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November 13, 2017

Ms. Barcy F. McNeal, Secretary
Ohio Power Siting Board
Docketing Division
180 East Broad Street, 11th Floor
Columbus, Ohio 43215-3793

Re: Case No. 17-774-EL-BGN, In the Matter of the Application of Vinton Solar Energy LLC for a Certificate of Environmental Compatibility and Public Need to Construct a Solar-Powered Electric Generation Facility in Vinton County, Ohio.

Responses to Third Set of Interrogatories from Staff of the Ohio Power Siting Board

Dear Ms. McNeal:

Attached please find Vinton Solar Energy LLC's ("Applicant") responses to the Third Set of Interrogatories from the staff of the Ohio Power Siting Board ("OPSB Staff"), which were provided to the Applicant on October 30, and 31, 2017. The Applicant provided these responses to OPSB Staff on November 13, 2017.

We are available, at your convenience, to answer any questions you may have.

Respectfully submitted,

/s/ *Christine M.T. Pirik*
Christine M.T. Pirik (0029759)
William V. Vorys (0093479)
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Attorneys for Applicant Vinton Solar Energy LLC

Enclosure
Cc: Jon Pawley

COLUMBUS 39579-29 78982v2

BEFORE
THE OHIO POWER SITING BOARD

In the Matter of the Application of Vinton Solar Energy LLC for a Certificate of Environmental Compatibility and Public Need to Construct a Solar-Powered Electric Generation Facility in Vinton County, Ohio.	))))	Case No: 17-774-EL-BGN

VINTON SOLAR ENERGY LLC'S RESPONSES TO THE THIRD SET OF INTERROGATORIES FROM THE STAFF OF THE OHIO POWER SITING BOARD

On July 5, 2017, as supplemented on August 16, 2017, Vinton Solar Energy LLC ("Applicant") filed an application ("Application") with the Ohio Power Siting Board ("OPSB") proposing to construct a solar-powered electric generation facility in Vinton County, Ohio ("Project").

On October 30, and 31, 2017, the Staff of the OPSB ("OPSB Staff") provided the Applicant with OPSB Staff's Third Set of Interrogatories. Now comes the Applicant providing the following responses to the Third Set of Interrogatories from the OPSB Staff.

1. Clarify the wetland and stream impacts for the project. It appears that all streams and wetlands would be avoided and have no impacts, however on page 66 of Part 1 of the application it states potential impacts could result in 2.18 acres of wetland impacts, 935 linear feet of stream impacts, and 0.59 acre of pond impacts. Clarify these impacts for and if they will be impacted, but not crossed during construction, explain how they will be impacted.

Response: Please see the attached revision to Figure 03-02 (**Attachment A**). With this revision, the Applicant has avoided impact to all streams and wetlands.

2. Please further describe or include a specifications sheet of the large-scale advanced battery system (e.g. including anticipated location on Figure 03-2, typical/anticipated manufacturers, power rating in MW).

Response: The proposed battery system would be up to 42 MW and is expected to utilize equipment from LG Chem Inc., Samsung SDI Co., or equivalent. The attached data sheet from LG Chem provides information on a representative model (**Attachment B**). Specifications for the exact equipment will be provided to the OPSB prior to construction. Figure 03-02 has been revised to show the anticipated location of the battery system (**Attachment A**). .

Respectfully submitted,

/s/ *Christine M.T. Pirik*
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CERTIFICATE OF SERVICE

The Ohio Power Siting Board's e-filing system will electronically serve notice of the filing of this document on the parties referenced in the service list of the docket card who have electronically subscribed to this case. In addition, the undersigned certifies that a copy of the foregoing document is also being served upon the person below via electronic mail this 13th day of November, 2017.

/s/ Christine M.T. Pirik
Christine M.T. Pirik (0029759)

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Administrative Law Judge:

