Norman Disney & Young
A TETRA TECH COMPANY

Report

Urbis

Barwon Solar Farm - Noise Assessment
Acoustic Services

CONFIDENTIAL

Revision: 3.0 – FOR INFORMATION **Issued**: 15 February 2023

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1 EXECUTIVE SUMMARY

1.1 Introduction

This report outlines the acoustic assessment for the proposed 300 MW Barwon Solar Farm Project against the requirements of the EPA noise limits.

The boundary of the solar farm is approximately 70m from the nearest residential receiver.

This report addresses the noise emitted from the site.

1.2 Authority

Authority to undertake this report was provided by Jon Mills of Urbis.

1.3 Information Sources

The report is based upon the following information:

- EPA Publication 1826.4 Noise limit and assessment protocol for the control of noise from commercial, industrial and trade premises and entertainment venues
- EPA Publication 1834 Civic construction building and demolition guide
- Elgin Energy Preliminary Design Layout revision 7.1 dated 12/10/22
- Sunny Central Solar Inverter and Storage Unit Technical Data

1.4 Revision History

	Date Issued	Comment
1.0	30th August 2022	For Information
2.0	17th October 2022	Updated For Information
3.0	15th February 2023	For Information – updated to incorporate EPA 1826.4 and 1834

2 SITE LOCATION AND EPA PUBLICATIONS

2.1 Location and Zoning

The site is located in the City of Greater Geelong. The location of the site (aerial masterplan and planning zoning) are shown in the figures below. The solar farm site is located in FZ Farm Zone according to the EPA Guideline.

