system to eliminate interference; • Resolve the insulation hazards and avoid safety accidents.
10	Abnormal communication	<ul style="list-style-type: none"> • Abnormality of the daisy chain communication cable; • Communication failure of the BMU board. 	<ul style="list-style-type: none"> • Replace the communication harness; • Replace the CMU board.
11	Abnormal voltage collection	<ul style="list-style-type: none"> • Disconnection of the voltage collection line of BMU; • Loosening of the terminal of the voltage collection line. 	<ul style="list-style-type: none"> • Replace the abnormal BMU; • Tighten the terminal of the collection line.
12	Abnormal temperature collection	<ul style="list-style-type: none"> • Disconnection of the temperature collection line of BMU; • Loosening of the terminal of the temperature collection line. 	<ul style="list-style-type: none"> • Replace the abnormal BMU; • Tighten the terminal of the collection line.
13	Adhesion of charging contactor Adhesion of discharging contactor	<ul style="list-style-type: none"> • False alarm of adhesion; • Contact adhesion due to on-load breaking. 	<ul style="list-style-type: none"> • Clear the fault; • It is recommended to replace the contactor.
14	Failure of fuse 1 Failure of fuse 2	Overcurrent	<ul style="list-style-type: none"> • Replace the fuse; • It is recommended to check the system power output to avoid excess power allocation.
15	Total voltage difference	Failure of total voltage collection of the battery	Replace the CMU board.
16	Abnormal current collection	<ul style="list-style-type: none"> • Failure of current collection; • Overcurrent. 	<ul style="list-style-type: none"> • Replace the CMU board; • It is recommended to check the system power output to avoid excess power allocation.
17	Abnormal version	Unsuitable upgrade software	Check the version of upgrade software and use the correct upgrade software.
18	Low total voltage of PACK in charging Low total voltage of PACK in discharging Total voltage difference of PACK in charging Total voltage difference of PACK in discharging	<ul style="list-style-type: none"> • Cell abnormality; • Abnormality of the collection harness; • Abnormality of the BMU board. 	<ul style="list-style-type: none"> • Charge it; • Maintain or repair the collection harness; • Replace the BMU board.

No.	Fault name	Common cause	Solution
19	High total voltage of PACK in charging High total voltage of PACK in discharging	<ul style="list-style-type: none"> Abnormality of the collection harness; Abnormality of the BMU board. 	<ul style="list-style-type: none"> Maintain or repair the collection harness; Replace the BMU board.
20	Memory chip failure	<ul style="list-style-type: none"> Abnormality of the memory medium; Hardware failure of the CMU board. 	<ul style="list-style-type: none"> Replace the memory medium; Replace the CMU motherboard.
21	On-load cutoff fault of contactor	<ul style="list-style-type: none"> Forced cutoff of the contactor; Level 3 fault. 	<ul style="list-style-type: none"> Avoid misoperation; Identify the type of fault and resolve the on-site fault in time to avoid the expansion of accidents.
22	Power supply failure of CMU	Abnormality of the power supply of switch gear	Replace or repair the power supply.
23	CMU-SMU heartbeat abnormality	<ul style="list-style-type: none"> Abnormality of the communication cable between SMU and CMU; SMU failure to send the heartbeat message. 	<ul style="list-style-type: none"> Check whether the communication busbar is connected reliably; Confirm the normal transmission and reception of data on the SMU side.
24	S/G fan failure	<ul style="list-style-type: none"> Inconsistency with the fan start/stop temperature in the CMU setting; Damage to the fan or disconnection of the power cable; Power supply failure of the fan; Hardware circuit failure of the fan drive. 	<ul style="list-style-type: none"> Set the correct threshold of fan control temperature of the SMU; Replace the fan; Replace the adapter of the switch gear.
25	BMU fan failure	<ul style="list-style-type: none"> Disconnection of the BMU fan; Failure of control hardware on the motherboard Damaged fan. 	<ul style="list-style-type: none"> Check whether the harness is disconnected and whether the wire sequence is incorrect; Replace the BMU board; Replace the fan.

8.2 Maintenance

8.2.1 Regular Maintenance and Maintenance Cycle

Below is the recommended maintenance cycle. The actual maintenance cycle should be adjusted according to the specific installation environment of this product.

