Tighe&Bond
Engineers | Environmental Specialists

C 0917

July 10, 2018

Ashland Planning Board
c/o Sheila Page
101 Main Street
Ashland, MA 01721

Re: **Ashland Landfill Solar Project**
Supplemental Information

Dear Ms. Page and Members of the Board:

On behalf of Ashland Solar, LLC (the Applicant), Tighe & Bond is pleased to provide supplemental information to the Planning Board in support of the application for Site Plan Review for the Ashland Landfill Solar project (Project), submitted on May 1, 2018. Information provided in this letter is intended to address comments raised at the first Planning Board hearing for the Project on June 14, 2018.

Tighe & Bond is also working with the Applicant to develop a response to peer review comments on the Project's Stormwater Permit Application provided by GCG Associates, Inc. on June 6, 2008. Those responses will be circulated to the Planning Board, Conservation Commission, and peer reviewer under separate cover. Lastly, we understand that the Town has engaged Green Environmental to conduct a review of the Project's engineering and design issues related to construction on the Nyanza landfill cap. Preliminary feedback and questions based on Green Environmental's review were relayed through the Town Planner on July 9, 2018. Upon receipt of the formal peer review comments, a response will be circulated to the Planning Board.

Based on comments raised by the Planning Board, Conservation Commission, and stormwater peer reviewer, minor modifications to the Project design are being made. An updated set of Progress Drawings will be presented at the Planning Board hearing on July 12, 2018 and a revised stamped set of drawings will be submitted following the completion of all review changes.

Discussion items raised at the June 14, 2018 hearing are provided below in bold, followed by our response in italics.

1) **Provide more information to Planning Board (narrative and updated plans) regarding what is required for applicant-owned utility pole installation and maintenance? (Address clearing, access roads)**

There is a total of approximately 1,800 ft of proposed overhead medium voltage cable connecting the southern equipment pad to the northern equipment and then interconnecting to the existing utility grid at Eversource utility pole #30 5/6 on Megunko Road. The overhead ("OHW") run will have poles spaced 100-125 feet apart and will be imbedded approximated 5-6 feet in the ground. Construction of the OHW run will be performed using an small excavator or combination hoe and bucket trucks, and ongoing operations and maintenance would require access to poles by a bucket truck along an approximately 10 foot wide gravel access road. The path for this overhead run will require minimal clearing of a ~225ft stretch just south of Megunko Road. The width of this clearing would be

approximately 25 feet, and will be maintained for the life of the project for operations and maintenance activities.

Design in the immediate vicinity of the point of interconnection (POI) at utility pole #30 5/6 on Megunko Road is still ongoing, but Ashland Solar anticipates the 6 poles leading up to the POI to be spaced approximately 50ft apart. The three poles closest to the POI will be utility owned poles (utility recloser, utility meter, utility disconnect switch), and the remaining three poles will be owned by Ashland Solar (disconnect switch, recloser, meter). The redundancy of this equipment is meant to protect the Utility infrastructure from the solar infrastructure and vice versa. Additionally, the equipment that these poles support is pole mounted equipment and will be connected via OHW wiring until it gets to the start of the landfill cap.

The remainder of the medium voltage run to the southern equipment pad is OHW as it traverses the environmentally sensitive Nyanza site; the overhead approach will cause the least disturbance to the site. Lastly, due to the unknown nature of the subsurface conditions (boulders, rock shelve, underground utilities [in service and abandoned], tree roots, etc.), electing to go OHW creates the least disturbance on the site and is the more economically viable option.

2) Provide a landscaping plan in updated drawing set showing screening along MBTA Road.

Since the first Planning Board hearing, the Applicant has engaged in discussions with the owner of the Cirrus Apartment complex on MBTA road. Based on those discussions, a screening plan has been developed to mitigate potential visual impacts from the Project. A proposed screening plan and profile cuts showing potential visual impacts will be provided at or before the July 12, 2018 hearing. Existing vegetation along MBTA Road will be selectively managed to a maximum height of 10'. Where needed, additional vegetation will be installed. Additionally, in those areas where the road grade is similar to the grade of the array along MBTA Road, the Applicant will install privacy slats in the chain link fence to minimize visual impacts as well as a native vine plant at the base of the fence.

