

David Mooney

From: Diana Mitchell
Sent: Monday, 4 December 2017 2:10 PM
To: David Mooney
Cc: Clay Preshaw
Subject: RE: HPE CM: Beryl Solar Farm - Amended Conditions
Attachments: IS B Series family at 1500 Vdc_v2.pdf; SW103_Constraints_20171204.pdf

Hi David,

Please find attached the updated map to include in Appendix 1 of the Beryl Solar Farm conditions of consent, which includes the location of the inverters.

The noise impact assessment prepared by Renzo Tonin & Associates in March 2017 that accompanied the Beryl Solar Farm EIS predicted the operational noise of the project by modelling the noise sources, receiver locations and topographical features of the intervening area.

The modelled noise sources associated with the operation of the project included:

- 3,600 tracking motors associated with the single-axis tracking system, with a sound power level of 78 dB(A) each; and
- 22 inverter stations (each with 3 Ingeteam 1640TL B630 Inverters), with a sound power level (SWL) of 88 dB(A) each.

Note that the manufacturer's noise sound pressure level (SPL) rating for the inverters is < 77dB(A) @ 1m (refer attached data sheet). The Department understands that First Solar took the worst case SPL and applied a conservative formula for converting the SPL to SWL, which resulted in a further 3dB(A) conservatism (i.e. $SWL = SPL + 20 \times \log(\text{distance}) + 11$ ==> $SWL = 77 + 20 \times \log(1) + 11 = 88\text{dB(A)}$).

For your reference, an example of an operating project in NSW which uses single-axis tracking and inverters similar to those modelled for the Beryl Solar Farm is the [56 MW Moree Solar Farm](#).

The Department understands that the location of the noise sources was based on the original project layout, and included inverter stations located both in the western portion of the project site and in the area of the project site zoned R5. The inverter stations are located either south of, or central to, the location of the solar arrays, setting them back from the nearest residences R2 and R3 a minimum of 550 m and 750 m, respectively.

The noise impact assessment for the Beryl Solar Farm concluded that the noise levels from the operation of the project would comply with the relevant noise criteria of 35 dB(A) established under the *Industrial Noise Policy* at all residences under all scenarios and meteorological conditions, with the highest predicted noise levels being 32 dB(A) at receivers R2 and R3.

Feel free to contact me if you require any additional information.

Best Regards,

Diana Mitchell

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From: Diana Mitchell
Sent: Monday, 4 December 2017 10:10 AM
To: David Mooney <David.Mooney@pac.nsw.gov.au>
Cc: Clay Preshaw <Clay.Preshaw@planning.nsw.gov.au>
Subject: HPE CM: Beryl Solar Farm - Amended Conditions

Hi David,

Please find attached the updated recommended conditions for the Beryl Solar Farm.

The conditions regarding landscaping in Schedule 3 have been updated, as well as the conditions regarding incident notification, non-compliance notification and independent environmental audit in Schedule 4. These updates also resulted in some changes to the Definitions.

First Solar is currently preparing a new map to include in Appendix 1 of the conditions, which includes the locations of the inverter stations.

We will provide you this updated map, as well as further information regarding the inverters, this afternoon.

Thank you and feel free to contact me if you have any questions.

Best Regards,

Diana Mitchell

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TRANSFORMERLESS CENTRAL INVERTERS WITH A SINGLE POWER BLOCK

1170TL B450 / 1400TL B540 / 1500TL B578 /
1560TL B600 / 1600TL B615 / 1640TL B630

Maximum power density

These PV central inverters feature more power per cubic foot. Thanks to the use of high-quality components, this inverter series performs at the highest possible level.

Latest generation electronics

The B Series inverters integrate an innovative control unit that runs faster and performs a more efficient and sophisticated inverter control, as it uses a last-generation digital signal processor. Furthermore, the hardware of the control unit allows some more accurate measurements and very reliable protections.

These inverters feature a low voltage ride-through capability and also a lower power consumption thanks to a more efficient power supply electronic board.

Integrated DC and AC connections

The input and output connections are integrated into the same cabinet, facilitating connection, maintenance and repair work.

Maximum protection

These three phase inverters are equipped with a motorized DC switch to decouple the PV generator from the inverter. Moreover, they are also supplied with a motorized AC circuit breaker. Optionally, they can be supplied with DC fuses, smart grounding kit and input current monitoring.

Maximum efficiency values

Through the use of innovative electro-nic conversion topologies, efficiency values of up to 98.9% can be achieved. Thanks to a sophisticated control algorithm, this equipment can guarantee maximum efficiency depending on the PV power available.