The power station scale, installation location and on-site environment affect the maintenance cycle of this product. In sandy or dusty environments, it is necessary to shorten the maintenance cycle and increase the frequency of maintenance.

Maintenance performed once every two years

Inspection item	Inspection method
Battery cluster status and	Check the following items. In case of nonconformity, take corrective

Inspection item	Inspection method
cleanliness	<p>actions immediately:</p> <ul style="list-style-type: none"> • Check the battery cluster and internal devices for damage or deformation. • Check the internal devices for abnormal noise during operation. • Check whether the temperature inside the battery cluster is too high. • Check whether the internal humidity and dust of the battery cluster are within the normal ranges. If necessary, clean the battery cluster. • Check whether the air inlet and outlet of the battery cluster are blocked.
Warning sign	Check whether the warning sign and label are legible and dirty. If necessary, replace them.
Wire and cable	Check whether the switch gear and battery module are connected correctly and whether the battery modules are also connected correctly.
Corrosion	Check the battery cluster for internal oxidation or rust.

Maintenance performed once a year

Inspection item	Inspection method
Switch gear and battery module box	<p>Check the following items. In case of nonconformity, take corrective actions immediately:</p> <ul style="list-style-type: none"> • Check whether there are flammable objects at the top of the battery cluster. • Check whether the battery cluster is secured at the fixing point on the foundation plate and whether there is rust. • Check the box for damage, paint peeling, oxidation, etc. • Check whether there are foreign objects, dust, dirt and condensate inside the battery cluster.
Wire and cable layout	<p>The inspection must not be carried out until all internal devices of the battery cluster are powered off!</p> <p>In case of nonconformity found in inspection, take corrective actions immediately:</p> <ul style="list-style-type: none"> • Check the cable layout for short circuit and compliance with the specifications. If case of any abnormality, take corrective actions immediately.

Inspection item	Inspection method
	<ul style="list-style-type: none"> • Check whether all wire inlets and outlets of the battery cluster are sealed properly. • Check the battery cluster for internal seepage of water. • Check whether the power cables and copper busbars are loose, and tighten them according to the aforesaid torque. • Check the power cable and communication cable for damage, especially cut marks on the surface exposed to the metal surface.
Grounding	Check whether the grounding is correct. The grounding resistance should not be greater than 0.1Ω.
Fan	<ul style="list-style-type: none"> • Check the fan for faults (e.g. locked rotor and stalling). • Check the fan for abnormal noise during operation.
Screw	Check whether screws inside the battery cluster fall off or are rusted.

Maintenance performed once every six months

Inspection item	Inspection method
Ambient temperature and humidity inspection	<ul style="list-style-type: none"> • Check whether the temperature in the ambient temperature record is within the operating range. • Check whether the humidity in the ambient humidity record is within the operating range.
Function inspection	<ul style="list-style-type: none"> • Check the operating status of the DC contactor: Send the Start/Stop command in the power-off status and check whether the system works properly. • Measure whether the 24V output voltage is within the range in the specification. • Check whether the current, voltage and temperature in the operation record of the battery cluster are within the operating ranges.

8.2.2 Maintenance Precautions

For safe and efficient maintenance of the system, maintenance personnel must carefully read and observe the following safety requirements:

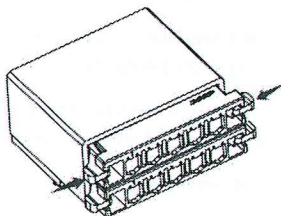
1. Have the electrician certificate issued by the Work Safety Supervision Bureau, and receive professional training before assuming their work.
2. Follow relevant safety precautions, use necessary tools, and wear personal protective equipment.
3. Do not wear metal accessories such as jewelry or watches.

4. Never touch the high-voltage positive and negative electrodes of the energy storage system by both hands at the same time under all circumstances.
5. Prior to the maintenance of the energy storage system, disconnect all high-voltage and low-voltage switches.
6. Do not clean this product directly with water. If necessary, use the vacuum cleaner to clean it.
7. Plug and remove cables in accordance with the specifications, without brute force or violent operation.
8. After maintenance is completed, clean tools and materials in time and check whether there are metal objects left inside or at the top of the product.
9. In case of any doubt on operation and maintenance of this product, contact SUNGROW's Customer Service Center instead of operation without permission.

Harness plug name	Correct operation diagram
-------------------	---------------------------

Removal: Press the buckles on both sides of the plug and pull them out.