3) Check feasibility of underground medium voltage cable off-cap to point of interconnection on Megunko Road.

Due to environmental conditions at the site and in an attempt to limit sub-surface work, the Applicant proposes to keep the medium voltage cable for interconnection on overhead wires as shown in the original application and drawings.

4) Provide update on approval to work on the Shell easement.

The Applicant has consulted with Shell regarding the status of the easement who has indicated that the former pipeline in the easement is abandoned. The Applicant is in the process of obtaining written confirmation from Shell that the Project can be installed as shown, and will circulate this confirmation to the Board upon receipt.

5) Show topography on updated site plans.

Topography will be depicted on the updated progress drawings.

6) Provide specification sheets for inverters with noise information.

Specification sheets for the proposed inverters are provided in Attachment A.

We look forward to discussing the project with the Planning Board at the July 12, 2018 hearing. If you have any questions regarding this submittal or if you require additional information, please contact me at (413) 875-1302.

Very truly yours,
TIGHE & BOND, INC.

Briony Angus, AICP
Senior Project Manager/Associate

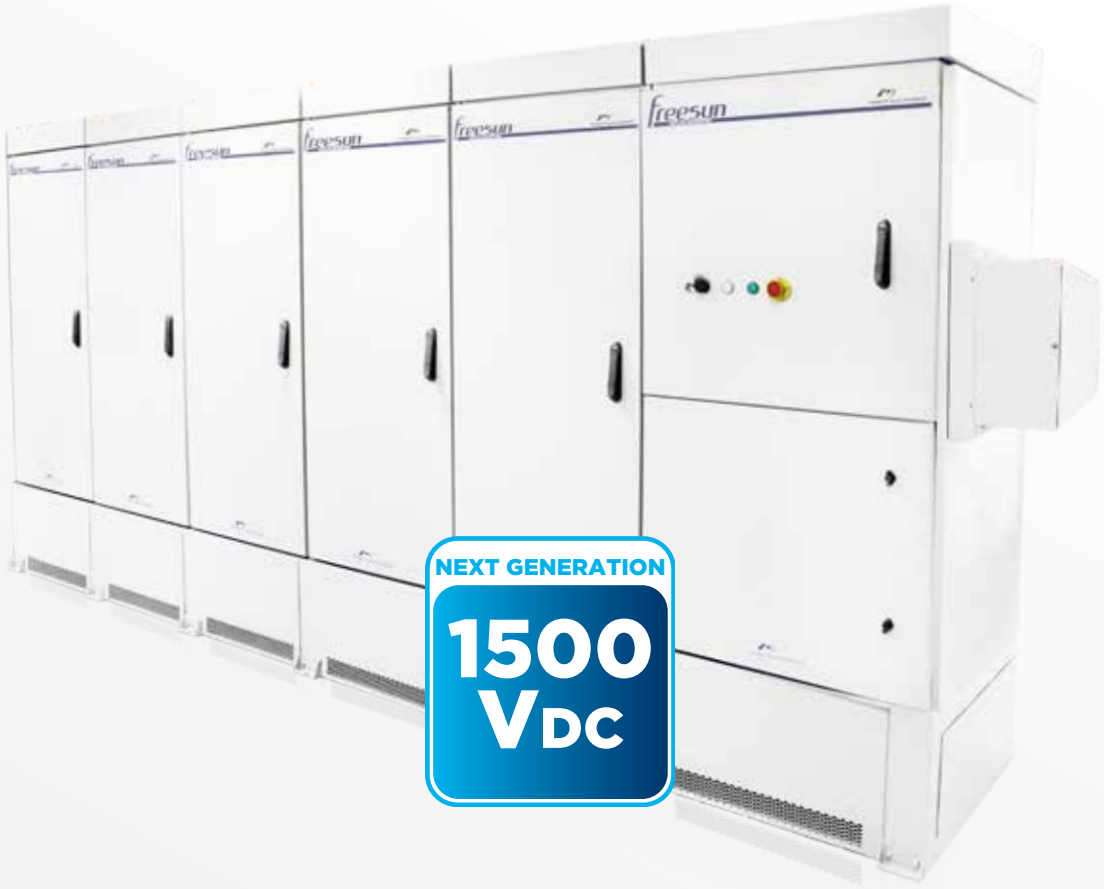
Enclosures: Attachment A – Inverter Specifications