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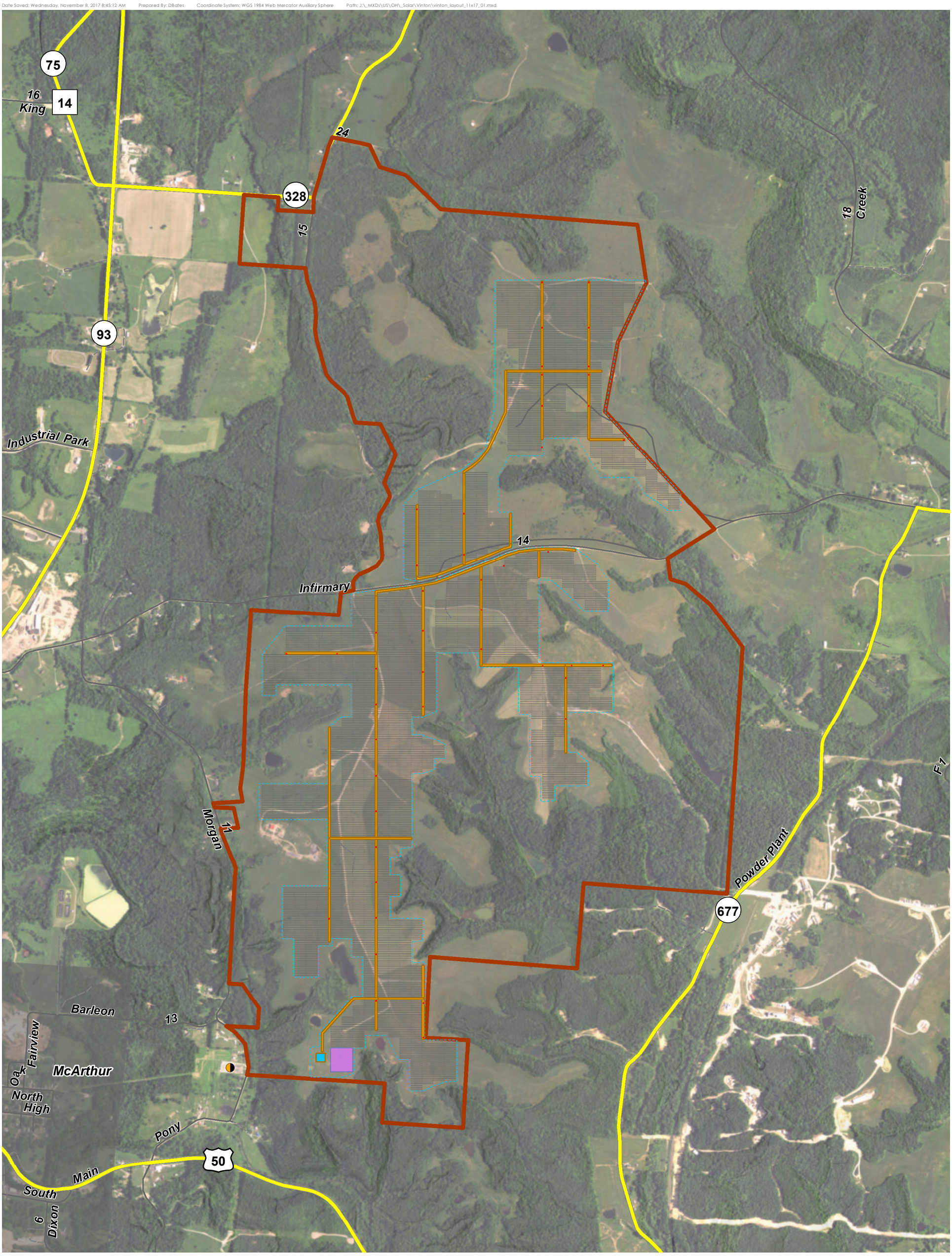
COLUMBUS 39579-29 78980v1

Date Saved: Wednesday, November 8, 2017 8:45:12 AM Prepared By: DBates Coordinate System: WGS 1984 Web Mercator Auxiliary Sphere Path: J:_MXDs\US\OH_Solar\Vinton\vinton_layout_11x17_01.mxd



Legend

- POI
- Inverter
- Substation
- Fence
- Modules
- Access Road
- Potential Battery Storage Area
- Proposed Project Boundary

Road Classification

- US/State Route
- County Road
- Local Road
- Dirt/Unpaved Road

1,200 0 1,200
Feet

Layout Summary

Vinton Solar Energy Center, Vinton County, Ohio

Rev. 00
November 08, 2017

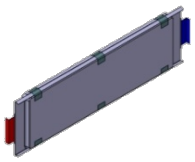
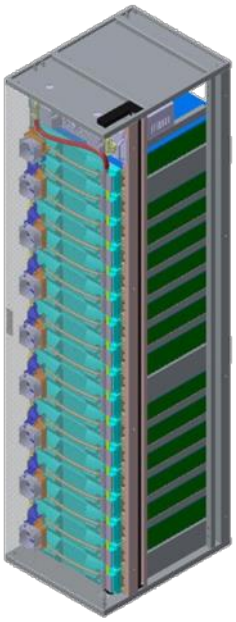
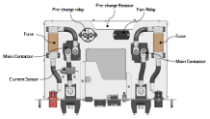
Invenergy