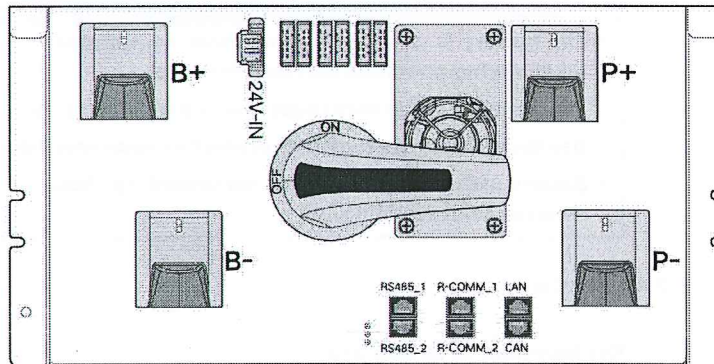
Daisy chain



Installation: Push the plug into the holder in the correct clamping direction, until a crisp click sound is heard.

Removal: Press the buckle and pull out the crystal connector.

RJ45 communication interface



Installation: Insert it in the correct clamping direction until a crisp click sound is heard.

8.2.3 Maintenance

1. Operating temperature: 0°C to 45°C. The temperature charging and discharging should be 15°C to 30°C and typically 25°C.
2. The RACK should not be charged or discharged with high magnifying power. The continuous charging and discharging current of a single rack should not exceed 280A.
3. When the energy storage system is not used in a long time, it should be charged once every six months, until its SOC is 50% to 80%.
4. When the system is used after long-term storage, it should be fully charged at least once to restore the best performance of the battery.
5. Regularly check whether the air duct of the cooling system is blocked and clean the system.

In particular, clean the air inlet and outlet of the fan and use a vacuum cleaner if necessary, to maintain free air circulation inside the cabinet. Before dust removal, the power supply must be cut off. It is forbidden to rinse the system with water.

6. Regularly check whether the fastening bolts of the high-voltage cables and connecting busbars of the energy storage system are loose, whether the contacts are in good conditions, and whether the terminal surfaces are severely corroded or oxidized.
7. Regularly check the protective covers of high-voltage positive and negative electrodes of the PACK for ageing, damage and missing.
8. Regularly check cables for loosening, ageing, damage and fracture and inspect whether the insulation is in good conditions.
9. Regularly check the battery cabinet for pungent odor and high-voltage connections for burning odor.
10. Regularly check whether the voltage, temperature and other data of the monitoring upper computer are correct and whether there are fault alarms in the alarm column.
11. Regularly check whether the status and alarm indicators of the energy storage system are in good conditions and whether they work properly.
12. Regularly check whether the emergency stop button of the energy storage system can be used, in order to quickly shut down the system in an emergency.
13. Regularly check whether the fire extinguishers are in good conditions and within the validity period.
14. Never use different types of battery modules in series or parallel.



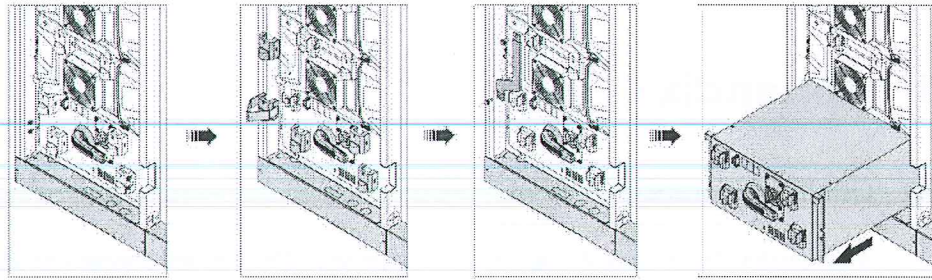
WARNING

- **The battery is potentially dangerous, so appropriate protective measures must be taken during operation and maintenance!**
- **Incorrect operation may cause severe personal injury and property damage!**
- **Use the appropriate tools and protective equipment during battery operation.**
- **Battery maintenance must be performed by those who have battery expertise and received safety training.**