Copy: Emily Mann, Ashland Solar, LLC
Brian Morrissey, Ashland Solar, LLC
Jerry Effren

APPENDIX A

HEC-US V1500

UTILITY SCALE SOLAR INVERTER



EXTENDED MPPT · AUTOMATIC REDUNDANT POWER MODULE SYSTEM · iCOOL V · ADJUSTABLE POWER · OUTDOOR DURABILITY · INGRESS PROTECTION · ACTIVE HEATING · 3 LEVEL TOPOLOGY

HEC-US V1500

The Power Electronics HEC-US V1500 outdoor inverters are powerful and reliable 1500Vdc utility scale PV units for the US market. The HEC-US V1500 inverter family has 20 different UL-1741 certified models ranging from 1MW to 3MW with no derating at 50°C and a 98.5% CEC rated efficiency.

Power Electronics designs and manufactures 1700Vdc power converters for market leading customers in the mining, oil & gas and water industries and for the most demanding environments. With up to 7 425KW power modules connected in parallel, the HEC-US V1500 is a multilevel 1500Vdc system built on the Power Electronics expertise in >1,000Vdc systems and the proven Freesun HEC modular topology. The HEC-US V1500 has a standard stainless steel enclosure and best-in-class cooling at 50°C without derating to ensure reliable performance in the most demanding conditions.

Power Electronics offers customized NEC2014 compliant FSDK15 external DC Recombiner cabinets. The FSDK15 includes user specified overcurrent protection up to 400 Amps with 16 or 32 inputs to support higher ratio DC:AC PV designs. FSDK15 cabinets include current monitoring.

Power Electronics continues to evolve with the solar industry and the HEC-US V1500 is designed specifically to meet the new demand for 1500Vdc PV systems.