Enhanced functionality

This new INGECON® SUN PowerMax range features a revamped, improved enclosure which, together with its innovative air cooling system, makes it possible to increase the ambient operating temperature to deliver its rated power up to 50 °C.



1170TL B450 / 1400TL B540 / 1500TL B578 / 1560TL B600 / 1600TL B615 / 1640TL B630

Long-lasting design

The inverters have been designed to guarantee a long life expectancy, as demonstrated by the stress tests they are subjected to. Standard 5 year warranty, extendable for up to 25 years.

Grid support

The INGECON® SUN PowerMax B Series has been designed to comply with the grid connection requirements in different countries, contributing to the quality and stability of the electric system. These inverters therefore feature a low voltage ride-through capability, and can deliver reactive power and control the active power delivered to the grid.

Ease of maintenance

All the elements can be removed or replaced directly from the inverter's front side, thanks to its new design.

Easy to operate

The INGECON® SUN PowerMax inverters feature an LCD screen for the simple and convenient monitoring of the inverter status and a range of internal variables.

The display also includes a number of LEDs to show the inverter operating status with warning lights to indicate any incidents. All this helps to simplify and facilitate maintenance tasks.

Monitoring and communication

Ethernet communications supplied as standard. The following applications are included at no extra cost: INGECON® SUN Manager, INGECON® SUN Monitor and its Smartphone version Web Monitor, available on the App Store. These applications are used for monitoring and recording the inverter's internal operating variables through the Internet (alarms, real time production, etc.), in addition to the historical production data.

Two communication ports available (one for monitoring and one for plant controlling), allowing fast and simultaneous plant control.

PROTECTIONS

- DC Reverse polarity.
- Short-circuits and overloads at the output.
- Anti-islanding with automatic disconnection.
- Insulation failure DC.
- Up to 15 pairs of fuse-holders.
- Lightning induced DC and AC surge arresters, type II.
- Lightning induced DC surge arresters, type I+II optional.
- Motorized DC switch to automatically disconnect the inverter from the PV array.
- Low-voltage ride-through capability.
- Hardware protection via firmware.
- IP66 protection class for the electronics.

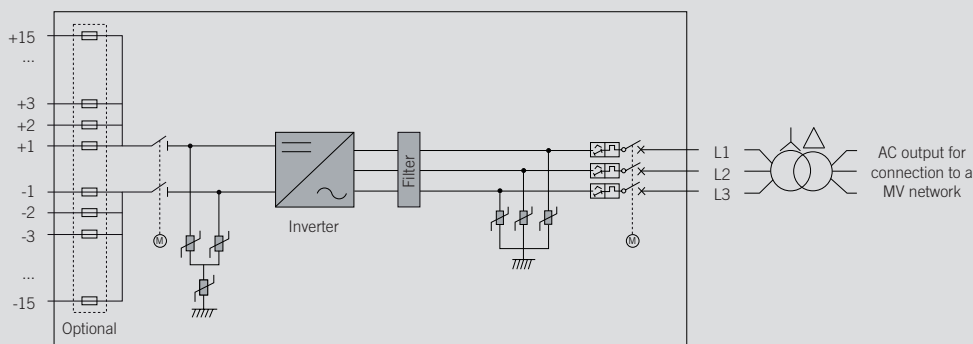
OPTIONAL ACCESSORIES

- AC circuit breaker with remote tripping.
- Motorization kit for the AC circuit breaker.
- Insulation failure AC.
- Grounding kit.
- Heating kit, for operating at an ambient temperature of down to -30 °C.
- DC fuses.
- Monitoring of the DC currents.
- Wattmeter on the AC side.
- PID prevention kit (PID: Potential Induced Degradation).
- Nighttime reactive power injection.

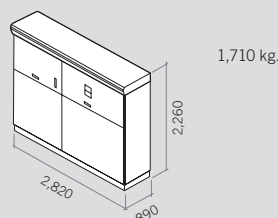
ADVANTAGES OF THE MONOBLOCK VERSION

- Higher power density.
- Latest generation electronics.
- More efficient electronic protection.
- Night time supply to communicate with the inverter at night.
- Enhanced performance.
- Easier maintenance thanks to its new design and enclosure.
- Lightweight spares.
- It allows to ground the PV array.
- Components easily replaceable.
- IP66 protection class for the electronics.