8.2.4 Replacement

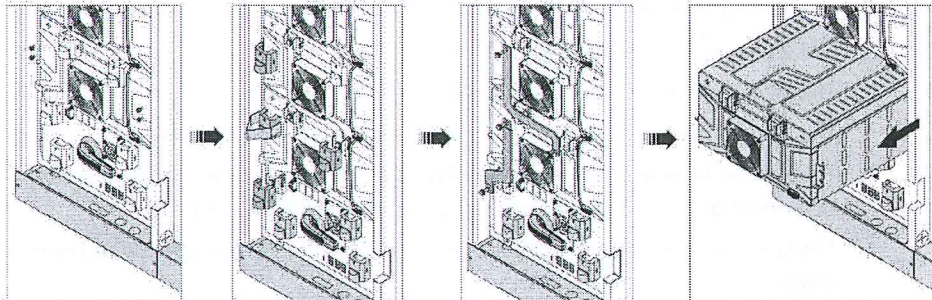
Replacement of switch gear

- Step 1** Turn off the power supply according to Step 3 in "6.2.1 M2L-R200A-280-U-M Battery Cluster".
- Step 2** Dismantle four M6 fixing bolts of the switch gear and battery rack via a screwdriver.
- Step 3** Dismantle the protective covers of two electrodes of the switch gear via corresponding tools.
- Step 4** Remove the series copper busbar 4 and negative power cable between the switch gear and LFP battery.
- Step 5** Remove the communication cable between the switch gear and LFP battery.
- Step 6** Remove the connecting cables between the switch gear and other devices.
- Step 7** Take out the switch gear.
- Step 8** Put the repaired switch gear or a new one into the battery rack. Install the switch gear in the reverse order of disassembly.
- Step 9** Debug the switch gear based on the test run results, to ensure normal operation.



Replacement of LFP battery module

- Step 1** Turn off the power supply according to Step 3 in "6.2.1 M2L-R200A-280-U-M Battery Cluster".
- Step 2** Dismantle four M6 fixing bolts of the LFP battery module and battery rack via a screwdriver.
- Step 3** Dismantle the protective covers of two electrodes of the LFP battery module via corresponding tools.
- Step 4** Remove the series copper busbar between the LFP battery modules.
- Step 5** Remove the communication cable between the LFP battery modules.
- Step 6** Take out the LFP battery module.
- Step 7** Put the repaired or new LFP battery module (with the same power as that of other power modules in the RACK). Install the LFP battery module in the reverse order of disassembly.
- Step 8** After replacement, read the parameters (e.g. voltage and temperature) of the LFP battery module from the upper computer, and confirm that the parameters are correct.



9 Appendix I

9.1 Quality Assurance

When product faults occur during the warranty period, SUNGROW will provide free service or replace the product with a new one.

Evidence

During the warranty period, the customer shall provide the product purchase invoice and date. In addition, the trademark on the product shall be undamaged and legible.

Otherwise, SUNGROW has the right to refuse to honor the quality guarantee.

Conditions

- After replacement, unqualified products shall be processed by SUNGROW.
- The customer shall give SUNGROW a reasonable period to repair the faulty device.

Exclusion of Liability

In the following circumstances, SUNGROW has the right to refuse to honor the quality guarantee:

- The free warranty period for the whole machine/components has expired.
- The device is damaged during transport.
- The device is incorrectly installed, refitted, or used.
- The device operates in harsh environment, as described in this manual.
- The fault or damage is caused by installation, repairs, modification, or disassembly performed by a service provider or personnel not from SUNGROW.
- The fault or damage is caused by the use of non-standard or non-SUNGROW components or software.
- The installation and use range are beyond stipulations of relevant international standards.
- The damage is caused by unexpected natural factors.

For faulty products in any of above cases, if the customer requests maintenance, paid maintenance service may be provided based on the judgment of SUNGROW.

9.2 Contact Information

Should you have any question about this product, please contact us.