THE MOST POWERFUL AND RELIABLE 1500VDC UL-1741 CERTIFIED UTILITY-SCALE PV INVERTER IN THE MARKET

HEC-US V1500

TECHNICAL CHARACTERISTICS

		565VAC - MPPt Window 800V-1310V				
		FRAME 3	FRAME 4	FRAME 5	FRAME 6	FRAME 7
NUMBER OF MODULES		3	4	5	6	7
REFERENCE		FS1050CU15	FS1400CU15	FS1750CU15	FS2100CU15	FS2450CU15
OUTPUT	AC Output Power(kVA/kW) @50°C [1]	1050	1400	1750	2100	2450
	AC Output Power(kVA/kW) @25°C [1]	1250	1675	2090	2510	2930
	AC Output Power(kW) @50°C; PF=0.9	945	1260	1575	1890	2205
	Max. AC Output Current (A) @25°C	1285	1710	2140	2570	3000
	Operating Grid Voltage (VAC)	565V ±10%				
	Operating Grid Frequency (Hz)	60Hz				
	Current Harmonic Distortion (THDi)	< 3% per IEEE519				
	Power Factor (cosine phi) [2]	0.0 leading ... 0.0 lagging / Reactive Power injection at night				
	Power Curtailment (kVA)	0...100% / 0.1% Steps				
INPUT	MPPt @full power (VDC) [1]	800V - 1310V				
	Maximum DC voltage	1500V				
	Minimum Start Voltage	1050V - User configurable				
	Max. DC continuous current (A)	1600	2140	2675	3210	3745
	Max. DC short circuit current (A)	2320	3100	3880	4650	5450
EFFICIENCY & AUX. SUPPLY	Efficiency (Max) (η)	98.2%	98.4%	98.5%	98.5%	98.5%
	CEC (η)	98.0%	98.0%	98.0%	98.5%	98.5%
	Max. Standby Consumption (Pnight)	< approx. 50W/per module				
	Control Power Supply	120V / 208VAC–6kVA power supply available for external equipment (optional)				
CABINET	Dimensions [WxDxH] [inches]	119.6"x37.2"x86.5"	147.6"x37.2"x86.5"	175.7"x37.2"x86.5"	203.8"x37.2"x86.5"	231.9"x37.2"x86.5"
	Dimensions [WxDxH] [mm]	3038x945x2198	3751x945x2198	4464x945x2198	5177x945x2198	5890x945x2198
	Weight (kg)	2635	3290	3945	4600	5255
	Weight (lbs)	5809	7253	8697	10141	11585
	Air Flow	Bottom intake. Exhaust top rear vent.				
	Type of ventilation	Forced air cooling				
ENVIRON-MENT	Degree of protection	NEMA 3R				
	Permissible Ambient Temperature	-31°F to +140°F, -35°C[3] to +60°C / Active Power derating >50°C/122°F				
	Relative Humidity	0% to 100% non condensing				
	Max. Altitude (above sea level)	2000m / >2000m power derating (Max. 4000m)				
	Noise level [4]	< 70 dBA				
CONTROL INTERFACE	Interface	Graphic Display (inside cabinet) / Optional Freesun App				
	Communication protocol	Modbus TCP/IP				
	Power Plant Controller	Optional / Compatible with Third Party SCADA Systems				
	Keyed ON/OFF switch	Standard				
	Digital I/O	User configurable				
	Analog I/O	User configurable				
PROTECTIONS	Ground Fault Protection	Floating PV array: Isolation Monitoring per MPP NEC2014 Grounded PV Array: GFDI protection Optional PV Array transfer kit: GFDI and Isolation monitoring device				
	Humidity control	Active Heating				
	General AC Protection & Disconn.	Circuit Breaker				
	General DC Protection & Disconn.	External Disconnecting Unit Cabinet				
	Module AC Protection & Disconn.	AC contactor & fuses				
	Module DC Protection	DC fuses				
	Overvoltage Protection	AC and DC protection (type 2)				
CERTI-FICA-TIONS	Safety	UL 1741; CSA 22.2 No.107.1-01				
	Utility interconnect	IEEE 1547 with Utility Interactive Control functions				

NOTES [1] Values at 1.00•Vac nom and cos Φ= 1. Consult Power Electronics for derating curves.
[2] Consult P-Q charts available: $Q(kVAr)=\sqrt{(S(kVA)^2-P(kW)^2)}$
[3] Heating kit option required below -20°C.
[4] Sound pressure level at a distance of 1m from the rear part.