LG Chem Gen 3 Cell/Module/Rack Data Sheet Package

2016.02.26

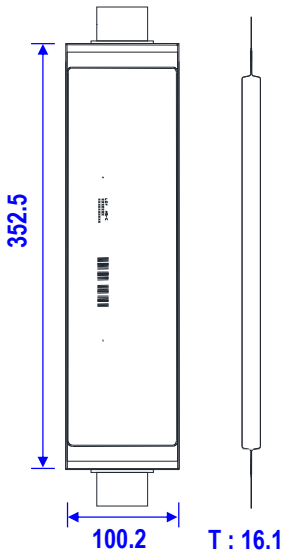
Rev	Date	Writer	Updates
AA	2015.08.06	Yongjun Hong	First Draft
AB	2015.09.10	Yongjun Hong	Rack Size Modification
AC	2015.09.14	Yongjun Hong	Typo Correction
AD	2015.10.20	Yongjun Hong	Picture Correction
AE	2015.11.03	Yongjun Hong	Dimension Correction
AF	2015.11.27	Yongjun Hong	JP3 Module Spec Correction
AG	2015.12.03	Yongjun Hong	Rack Width Correction
AH	2015.12.24	Injung Kim	JP3 Cell and Module Capacity Modification
AI	2016.01.25	Luke Kim	BPU info. Added
AJ	2016.02.26	Luke Kim	Module/Rack Dimension revised

1. Battery System Overview

Main Components				
Component	**Appearance**	**Cell Model**	**Description**	**Energy**
Cell		JH3	Energy-centric cell (63Ah)	233 Wh
		JP3	Power-centric cell (63.9Ah)	234.5 Wh
Module		JH3	14S1P configuration	3.26 kWh
			14S2P configuration	6.52 kWh
			14S3P configuration	9.79 kWh
		JP3	14S1P configuration	3.28 kWh
			14S2P configuration	6.56kWh
Rack		JH3 – R800	800VDC Rack with JH3 14S2P Module	91.2 kWh
			800VDC Rack with JH3 14S3P Module	137.0 kWh
		JH3 – R1000	1000VDC Rack with JH3 14S2P Module	55.4 kWh
			1000VDC Rack with JH3 14S2P Module	110.8 kWh
			1000VDC Rack with JH3 14S3P Module	166.4 kWh
		JP3 – R800	800VDC Rack with JP3 14S1P Module	45.9 kWh
			800VDC Rack with JP3 14S2P Module	91.9 kWh
		JP3 – R1000	1000VDC Rack with JP3 14S1P Module	55.8 kWh
			1000VDC Rack with JP3 14S2P Module	111.6 kWh
BPU		P160DF1	UL Complaint DC Protection Fuse/Contactor	-

1.1. Battery Cell

Battery Cell – JH3, JP3
Dimensions



□ Cell Features

JH3	JP3
-Long Cycle Life -Safety Reinforced Separator -High Energy density -Low Self-discharge rate -Wide Temperature Range	- Long Cycle Life and High Power - Safety Reinforced Separator - High power performance - Low Self-discharge rate - Wide Temperature Range

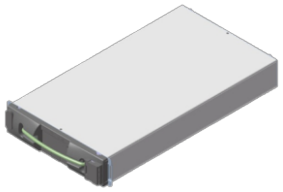
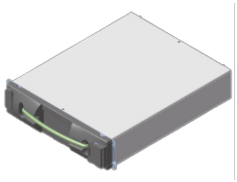
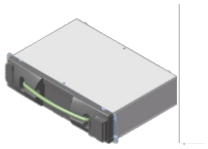
□ Nominal Specifications: Typical values at 25°C

	JH3	JP3
Nominal Capacity (Ah)	63.0Ah (0.3C)	63.9Ah (1C)
Nominal Voltage (3.0 ~ 4.2 V, Discharge)	3.70 V (0.3C)	3.67 V (1C)
Energy Density	198 Wh/kg	202 Wh/kg
Power Density (at 50% SOC, 10 sec.)	TBD	TBD
Voltage Range	3.0 ~ 4.2 V	3.0-4.25V
Temperature Range	-30 ~ 60 °C	-30 ~ 60 °C
Weight	approx. 1175 g	approx. 1160 g
Volume	approx. 565 mL	approx. 569 mL
Ready for Shipment	’16.1Q	’16.3Q

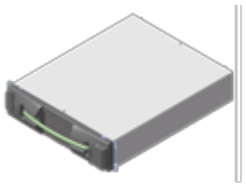
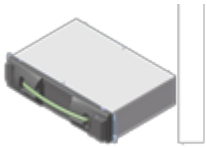
2. Battery Module

LG Chem's Battery modules are offered in two options, namely product for Energy oriented application (JH3) and Power oriented application (JP3).