PowerMax B Series



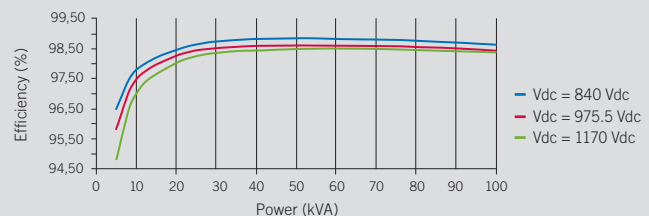
Size and weight (mm)



	1170TL B450	1400TL B540	1500TL B578
Input (DC)			
Recommended PV array power range ⁽¹⁾	1,072 - 1,469 kWp	1,286 - 1,763 kWp	1,377 - 1,887 kWp
Voltage Range MPP ⁽²⁾	660 - 1,300 V	786 - 1,300 V	840 - 1,300 V
Maximum voltage ⁽³⁾	1,500 V		
Maximum current	2,000 A		
N° inputs with fuse holders	6 up to 15		
Fuse dimensions	63 A / 1,500 V to 400 A / 1,500 V fuses (optional)		
Type of connection	Connection to copper bars		
Power blocks	1		
MPPT	1		
Max. current at each input	From 40 A to 250 A for positive and negative poles		
Input protections			
Overvoltage protections	Type II surge arresters (type I+II optional)		
DC switch	Motorized DC load break disconnect		
Other protections	Up to 15 pairs of DC fuses (optional) / Insulation failure monitoring / Anti-islanding protection / Emergency pushbutton		
Output (AC)			
Power @30 °C / @50 °C	1,169 kVA / 1,052 kVA	1,403 kVA / 1,263 kVA	1,502 kVA / 1,352 kVA
Current @30 °C / @50 °C	1,500 A / 1,350 A		
Rated voltage	450 V IT System	540 V IT System	578 V IT System
Frequency	50 / 60 Hz		
Power Factor ⁽⁴⁾	1		
Power Factor adjustable	Yes. S _{max} =1,169 kVA	Yes. S _{max} =1,403 kVA	Yes. S _{max} =1,502 kVA
THD (Total Harmonic Distortion) ⁽⁵⁾	<3%		
Output protections			
Overvoltage protections	Type II surge arresters		
AC breaker	Motorized AC circuit breaker		
Anti-islanding protection	Yes, with automatic disconnection		
Other protections	AC short circuits and overloads		
Features			
Maximum efficiency	98.9%		
Euroefficiency	98.5%		
Max. consumption aux. services	4,250 VA		
Stand-by or night consumption ⁽⁶⁾	60 W		
Average energy consumption per day	30 kWh		
General Information			
Ambient temperature	-20 °C to +60 °C		
Relative humidity (non-condensing)	0 - 100%		
Protection class	IP56 (Outdoor)		
Maximum altitude	4,500 m (for installations beyond 1,000 m, please contact Ingeteam's solar sales department)		
Cooling system	Air forced with temperature control (230 V phase + neutral power supply)		
Air flow	6,200 m ³ /h		
Acoustic emission	< 77 dB (A) at 1 m		
Marking	CE		
EMC and security standards	EN 61000-6-1, EN 61000-6-2, EN 61000-6-4, EN 61000-3-11, EN 61000-3-12, EN 62109-1, EN 62109-2, IEC62103, EN 50178, FCC Part 15, AS3100		
Grid connection standards	IEC 62116, Arrêté 23-04-2008, CEI 0-16 Ed. III, Terna A68, G59/2, BDEW-Mittelspannungsrichtlinie:2011, P.O.12.3, South African Grid code (ver 2.6), Chilean Grid Code, Ecuadorian Grid Code, Peruan Grid code, Thailand PEA requirements, IEC61727, UNE 206007-1, ABNT NBR 16149, ABNT NBR 16150, IEEI 1547, IEEEE1547.1, GGC&CGC China, DEWA (Dubai) Grid code, Jordan Grid Code		

Notes: ⁽¹⁾ Depending on the type of installation and geographical location. Data for STC conditions ⁽²⁾ V_{mpp,min} is for rated conditions (V_{ac}=1 p.u. and Power Factor=1) ⁽³⁾ Consider the voltage increase of the 'Voc' at low temperatures ⁽⁴⁾ For P_{out}>25% of the rated power ⁽⁵⁾ For P_{out}>25% of the rated power and voltage in accordance with IEC 61000-3-4 ⁽⁶⁾ Consumption from PV field when there is PV power available.