HEC-US V1500

TECHNICAL CHARACTERISTICS

		600VAC - MPPt Window 849V-1310V				
		FRAME 3	FRAME 4	FRAME 5	FRAME 6	FRAME 7
NUMBER OF MODULES		3	4	5	6	7
REFERENCE		FS1100CU15	FS1475CU15	FS1850CU15	FS2225CU15	FS2600CU15
OUTPUT	AC Output Power(kVA/kW) @50°C [1]	1100	1475	1850	2225	2600
	AC Output Power(kVA/kW) @25°C [1]	1335	1780	2225	2660	3110
	AC Output Power(kW) @50°C; PF=0.9	990	1325	1665	2000	2340
	Max. AC Output Current (A) @25°C	1285	1710	2140	2570	3000
	Operating Grid Voltage (VAC)	600V ±10%				
	Operating Grid Frequency (Hz)	60Hz				
	Current Harmonic Distortion (THDi)	< 3% per IEEE519				
	Power Factor (cosine phi) [2]	0.0 leading ... 0.0 lagging / Reactive Power injection at night				
	Power Curtailment (kVA)	0...100% / 0.1% Steps				
INPUT	MPPt @full power (VDC) [1]	849V - 1310V				
	Maximum DC voltage	1500V				
	Minimum Start Voltage	1050V - User configurable				
	Max. DC continuous current (A)	1600	2140	2675	3210	3745
	Max. DC short circuit current (A)	2320	3100	3880	4650	5450
EFFICIENCY & AUX. SUPPLY	Efficiency (Max) (η)	98.4%	98.5%	98.6%	98.6%	98.6%
	CEC (η)	98.0%	98.0%	98.5%	98.5%	98.5%
	Max. Standby Consumption (Pnight)	< approx. 50W/per module				
	Control Power Supply	120V / 208VAC–6kVA power supply available for external equipment (optional)				
CABINET	Dimensions [WxDxH] [inches]	119.6"x37.2"x86.5"	147.6"x37.2"x86.5"	175.7"x37.2"x86.5"	203.8"x37.2"x86.5"	231.9"x37.2"x86.5"
	Dimensions [WxDxH] [mm]	3038x945x2198	3751x945x2198	4464x945x2198	5177x945x2198	5890x945x2198
	Weight (kg)	2635	3290	3945	4600	5255
	Weight (lbs)	5809	7253	8697	10141	11585
	Air Flow	Bottom intake. Exhaust top rear vent.				
	Type of ventilation	Forced air cooling				
ENVIRON-MENT	Degree of protection	NEMA 3R				
	Permissible Ambient Temperature	-31°F to +140°F, -35°C[3] to +60°C / Active Power derating >50°C/122°F				
	Relative Humidity	0% to 100% non condensing				
	Max. Altitude (above sea level)	2000m / >2000m power derating (Max. 4000m)				
	Noise level [4]	< 70 dBA				
CONTROL INTERFACE	Interface	Graphic Display (inside cabinet) / Optional Freesun App				
	Communication protocol	Modbus TCP/IP				
	Power Plant Controller	Optional / Compatible with Third Party SCADA Systems				
	Keyed ON/OFF switch	Standard				
	Digital I/O	User configurable				
	Analog I/O	User configurable				
PROTECTIONS	Ground Fault Protection	Floating PV array: Isolation Monitoring per MPP NEC2014 Grounded PV Array: GFDI protection Optional PV Array transfer kit: GFDI and Isolation monitoring device				
	Humidity control	Active Heating				
	General AC Protection & Disconn.	Circuit Breaker				
	General DC Protection & Disconn.	External Disconnecting Unit Cabinet				
	Module AC Protection & Disconn.	AC contactor & fuses				
	Module DC Protection	DC fuses				
	Overvoltage Protection	AC and DC protection (type 2)				
CERTI-FICA-TIONS	Safety	UL 1741; CSA 22.2 No.107.1-01				
	Utility interconnect	IEEE 1547 with Utility Interactive Control functions				

NOTES [1] Values at 1.00•Vac nom and cos Φ= 1. Consult Power Electronics for derating curves.
[2] Consult P-Q charts available: $Q(kVAr)=\sqrt{(S(kVA)^2-P(kW)^2)}$
[3] Heating kit option required below -20°C.
[4] Sound pressure level at a distance of 1m from the rear part.