2.1. Battery Module with JH3 Cell for Energy Application

Battery Module –JH3_14S3P & 14S2P & 14S1P			
Appearance			
Module Type	**JH3_14S3P (M48189P3B)**	**JH3_14S2P (M48126P3B)**	**JH3_14S1P (M4863P3B)**
Image			
Module Features			
Built in BMS for self-diagnostic and balancing Flexible power and energy ratio Easy to integrate(19" standard rack compatible) Efficient dimension to maximize Energy density			
Nominal Characteristics			
Voltage Range	42~ 58.8 V	42~ 58.8 V	42~ 58.8 V
Capacity (0.3C)	189 Ah	126 Ah	63 Ah
Energy (0.3C)	9.79 KWh	6.52 KWh	3.26 KWh
Maximum Power Rate	0.5CP	1.0CP	1.0CP
Physical Characteristics			
Width	W/O MTG: 445 mm W MTG: 483mm	W/O MTG: 445 mm W MTG: 483mm	W/O MTG: 445 mm W MTG: 483mm
Depth	846.4 mm	586.6mm	338.8mm
Height	110 mm (2.5U)	110 mm (2.5U)	110 mm (2.5U)
Weight	68.0 kg	46.5 kg	25.0 kg
Cell Configuration	14S3P	14S2P	14S1P
Control and Protection			
Module BMS	Integrated	Integrated	Integrated
Cooling	Air-Cooled	Air-Cooled	Air-Cooled
Ready for Shipment			
Ready for Shipment	'16.1Q		

2.2. Battery Module with JP3 Cell for Power Application

Battery Module – JP3_2P & JP3_1P		
Appearance		
Module Type	**JP3_2P (M48128P6B)**	**JP3_1P (M4864P6B)**
Image		
Module Features		
Built in BMS for self-diagnostic and balancing Flexible power and energy ratio Easy to integrate(19” standard rack compatible) Efficient dimension to maximize performance for power application		
Nominal Characteristics		
Voltage Range	42~ 59.5 V	42~ 59.5 V
Capacity (1C)	127.8 Ah	63.9 Ah
Energy (1C)	6.56 kWh	3.28 kWh
Maximum Power Rate	2.0CP	2.0CP
Physical Characteristics		
Width	W/O MTG: 445 mm W MTG: 483mm	W/O MTG: 445 mm W MTG: 483mm
Depth	586.6mm	338.8 mm
Height	110 mm (2.5U)	110 mm (2.5U)
Weight	46.1 kg	24.8 kg
Cell Configuration	14S2P	14S1P
Control and Protection		
Module BMS	Integrated	Integrated
Cooling	Air-Cooled	Air-Cooled
Ready for Shipment		
Ready for Shipment	’16.3Q	

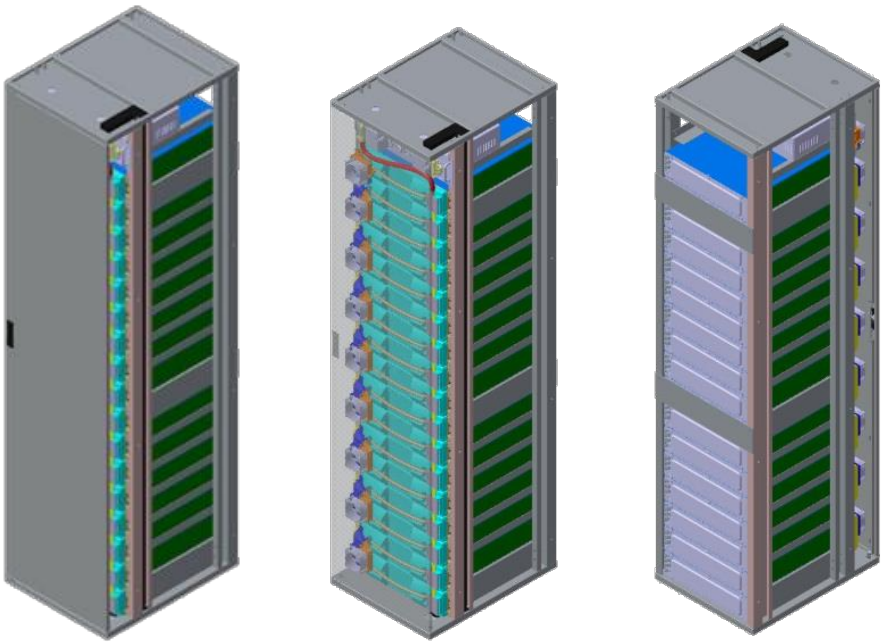
3. Battery Rack

LG Chem's Battery Rack systems are offered in two options, namely product for Energy oriented application (JH3) and Power oriented application (JP3).