We need the following information to provide you the best assistance:

- Type of the device
- Serial number of the device
- Date of the device

- Fault code/name
- Brief description of the problem

China (HQ)

Sungrow Power Supply Co., Ltd
Hefei
+86 551 65327834
service@sungrowpower.com

Brazil

Sungrow Do Brasil
Sao Paulo
+55 11 2366 1957
latam.service@sa.sungrowpower.com

Germany, Austria, Switzerland

Sungrow Deutschland GmbH
Munich
+49 0800 4327 9289
service@sungrow-emea.com

India

Sungrow (India) Private Limited
Gurgaon
+91 080 41201350
service@in.sungrowpower.com

Japan

Sungrow Japan K.K.
Tokyo
+81 3 6262 9917
service@jp.sungrowpower.com

Malaysia

Sungrow SEA
Selangor Darul Ehsan
+60 19 897 3360
service@my.sungrowpower.com

Thailand

Sungrow Thailand Co., Ltd.
Bangkok
+66 891246053
service@th.sungrowpower.com

Romania

Service Partner - Elerex
+40 241762250
service@sungrow-emea.com

UK

Sungrow Power UK Ltd.
Milton Keynes
+44 (0) 01908 414127
service@sungrow-emea.com

Vietnam

Sungrow Vietnam
Hanoi
+84 918 402 140
service@vn.sungrowpower.com

Poland

+48 221530484
service@sungrow-emea.com

Australia

Sungrow Australia Group Pty. Ltd.
Sydney
+61 2 9922 1522
service@sungrowpower.com.au

France

Sungrow France
Lyon
+33420102107
service@sungrow-emea.com

Greece

Service Partner – Survey Digital
+30 2106044212
service@sungrow-emea.com

Italy

Sungrow Italy
Verona
+39 0800 974739 (Residential)
+39 045 4752117 (Others)
service@sungrow-emea.com

Korea

Sungrow Power Korea Limited
Seoul
+82 70 7719 1889
service@kr.sungrowpower.com

Philippines

Sungrow Power Supply Co., Ltd
Mandaluyong City
+63 9173022769
service@ph.sungrowpower.com

Spain

Sungrow Ibérica S.A.U.
Mutilva
+34 948 05 22 04
service@sungrow-emea.com

Turkey

Sungrow Deutschland GmbH Turkey
Istanbul
+90 216 663 61 80
service@sungrow-emea.com

U.S.A, Mexico













Sungrow USA Corporation
Phoenix
+1 833 747 6937
techsupport@sungrow-na.com

Belgium, Netherlands and Luxembourg (Benelus)

Service (only NL): +31 08000227012
service@sungrow-emea.com

10 Appendix II

Faites attention aux panneaux d'avertissement de danger sur la machine, comme détaillé ci-dessous.

Panneau	Signification
	Faites attention au danger. Ne faites pas fonctionner ce produit lorsqu'il est sous tension !
	Ce produit est sous haute tension. En touchant ce produit, vous pouvez subir un choc électrique !
	Faites attention aux objets lourds. Vous pouvez vous faire mal au dos en soulevant des objets lourds. Veuillez soulever les objets lourds avec des outils appropriés.
	Faites attention à une possibilité d'explosion.
	Faites attention à la corrosion.
	Ne le jetez pas avec vos déchets ménagers.
	Pas de feu.
	Il doit y avoir un centre médical à proximité.
	En cas de contact oculaire, rincez-vous immédiatement les yeux avec de l'eau courante ou une solution saline normale et ne tardez pas à consulter un médecin.
	Lisez le manuel avant tout fonctionnement du produit.
	Il est obligatoire de porter des lunettes de protection.
	C'est une borne de mise à la terre de protection, qui doit être mise à la terre de façon sûre pour la sécurité des opérateurs.

I, Frank W. Lyman, ^{8408 Pa 269}
FEB 4 1946 15 REC 3 REGM QM 20:10

BC. K

8408

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of Ashby, Middlesex County, Massachusetts, hereinafter
for consideration paid, grant to The Inhabitants of the Town of Ashby,

ss Middlesex County, Massachusetts,
with warranty covenants

a certain tract of land situated on the northeasterly side of Main Street in said Ashby, bounded and described as follows:- beginning at the southwesterly corner thereof at land of Gustaf A. Holmgren et ux. and at land of the grantees; thence N. 52° 07' E. by other land of the grantor three hundred nine and 57/100 (309.57) feet to a pipe; thence S. 61° 29' E., still by grantor's other land, thirty and 75/100 (30.75) feet to a drill hole in the corner of a stone wall; thence S. 23° 57' W. by a stone wall, three hundred forty-nine and 73/100 (349.73) feet to a drill hole; thence N. 43° 50' W. by a stone wall, twenty-three and 8/10 (23.8) feet to a drill hole; thence N. 41° 41' W. by the stone wall one hundred seventy (170) feet, more or less, to a drill hole at the place of beginning, the last three courses all being by other land of the grantees. Containing 35,104 square feet of land, more or less.