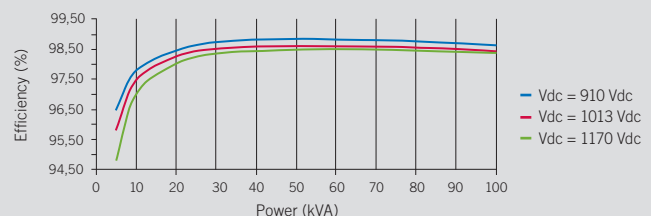
Efficiency INGECON® SUN Power Max B578

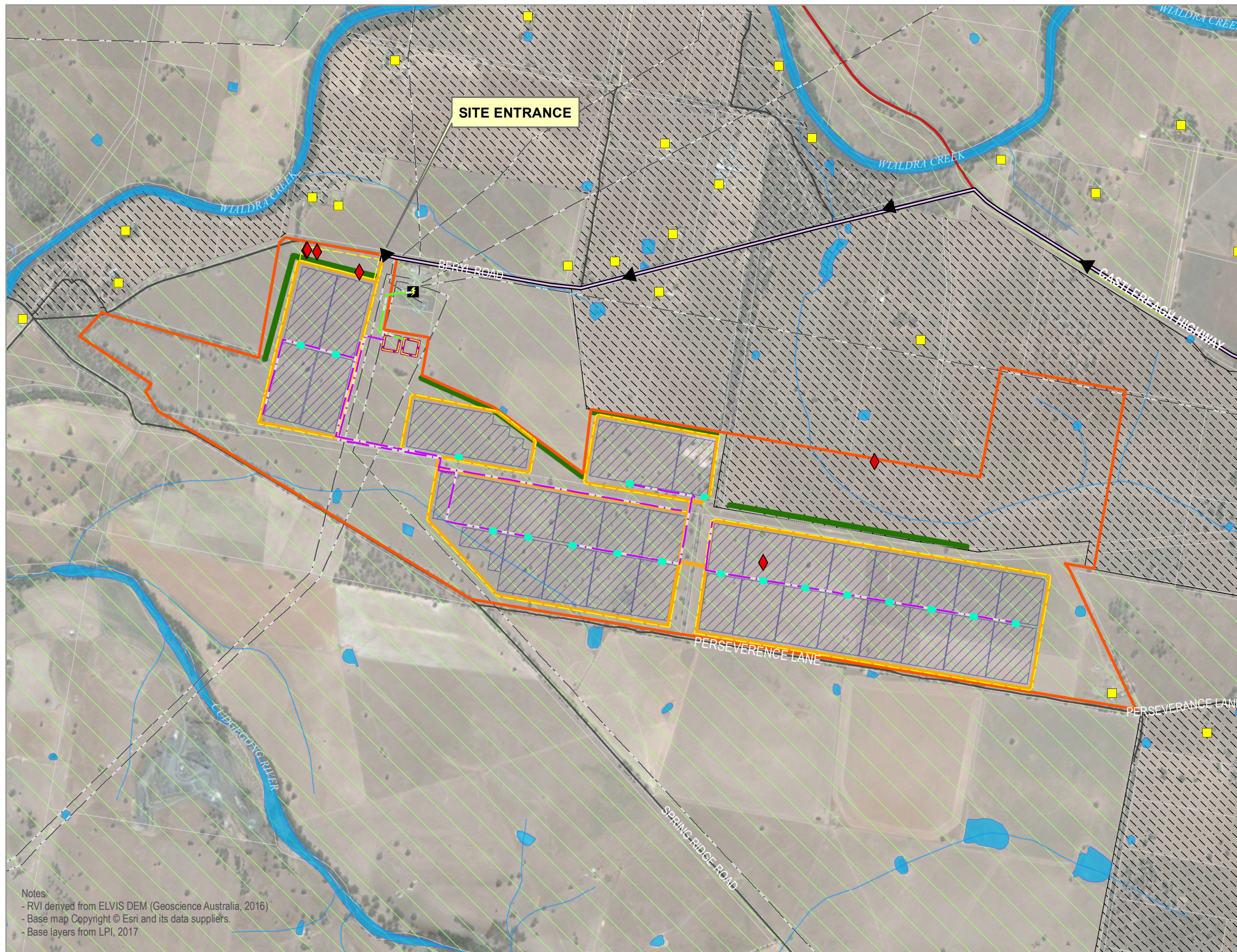


	1560TL B600	1600TL B615	1640TL B630
Input (DC)			
Recommended PV array power range ⁽¹⁾	1,429 - 1,959 kWp	1,465 - 2,008 kWp	1,500 - 2,057 kWp
Voltage Range MPP ⁽²⁾	870 - 1,300 V	889 - 1,300 V	915 - 1,300 V
Maximum voltage ⁽³⁾	1,500 V		
Maximum current	2,000 A		
N° inputs with fuse holders	6 up to 15		
Fuse dimensions	63 A / 1,500 V to 400 A / 1,500 V fuses (optional)		
Type of connection	Connection to copper bars		
Power blocks	1		
MPPT	1		
Max. current at each input	From 40 A to 250 A for positive and negative poles		
Input protections			
Overvoltage protections	Type II surge arresters (type I+II optional)		
DC switch	Motorized DC load break disconnect		
Other protections	Up to 15 pairs of DC fuses (optional) / Insulation failure monitoring / Anti-islanding protection / Emergency pushbutton		
Output (AC)			
Power @30 °C / @50 °C	1,559 kVA / 1,403 kVA	1,598 kVA / 1,438 kVA	1,637 kVA / 1,473 kVA
Current @30 °C / @50 °C	1,500 A / 1,350 A		
Rated voltage	600 V IT System	615 V IT System	630 V IT System
Frequency	50 / 60 Hz		
Power Factor ⁽⁴⁾	1		
Power Factor adjustable	Yes. S _{max} =1,559 kVA	Yes. S _{max} =1,598 kVA	Yes. S _{max} =1,637 kVA
THD (Total Harmonic Distortion) ⁽⁵⁾	<3%		
Output protections			
Overvoltage protections	Type II surge arresters		
AC breaker	Motorized AC circuit breaker		
Anti-islanding protection	Yes, with automatic disconnection		
Other protections	AC short circuits and overloads		
Features			
Maximum efficiency	98.9%		
Euroefficiency	98.5%		
Max. consumption aux. services	4,250 VA		
Stand-by or night consumption ⁽⁶⁾	60 W		
Average energy consumption per day	30 kWh		
General Information			
Operating temperature	-20 °C to +60 °C		
Relative humidity (non-condensing)	0 - 100%		
Protection class	IP56 (Outdoor)		
Maximum altitude	4,500 m (for installations beyond 1,000 m, please contact Ingeteam's solar sales department)		