Figure 1 - Masterplan showing site context

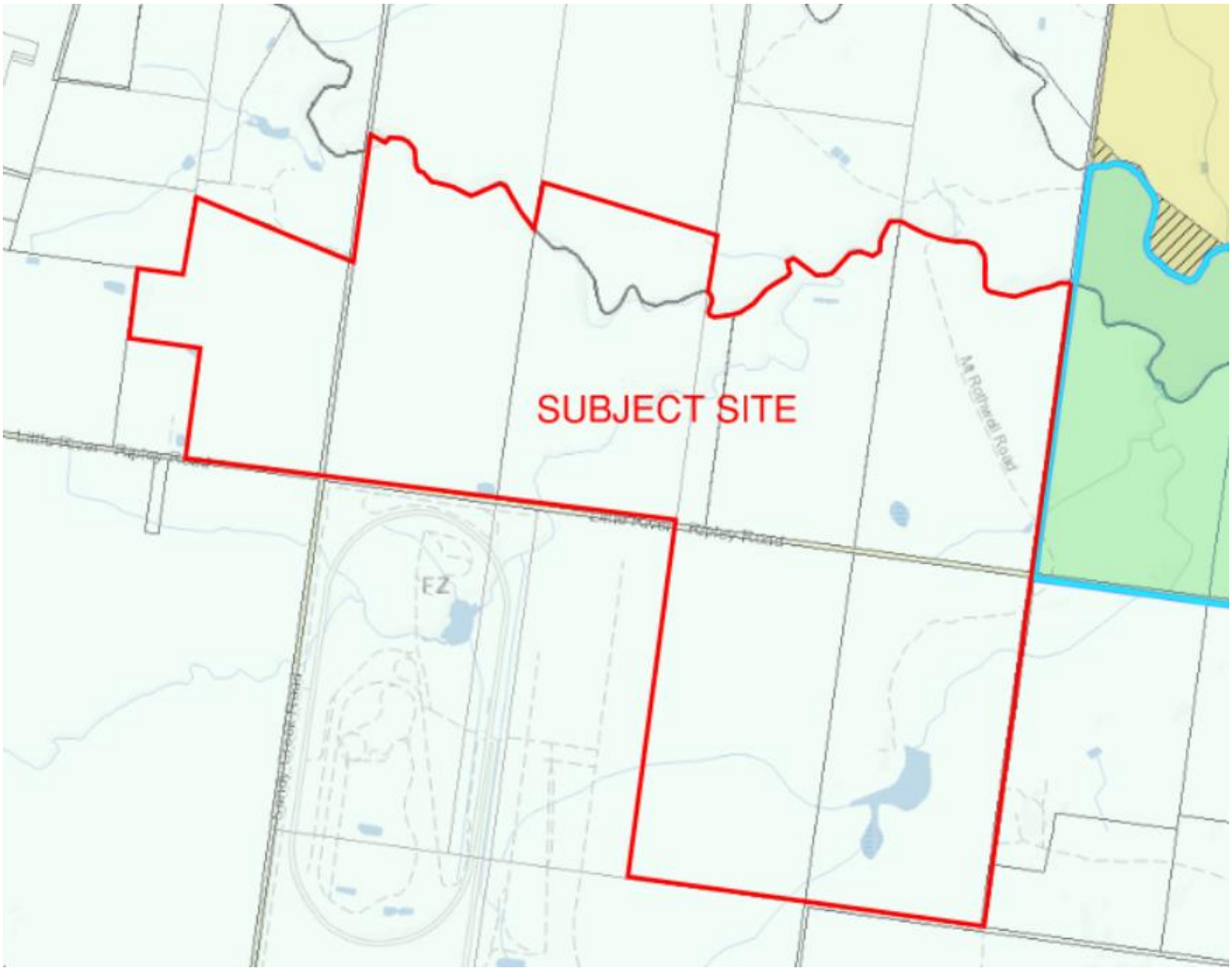


Figure 2 - Planning map showing zoning

2.2 Nearest Receivers

The three dwellings within a 1km radius of the site boundary have been analysed as part of this assessment (Figure 3). The nearest residential buildings are as follows:

- 25 Mt Rothwell Rd (70m from boundary)
- 2430 Bacchus Marsh Rd (840m from boundary)
- 1340 Little River-Ripley Rd (78m from boundary)