HEC-US V1500

TECHNICAL CHARACTERISTICS

		630VAC - MPPt Window 891V-1310V				
		FRAME 3	FRAME 4	FRAME 5	FRAME 6	FRAME 7
NUMBER OF MODULES		3	4	5	6	7
REFERENCE		FS1270CU15	FS1695CU15	FS2120CU15	FS2540CU15	FS3001CU15
OUTPUT	AC Output Power(kVA/kW) @50°C [1]	1180	1570	1965	2360	2750
	AC Output Power(kVA/kW) @40°C [1]	1270	1695	2120	2540	3000
	AC Output Power(kVA/kW) @25°C [1]	1400	1870	2340	2800	3275
	Max. AC Output Current (A) @50°C	1080	1440	1800	2160	2520
	Max. AC Output Current (A) @40°C	1165	1550	1940	2330	2715
	Max. AC Output Current (A) @25°C	1285	1710	2140	2570	3000
	Operating Grid Voltage (VAC)	630V ±10%				
	Operating Grid Frequency (Hz)	60Hz				
	Current Harmonic Distortion (THDi)	< 3% per IEEE519				
	Power Factor (cosine phi) [2]	0.0 leading ... 0.0 lagging / Reactive Power injection at night				
	Power Curtailment (kVA)	0...100% / 0.1% Steps				
INPUT	MPPt @full power (VDC)	@50°C 891V-1310V / @40°C 891V-1285V / @25°C 891V-1250V				
	Maximum DC voltage	1500V				
	Minimum Start Voltage	1050V - User configurable				
	Max. DC continuous current (A)	1600	2140	2675	3210	3745
	Max. DC short circuit current (A)	2320	3100	3880	4650	5450
EFFICIENCY & AUX. SUPPLY	Efficiency (Max) (η) Preliminary	98.5%				
	CEC (η) Preliminary	98.5%				
	Max. Standby Consumption (Pnight)	< approx. 50W/per module				
	Control Power Supply	120V / 208VAC-6kVA power supply available for external equipment (optional)				
CABINET	Dimensions [WxDxH] [inches]	119.6"x37.2"x86.5"	147.6"x37.2"x86.5"	175.7"x37.2"x86.5"	203.8"x37.2"x86.5"	231.9"x37.2"x86.5"
	Dimensions [WxDxH] [mm]	3038x945x2198	3751x945x2198	4464x945x2198	5177x945x2198	5890x945x2198
	Weight (kg)	2635	3290	3945	4600	5255
	Weight (lbs)	5809	7253	8697	10141	11585
	Air Flow	Bottom intake. Exhaust top rear vent.				
	Type of ventilation	Forced air cooling				
ENVIRON-MENT	Degree of protection	NEMA 3R				
	Permissible Ambient Temperature	-31°F to +140°F, -35°C[3] to +60°C / Power derating >40°C/104°F				
	Relative Humidity	0% to 100% non condensing				
	Max. Altitude (above sea level)	2000m / >2000m power derating (Max. 4000m)				
	Noise level [4]	< 70 dBA				
CONTROL INTERFACE	Interface	Graphic Display (inside cabinet) / Optional Freesun App				
	Communication protocol	Modbus TCP/IP				
	Power Plant Controller	Optional / Compatible with Third Party SCADA Controls				
	Keyed ON/OFF switch	Standard				
	Digital I/O	User configurable				
	Analog I/O	User configurable				
PROTECTIONS	Ground Fault Protection	Floating PV array: Isolation Monitoring per MPP NEC2014 Grounded PV Array: GFDI protection Optional PV Array transfer kit: GFDI and Isolation monitoring device				
	Humidity control	Active Heating				
	General AC Protection & Disconn.	Circuit Breaker				
	General DC Protection & Disconn.	External Disconnecting Unit Cabinet				
	Module AC Protection & Disconn.	AC contactor & fuses				
	Module DC Protection	DC fuses				
	Overvoltage Protection	AC and DC protection (type 2)				
CERTI-FICA-TIONS	Safety	UL 1741; CSA 22.2 No.107.1-01 (pending)				
	Utility interconnect	IEEE 1547 with Utility Interactive Control functions				

NOTES [1] Values at 1.00•Vac nom and cos Φ= 1. Consult Power Electronics for derating curves.
[2] Consult P-Q charts available: $Q(kVAr)=\sqrt{(S(kVA)^2-P(kW)^2)}$
[3] Heating kit option required below -20°C.
[4] Sound pressure level at a distance of 1m from the rear part.