Cooling system	Air forced with temperature control (230 V phase + neutral power supply)		
Air flow	6,200 m ³ /h		
Acoustic emission	< 77 dB (A) at 1 m		
Marking	CE		
EMC and security standards	EN 61000-6-1, EN 61000-6-2, EN 61000-6-4, EN 61000-3-11, EN 61000-3-12, EN 62109-1, EN 62109-2, IEC62103, EN 50178, FCC Part 15, AS3100		
Grid connection standards	IEC 62116, Arrêté 23-04-2008, CEI 0-16 Ed. III, Terna A68, G59/2, BDEW-Mittelspannungsrichtlinie:2011, P.O.12.3, South African Grid code (ver 2.6), Chilean Grid Code, Ecuadorian Grid Code, Peruan Grid code, Thailand PEA requirements, IEC61727, UNE 206007-1, ABNT NBR 16149, ABNT NBR 16150, IEEEE 1547, IEEEE1547.1, GGC&CGC China, DEWA (Dubai) Grid code, Jordan Grid Code		

Notes: ⁽¹⁾ Depending on the type of installation and geographical location. Data for STC conditions ⁽²⁾ V_{mpp,min} is for rated conditions (V_{ac}=1 p.u. and Power Factor=1) ⁽³⁾ Consider the voltage increase of the 'Voc' at low temperatures ⁽⁴⁾ For P_{out}>25% of the rated power ⁽⁵⁾ For P_{out}>25% of the rated power and voltage in accordance with IEC 61000-3-4 ⁽⁶⁾ Consumption from PV field when there is PV power available.

Efficiency INGECON® SUN Power Max B630





BERYL SOLAR FARM
Constraints map

- Aboriginal heritage site
- Transport route
- Indicative inverter station locations. Not to scale: Max dims 12.2m L x 2.5m W
- Residence
- Overhead transmission lines (proposed)
- Underground transmission lines (proposed)
- Substation (proposed)
- Fence (proposed)
- Road (proposed)
- Array (proposed)
- Project site
- Screening (proposed)
- Substation
- Highway
- Local road
- Drainage feature
- Existing transmission lines
- Farm dam or other water body
- Cadastre
- R5 zoning
- RU1 zoning



Ref: SW103_additional_20170823
 Author: SP Date: 4/12/2017



Notes
 - RVI derived from ELVIS DEM (Geoscience Australia, 2016)
 - Base map Copyright © Esri and its data suppliers.
 - Base layers from LPI, 2017