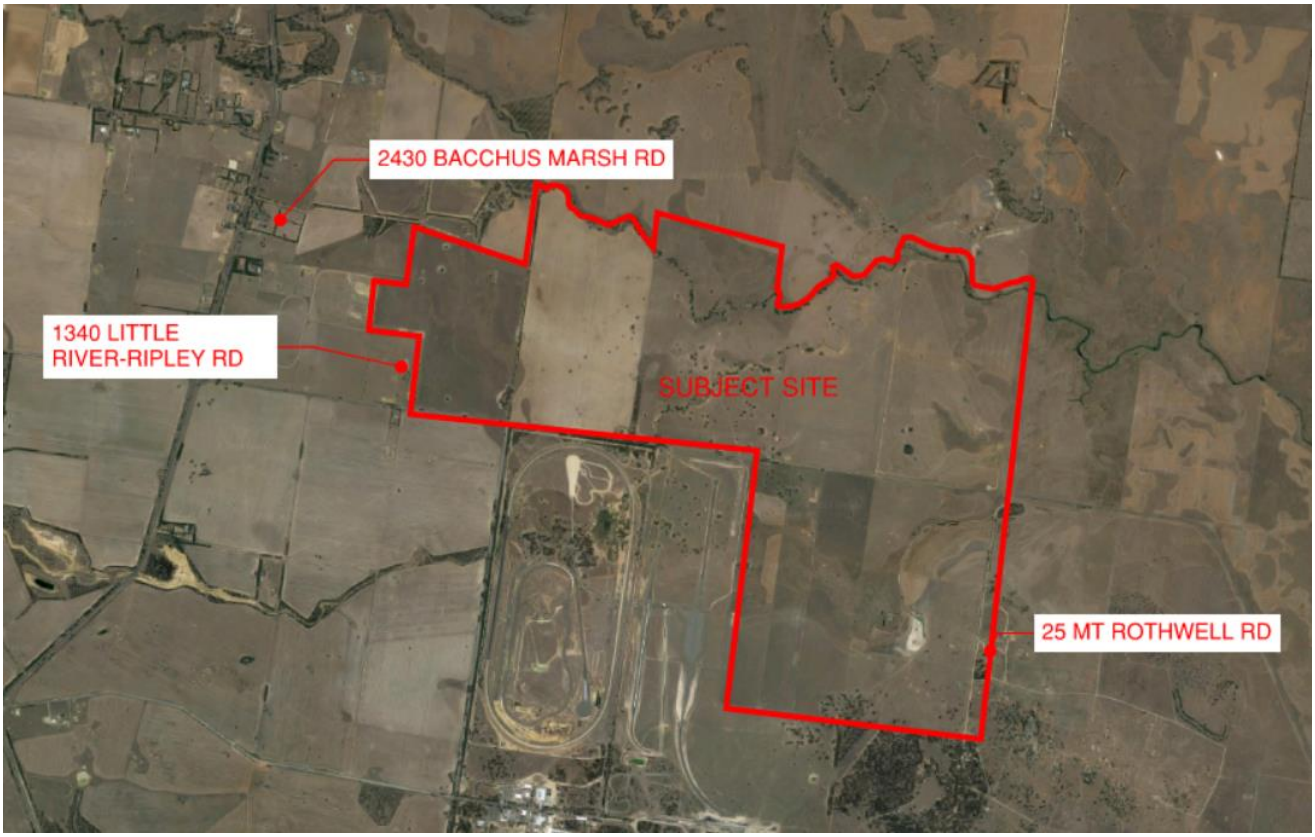


Figure 3 - Nearest Residential Receivers

2.3 EPA Publication 1826.4 Noise Limits

Noise limits in rural areas for utilities are obtained by following the method set out in section 2.6 *Noise limits in rural areas for utilities* of EPA publication 1826.4 *Noise limit and assessment protocol for the control of noise from commercial, industrial and trade premises and entertainment venues*:

(29) Determine the zone level and distance-adjusted level for each period using the method in clauses 19 and 20.

- *(19) Determine the zone levels for each of the day, evening and night periods using Annex B to this Noise Protocol*
- *(20) Adjust the zone levels determined under clause 19 by accounting for the distance between the zone where the noise generator is located and the location of the noise receiver in the noise sensitive area –*
  a. if the noise generator and receiver are covered by the same contiguous zone, the distance adjustment is 0 dB;
  […]

(30) [not applicable]

(31) If the utility is located in a Farming Zone, Rural Activity Zone or Green Wedge Zone and the distance adjustment is 0 dB, and unless a background level assessment is conducted in accordance with clauses 21 to 23, then:

a. the distance-adjusted level for each period is –

i. Day 45 dB(A)

ii. Evening: 39 dB(A)

iii. Night: 34 dB(A)

(32) Where a background level assessment is conducted in accordance with clauses 21 to 23, the noise limit is determined in accordance with clause 24 and rounded to the nearest decibel.

It is apparent based on the above process that the noise limits applicable to the site are as follows:

Table 1 Noise limits applicable to receivers

Period	Noise criteria, dBA
Day	45
Evening	39
Night	34

Given the equipment could operate day or night, the night-time limit of 34dBA is likely to be the relevant criterion for compliance. It is also understood that the inverters and substation will not be operating during night-time periods.

2.4 EPA Publication 1834 Construction Guide

Earthworks and construction noise can impact the health and wellbeing of people when not managed appropriately.

The following should be implemented as part of good project management procedure:

- Identifying sensitive receivers that could be affected by the activities
- Carry out appropriate community engagement
- Avoid the generation of noise and vibration
- Carry out construction works during normal work hours where possible
- Reduce noise and vibration by using the most appropriate equipment and work practices for the activities
- Choosing alternative equipment or methods that generate less noise or vibration
- Maintaining equipment and vehicles according to manufacturer's instructions
- Attenuating noise by obstructing the path between noise source and receiver, if required
- Mitigating offsite noise with measures such as respite offers and acoustic treatment, if appropriate
- Considering alternatives of noise and vibration cannot be reduced through avoidance, reduction or attenuation

A construction noise and vibration impact assessment may be required in order to control noise effects to surrounding residents. This should be determined when a contractor is engaged and the construction methodology is developed.