HEC-US V1500

TECHNICAL CHARACTERISTICS

		645VAC - MPPt Window 913V-1310V				
		FRAME 3	FRAME 4	FRAME 5	FRAME 6	FRAME 7
NUMBER OF MODULES		3	4	5	6	7
REFERENCE		FS1200CU15	FS1600CU15	FS2000CU15	FS2400CU15	FS2800CU15
OUTPUT	AC Output Power(kVA/kW) @50°C [1]	1200	1600	2000	2400	2800
	AC Output Power(kVA/kW) @25°C [1]	1430	1910	2390	2860	3345
	AC Output Power(kW) @50°C; PF=0.9	1080	1440	1800	2160	2520
	Max. AC Output Current (A) @25°C	1285	1710	2140	2570	3000
	Operating Grid Voltage (VAC)	645V ±10%				
	Operating Grid Frequency (Hz)	60Hz				
	Current Harmonic Distortion (THDi)	< 3% per IEEE519				
	Power Factor (cosine phi) [2]	0.0 leading ... 0.0 lagging / Reactive Power injection at night				
	Power Curtailment (kVA)	0...100% / 0.1% Steps				
INPUT	MPPt @full power (VDC) [1]	913V - 1310V				
	Maximum DC voltage	1500V				
	Minimum Start Voltage	1075V - User configurable				
	Max. DC continuous current (A)	1600	2140	2675	3210	3745
	Max. DC short circuit current (A)	2320	3100	3880	4650	5450
EFFICIENCY & AUX. SUPPLY	Efficiency (Max) (η)	98.4%	98.5%	98.6%	98.6%	98.6%
	CEC (η)	98.0%	98.0%	98.5%	98.5%	98.5%
	Max. Standby Consumption (Pnight)	< approx. 50W/per module				
	Control Power Supply	120V / 208VAC–6kVA power supply available for external equipment (optional)				
CABINET	Dimensions [WxDxH] [inches]	119.6"x37.2"x86.5"	147.6"x37.2"x86.5"	175.7"x37.2"x86.5"	203.8"x37.2"x86.5"	231.9"x37.2"x86.5"
	Dimensions [WxDxH] [mm]	3038x945x2198	3751x945x2198	4464x945x2198	5177x945x2198	5890x945x2198
	Weight (kg)	2635	3290	3945	4600	5255
	Weight (lbs)	5809	7253	8697	10141	11585
	Air Flow	Bottom intake. Exhaust top rear vent.				
	Type of ventilation	Forced air cooling				
ENVIRON-MENT	Degree of protection	NEMA 3R				
	Permissible Ambient Temperature	-31°F to +140°F, -35°C[3] to +60°C / Active Power derating >50°C/122°F				
	Relative Humidity	0% to 100% non condensing				
	Max. Altitude (above sea level)	2000m / >2000m power derating (Max. 4000m)				
	Noise level [4]	< 70 dBA				
CONTROL INTERFACE	Interface	Graphic Display (inside cabinet) / Optional Freesun App display				
	Communication protocol	Modbus TCP/IP				
	Power Plant Controller	Optional / Compatible with Third Party SCADA Systems				
	Keyed ON/OFF switch	Standard				
	Digital I/O	User configurable				
	Analog I/O	User configurable				
PROTECTIONS	Ground Fault Protection	Floating PV array: Isolation Monitoring per MPP NEC2014 Grounded PV Array: GFDI protection Optional PV Array transfer kit: GFDI and Isolation monitoring device				
	Humidity control	Active Heating				
	General AC Protection & Disconn.	Circuit Breaker				
	General DC Protection & Disconn.	External Disconnecting Unit Cabinet				
	Module AC Protection & Disconn.	AC contactor & fuses				
	Module DC Protection	DC fuses				
	Overvoltage Protection	AC and DC protection (type 2)				
CERTI-FICA-TIONS	Safety	UL 1741; CSA 22.2 No.107.1-01				
	Utility interconnect	IEEE 1547 with Utility Interactive Control functions				

NOTES [1] Values at 1.00•Vac nom and cos Φ= 1. Consult Power Electronics for derating curves.
[2] Consult P-Q charts available: $Q(kVAr)=\sqrt{(S(kVA)^2-P(kW)^2)}$
[3] Heating kit option required below -20°C.
[4] Sound pressure level at a distance of 1m from the rear part.