3.1. Battery Rack with JH3 Modules for Energy Application

Rack Type	R1000 – JH3			R800 – JH3	
Type of Module	14S3P	14S2P	14S1P	14S3P	14S2P
Number of Modules per rack [EA]	17			14	
DC Voltage Range[VDC]	714-999.6			588-823.2	
Size [W x D x H, mm]	520 x 930 x 2200	520 x 670 x 2200	520 x 425 x 2200	520 x 945 x 2000	520 x 670 x 2000
Weight [kg]	1300	920	540	TBD	TBD
Total Rack Energy [kWh]	166.4	110.8	55.4	137.0	91.2
Rack Configuration	238S3P	238S2P	238S1P	196S3P	196S2P
Cooling	Air Cooling				

BPU can be positioned at the bottom or at the top of the rack depending on the interface with the main DC bus.

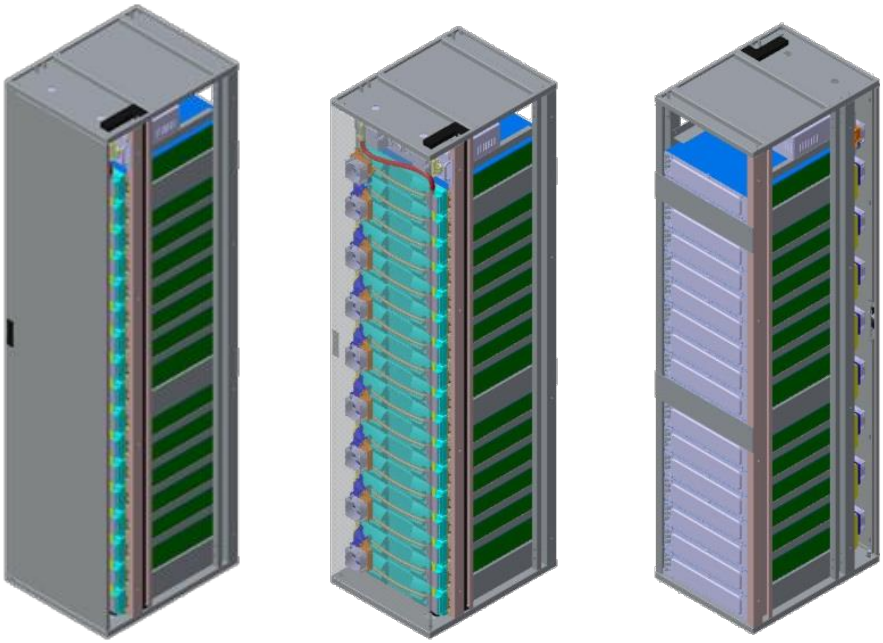


[Front View] [Rear View]

3.2. Battery Rack with JP3 Modules for Power Application

Rack Type	R1000 – JP3		R800 – JP3	
Type of Module	14S2P	14S1P	14S2P	14S1P
Number of Modules per rack [EA]	17		14	
DC Voltage Range[VDC]	714-999.6		588-823.2	
Size [W x D x H, mm]	520 x 670 x 2200	520 x 425 x 2200	520 x 670 x 2000	520 x 425 x 2000
Weight [kg]	920	540	TBD	TBD
Total Rack Energy [kWh]	111.7	55.8	91.9	45.9
Rack Configuration	238S2P	238S1P	196S2P	196S1P
Cooling	Air Cooling			

Battery Protection Unit (BPU) can be positioned at the bottom or at the top of the rack depending on the interface with the main DC bus.