The outcomes of a noise and vibration impact assessment can be used to:

- inform the risk assessment process

- inform plans for managing noise
- predict the effects of implementing noise and vibration controls
- identify the need for noise and vibration monitoring, which can also determine the effectiveness of noise controls.

A noise and vibration impact assessment includes:

- identifying legislated obligations and statutory approvals
- identifying sensitive receivers which include residents, other people and sensitive environments who could be affected
- reviewing activities:
  - considering what works can be done during normal working hours and whether there are likely to be outside normal working hours works, and in particular at night
  - assessing construction or demolition equipment, methods and processes, including undertaking noise modelling as required and depending on the scale of your activities or project
  - considering alternative equipment, methods and processes (including works scheduling) to reduce noise impacts.

Noise and vibration impact assessments can also be useful when providing information to the community and people who could be affected by noise.

3 ANALYSIS

3.1 Noise Sources

The primary noise sources within the solar farm will be:

- Sunny Central UP Power inverters/transformers, <63dBA at 10m from the unit (Appendix A - Technical Data) – 69x units
    - It is understood that the inverters will not be operating during night time periods.
- Sunny Central Storage UP-XT storage units, <65dBA at 10m from the unit (Appendix A - Technical DataSolar Inverter Technical) – Assumed 26x units located within the BESS (Battery Energy Storage System)
- 25MW Substation located towards the southern side of the site.
    - As minimal information has been provided in regards to the substation equipment, the substation has been assumed to have a sound power level of 90 dB(A) based on typical substation sound data available in NDY's library.
    - This will need to be reviewed once the proposed equipment has been selected and more information (including sound data) is available.
    - It is understood that the inverters will not be operating during night time periods.

This equipment will be located within the project boundaries shown in Figure 4.