HEC-US V1500

TECHNICAL CHARACTERISTICS

		690VAC - MPPt Window 976V-1310V				
		FRAME 3	FRAME 4	FRAME 5	FRAME 6	FRAME 7
NUMBER OF MODULES		3	4	5	6	7
REFERENCE		FS1275CU15	FS1700CU15	FS2125CU15	FS2550CU15	FS3000CU15
OUTPUT	AC Output Power(kVA/kW) @50°C [1]	1275	1700	2125	2550	3000
	AC Output Power(kVA/kW) @25°C [1]	1530	2040	2550	3060	3500
	AC Output Power(kW) @50°C; PF=0.9	1150	1530	1910	2250	2700
	Max. AC Output Current (A) @25°C	1285	1710	2140	2570	3000
	Operating Grid Voltage (VAC)	690V ±10%				
	Operating Grid Frequency (Hz)	60Hz				
	Current Harmonic Distortion (THDi)	< 3% per IEEE519				
	Power Factor (cosine phi) [2]	0.0 leading ... 0.0 lagging / Reactive Power injection at night				
	Power Curtailment (kVA)	0...100% / 0.1% Steps				
INPUT	MPPt @full power (VDC) [1]	976V - 1310V				
	Maximum DC voltage	1500V				
	Minimum Start Voltage	1100V - User configurable				
	Max. DC continuous current (A)	1600	2140	2675	3210	3745
	Max. DC short circuit current (A)	2320	3100	3880	4650	5450
EFFICIENCY & AUX. SUPPLY	Efficiency (Max) (η)	98.5%	98.7%	98.7%	98.7%	98.7%
	CEC (η)	98.0%	98.5%	98.5%	98.5%	98.5%
	Max. Standby Consumption (Pnight)	< approx. 50W/per module				
	Control Power Supply	120V / 208VAC–6kVA power supply available for external equipment (optional)				
CABINET	Dimensions [WxDxH] [inches]	119.6"x37.2"x86.5"	147.6"x37.2"x86.5"	175.7"x37.2"x86.5"	203.8"x37.2"x86.5"	231.9"x37.2"x86.5"
	Dimensions [WxDxH] [mm]	3038x945x2198	3751x945x2198	4464x945x2198	5177x945x2198	5890x945x2198
	Weight (kg)	2635	3290	3945	4600	5255
	Weight (lbs)	5809	7253	8697	10141	11585
	Air Flow	Bottom intake. Exhaust top rear vent.				
	Type of ventilation	Forced air cooling				
ENVIRON-MENT	Degree of protection	NEMA 3R				
	Permissible Ambient Temperature	-31°F to +140°F, -35°C[3] to +60°C / Active Power derating >50°C/122°F				
	Relative Humidity	0% to 100% non condensing				
	Max. Altitude (above sea level)	2000m / >2000m power derating (Max. 4000m)				
	Noise level [4]	< 79 dBA				
CONTROL INTERFACE	Interface	Graphic Display (inside cabinet) / Optional Freesun App				
	Communication protocol	Modbus TCP/IP				
	Power Plant Controller	Optional / Compatible with Third Party SCADA Systems				
	Keyed ON/OFF switch	Standard				
	Digital I/O	User configurable				
	Analog I/O	User configurable				
PROTECTIONS	Ground Fault Protection	Floating PV array: Isolation Monitoring per MPP NEC2014 Grounded PV Array: GFDI protection Optional PV Array transfer kit: GFDI and Isolation monitoring device				
	Humidity control	Active Heating				
	General AC Protection & Disconn.	Circuit Breaker				
	General DC Protection & Disconn.	External Disconnecting Unit Cabinet				
	Module AC Protection & Disconn.	AC contactor & fuses				
	Module DC Protection	DC fuses				
	Overvoltage Protection	AC and DC protection (type 2)				
CERTI-FICA-TIONS	Safety	UL 1741; CSA 22.2 No.107.1-01				
	Utility interconnect	IEEE 1547 with Utility Interactive Control functions				

NOTES [1] Values at 1.00•Vac nom and cos Φ= 1. Consult Power Electronics for derating curves.
[2] Consult P-Q charts available: $Q(kVAr)=\sqrt{(S(kVA)^2-P(kW)^2)}$
[3] Heating kit option required below -20°C.
[4] Sound pressure level at a distance of 1m from the rear part.

POWER ELECTRONICS
PURE **ENERGY**

For more information on
Power Electronics Product Families

Contact:

Engineering and Sales Support,
Power Electronics USA
Email: sales@power-electronics.com
Phone: (602) 354-4890

Or visit us at
www.Power-Electronics.com