[Front View] [Rear View]

4. Battery Protection Unit (BPU)

Battery Protection Unit is designed to protect Battery System during operation

Battery Protection Unit (BPU)

- Product Name : ESS BPU
- Model Name : P160DF1

4.1. ELECTRICAL SPECIPICATION

MODEL		P160DF1
Main DC	Voltage	1,000V DC
	Current (Rated)	160A
Aux power	Voltage Range	24VDC
	Input Current	113W
Insulation resistance		100 ㏁ (1,000Vdc)

4.2. MECHANICAL SPECIPICATION

Housing Material		SGCC(2.0T)
Dimension (W x D x H)		438 x 282 x 126 (mm)
Unit Weight		10.2kg
Indicator	Status	Green On (Normal), Yellow On (Warning), Red On (Fault)
Cooling System		FAN
Main DC Terminal		M10 SEMS BOLT / 10.2 (N.m)
Control Power		M3 SCREW / 1.0 (N.m)
E-STOP Input Terminal		MSTB 2.5/2-STF-5.08 Connector (PHOENIX)
Main DC Wire		1/0 AWG

4.3. PROTECTION(*)

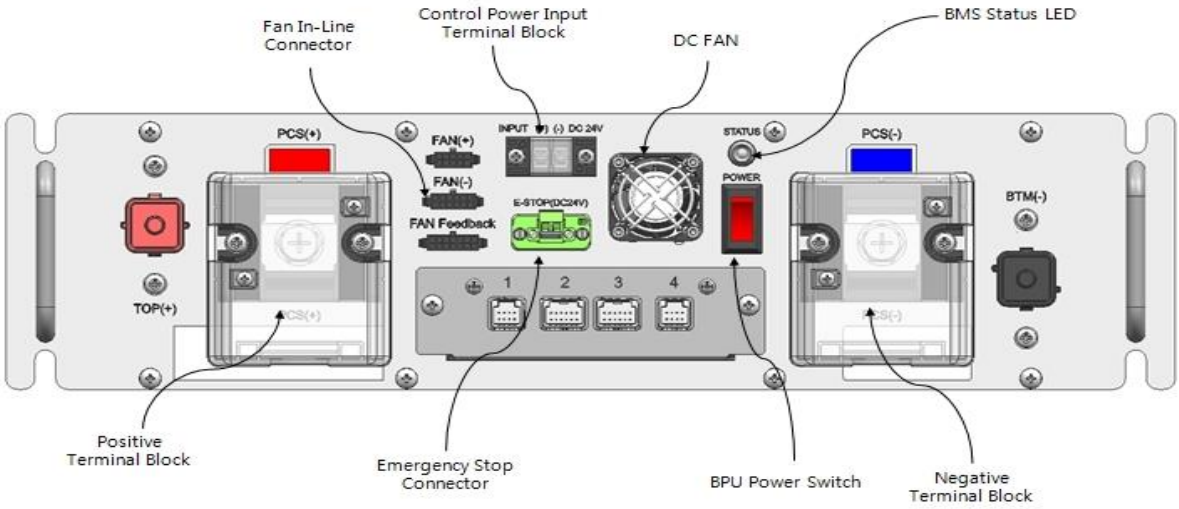
Over/Under Voltage	If the sensing value exceed or falls below a specified CB Shunt Trip by BMS
Over Current	If the sensing value exceed or falls below a specified CB Shunt Trip by BMS
Over Temperature	If the sensing value exceed or falls below a specified CB Shunt Trip by BMS
Over/Under SOC	If the sensing value exceed or falls below a specified CB Shunt Trip by BMS
Short Circuit	If a short circuit occurs CB Trip by itself
Inrush Current	Pre-charge resistor

(*) : Above condition should be defined by request from customers. Please see specification of BMS for more details.

4.4. OPERATING ENVIRONMENT

Storage temperature	-25~70℃
Operating Temperature Range	-10~40℃
Recommended Operating Temperature	23 ±5℃
Operating Humidity	< 95%
Operating Altitude	3,000 METERS
Pollution Degree	2
Warranty	4 Years

4.5. FRONT LAYOUT



- **DC Power Connection**

BATT POS	BATT NEG
TOP = Top Module (+) Connect	BTM = Bottom Module (-) Connect
PCS = Power Conversion System (+) Connect	PCS = Power Conversion System (-) Connect