Being a portion of the premises conveyed to me by Ashby Stock Farms, Inc., by deed dated April 24, 1941, recorded with Middlesex South District Deeds, Book 6527, Page 258.

BOOK
8408
PAGE
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I, Frieda B. Lyman,

wife of said grantor,

release to said grantee s all rights of
interests therein.

dower and homestead and other

Witness our hands and seal s this twenty-seventh day of
January, 1955.

Witnessed by

The consideration being
less than \$100.00 this
deed requires no stamp.

Commonwealth of Massachusetts

Worcester, SS. January 27, 1955.

Then personally appeared the above named Frank W. Lyman

and acknowledged the foregoing instrument to be his free act and deed,
before me

Robert L. Ware
Robert L. Ware, Notary Public ~~Notary Public~~

My commission expires September 17, 1960.

DEC 13-67 AM 9:48 0308E ***7.00

BK11441 PG578

MASSACHUSETTS QUITCLAIM DEED INDIVIDUAL (LONG FORM) 802

07

FRIEDA B. LYMAN

of Ashby,

Middlesex

County, Massachusetts,

being unmarried, for consideration paid, grant to the TOWN OF ASHBY, in said County and Commonwealth,

306

with quitclaim covenants

~~with quitclaim covenants~~

~~with quitclaim covenants~~

A certain parcel of land situated in said Ashby, about one third of a mile west of Ashby Center on the northerly side of the State Road, Route 119, as shown on a plan entitled "Plan of property for Frank W. Lyman Est., Ashby, Mass." dated Nov. 1966 by Allen C. Davis, C.E. to be recorded herewith, bounded and described according to said plan as follows:

SOUTHWESTERLY by said State Road, Route 119, 618 feet more or less;
NORTHWESTERLY by land of Francis H. Affayroux et ux 337.95 feet;
SOUTHWESTERLY by land of the same 65.25 feet;
NORTHWESTERLY by land of Douglas H. Kimball 633.59 feet;
NORTHEASTERLY by land of the Grantors 2002.67 feet;
SOUTHEASTERLY by a stone wall 400 feet;
SOUTHWESTERLY by land of the Town of Ashby 384.82 feet;
SOUTHEASTERLY by land of the same 309.57 feet;
SOUTHWESTERLY by land of the Town of Ashby, by land of Norman D. Garceaux et ux, by land of Robert A. Peterson et ux and by land of Bernard E. Mason et ux 332.11 feet;
SOUTHEASTERLY by land of said Mason and land of George R. Johnson et ux 180 feet more or less;
WESTERLY by land of said Johnson 39.55 feet;
SOUTHWESTERLY in two courses in part by land of said Johnson and in part by land of Clarence A. Brittell et ux measuring in the aggregate 463.68 feet more or less;
SOUTHEASTERLY by land of said Brittell 467 feet more or less.

Containing 34.4 acres of land more or less.

The premises are being conveyed subject to real estate taxes assessed by the Town of Ashby as of January 1, 1967 and to easements, restrictions, agreements and conditions of record insofar as the same are now in force and applicable.

For title of Grantor, see deed of Edwin J. Lyman et al Trustees under the will of Frank W. Lyman, Middlesex Probate Case No. 383264, said deed being recorded immediately prior hereto.

NO REVENUE STAMPS ARE AFFIXED HERETO
AS NONE IS REQUIRED BY LAW

1454
SEE PLAN IN RECORD BOOK 11441 PAGE 578

~~transcribed~~ ~~not~~ ~~transcribed~~ ~~not~~ ~~transcribed~~

~~release to said grantee or rights in~~ ~~XEROX COPY OF THE WHOLE~~ ~~AND CANNOT BE USED FOR ANY OTHER PURPOSES~~

Witness my hand and seal this 20 day of June 1967.

Frieda B. Lyman

The Commonwealth of Massachusetts

Middlesex ss.

Ashtabula Nov. 20 1967

Then personally appeared the above named Frieda B. Lyman

and acknowledged the foregoing instrument to be her free act and deed, before me

Arthur L. Wass
(Arthur L. Wass) Notary Public — Justice of the Peace

(Arthur L. Wass) ~~Notary Public - State of New York~~

My Commission Expires July 19, 1974