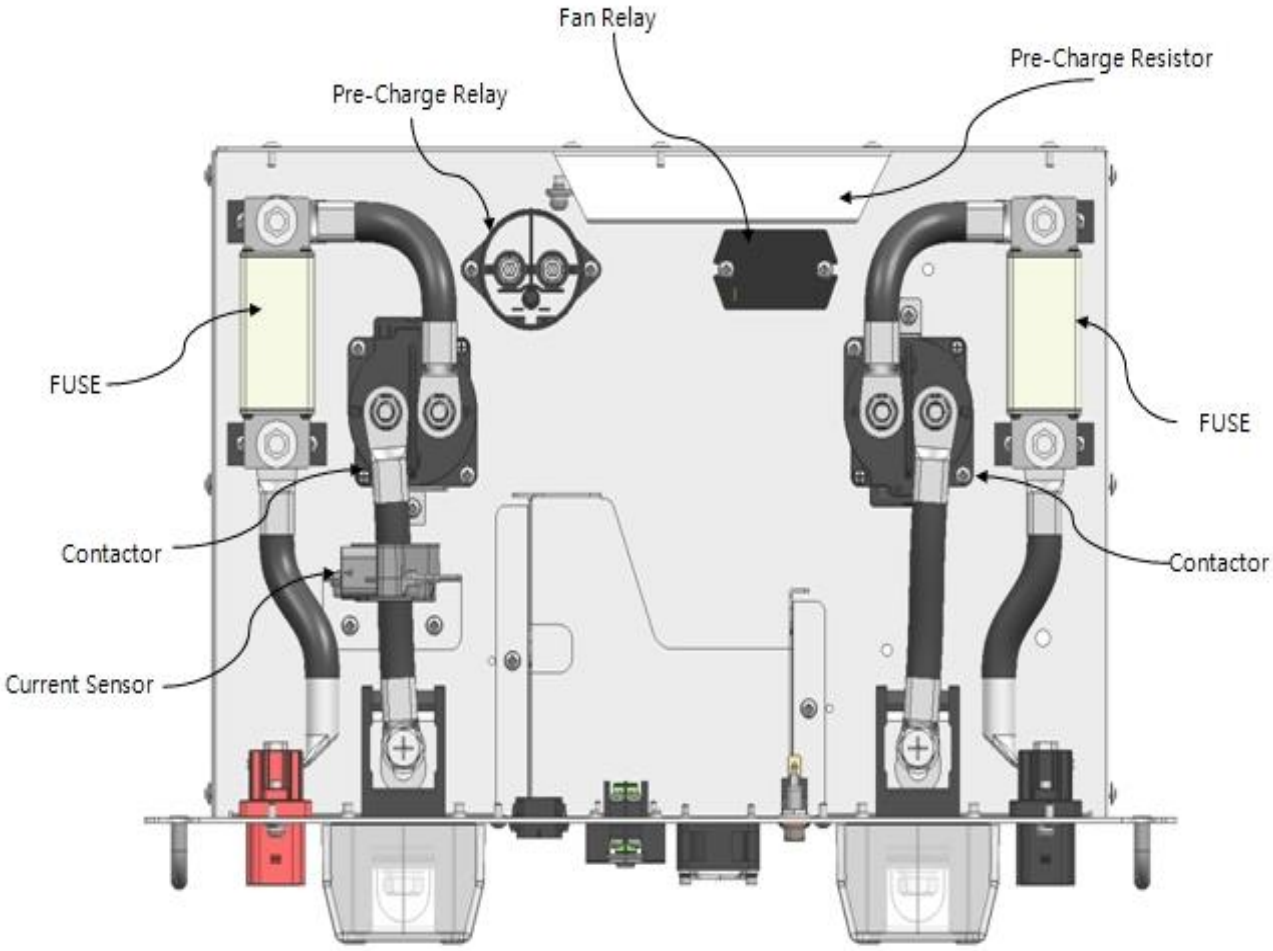
- **Auxiliary Power Connection**

Input Terminal	FAN Power / BMS Power
+	DC 24V
-	

- **E-Stop signal Connection**

E-Stop Terminal	DC 24V
2PIN Housing (Phoenix : MSTB 2.5/2-STF-5.08)	

4.6. INTERNAL LAYOUT

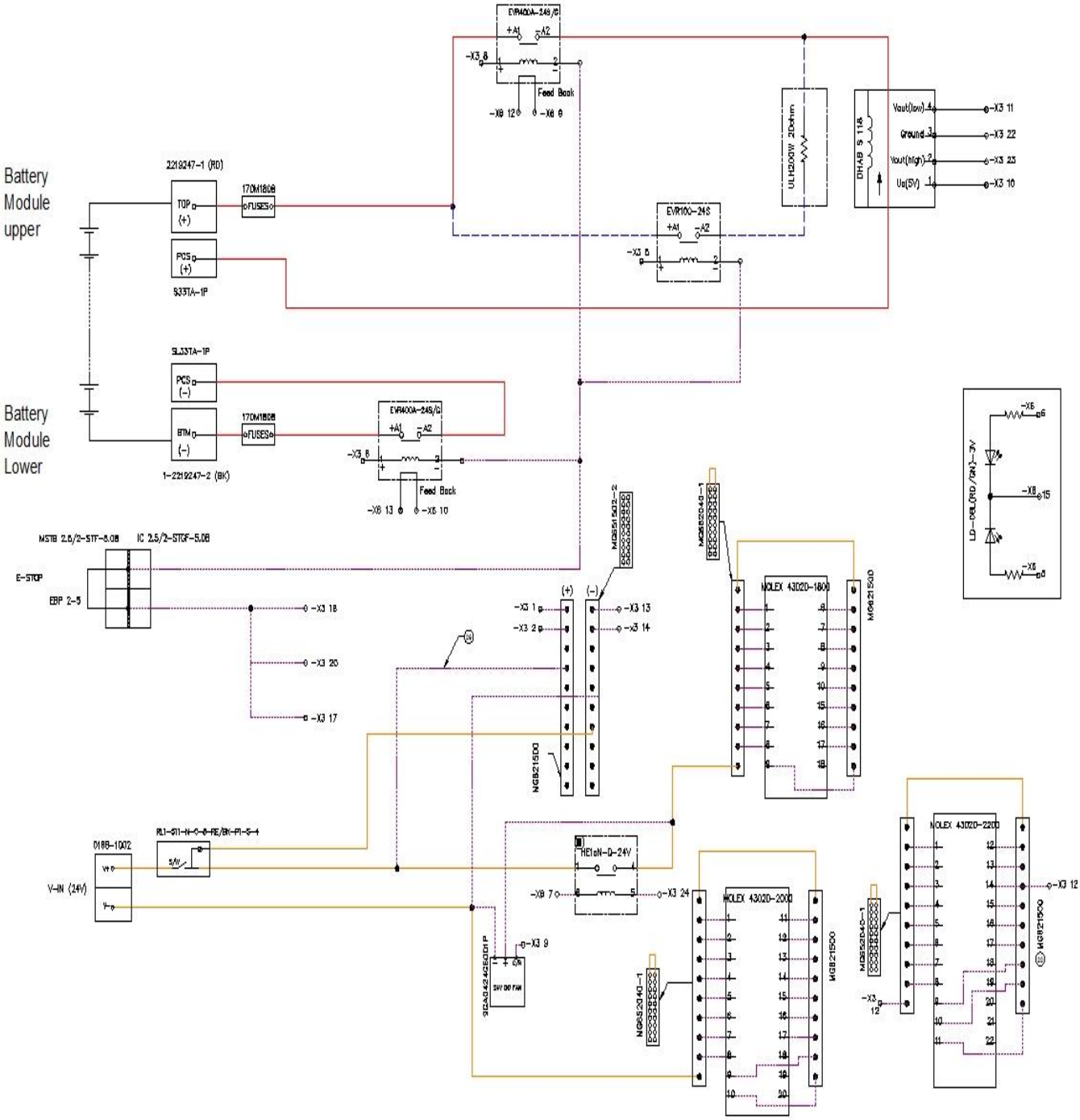


4.7. COMPONENTS LIST AND FUNCTION

Component	Part Number	Function
Relay	HE1aN-Q-24V	Fan ON/OFF
Pre-charge Relay	EVR100-24S	Prevents Inrush Current when the contactor to the inverter is closed.
Contactor(1)	EVR400A-24S/G	Switch Rack Circuit
Fuse	170M1811	Protect to Over Current by Battery or Grid Power System Protection from battery module failure
Current Sensor	DHAB S 118	Measuring current of Battery Charge/Discharge
Pre-charge Resistor	ULH200 20OHM 3500V	Limits Inrush Current when Pre-charge Relay On State
Terminal Block	SL33TA-1P	PCS Connection
	0168-1002	Control power
Header	2219247-1 (Positive : RD, "+")	Battery Connection
	1-2219247-2 (Negative : BK, "-")	
FAN	9GA0424G6001P	BPU Cooling
Housing	2PIN Housing (Phoenix : MSTB 2.5/2-STF-5.08)	Emergency Stop

(1) : Contactor is located on BPU in the backward direction of battery charging

4.8. SCHEMATIC DIAGRAM



Summary: Response to Third Set of Interrogatories from Staff of the OPSB electronically filed by Christine M.T. Pirik on behalf of Vinton Solar Energy LLC