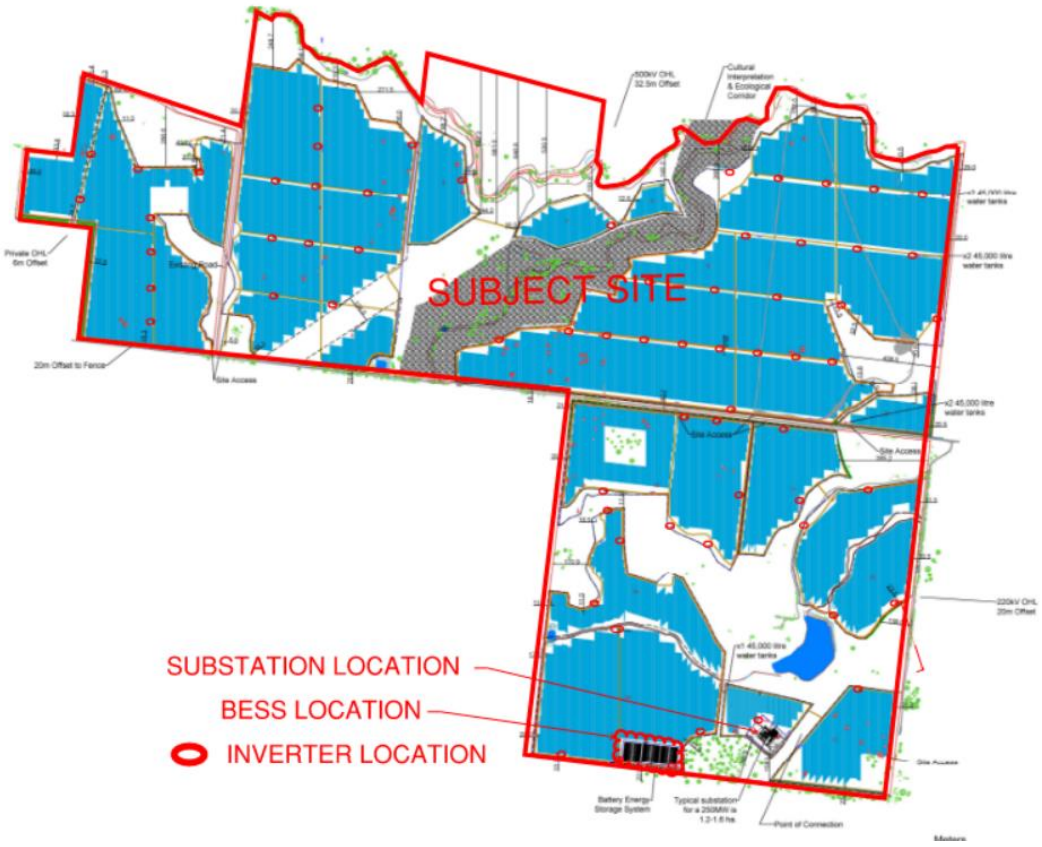


Figure 4 - Location of Noise Generating Equipment

3.2 Noise level calculation methodology

The noise level calculation methodology is outlined as follows

1. Sound pressure level (SPL) @10m from the inverters was set as 63dBA as per the technical data and 65dBA for the BESS storage units
2. SPL noise spectrum was approximated due to the absence of spectral data.
3. The sound power level (SWL) of the inverters was calculated using the sound pressure level and distance at which the SPL was measured.
4. Sound power level (SWL) of the substation has been assumed as 90 dB(A) based on typical generic sound data available in NDY's library due to lack of information available on the equipment.
5. The distance from each inverter and BESS to each of the three dwellings was measured.
6. These distances were used to calculate the expected distance attenuation and resulting SPL at the receiver locations using the following formula (simplified):

$$SPL = SWL - 20log_{10}(r) - 8$$

Where:

- SPL = sound level at receiver locations
- SWL = sound power level of inverter
- r = distance from inverters to receivers

7. The sound pressure levels from each of the noise sources were then combined to determine the cumulative noise level at the receivers. The overall noise levels were then compared against the noise level of 36dBA (excluding the inverters and substation) set in section 2.3.1 during night time periods and 41 dBA (for all equipment) during evening/day periods.

3.3 Predicted noise levels at residential receivers

The predicted noise levels at the three most affected residential receivers for each inverter are shown in Table 2. The predicted noise levels at 2430 Bacchus Marsh Rd comply with the night period criterion, however predicted noise levels at 25 Mt Rothwell Rd and 1340 Little River-Ripley Rd do not comply on account of their proximity to the inverters. Acoustic treatment will be required in order to ensure compliance with the night period criteria.

Table 2 Predicted noise levels at receivers

Receiver	Predicted Noise Level	Criteria	Comment
25 Mt Rothwell Rd	Day/Evening - 43 dBA Night- 42 dBA	Day/Evening – 39 dB(A) Night - 34 dBA	Non-compliant – treatment required
2430 Bacchus Marsh Rd	Day/Evening - 35 dBA Night- 26 dBA	Day/Evening – 39 dB(A) Night - 34 dBA	Compliant
1340 Little River-Ripley Rd	Day Evening- 41 dBA Night- 29 dBA	Day/Evening – 39 dB(A) Night - 34 dBA	Non-compliant – treatment required

3.4 Acoustic Treatment

In order to comply with the night period criteria acoustic treatment will be required to the BESS and to some inverters, as follows (see also Figure 4 for clarification):

25 Mt Rothwell Rd:

- Acoustic barrier required around BESS (to block line of sight to 25 Mt Rothwell Rd)
- Inverters within 1200m of 25 Mt Rothwell Rd require a two sided acoustic barrier blocking line of sight between inverter and 25 Mt Rothwell Rd (see Figure 5 for example)
- No treatments required to the substation if the overall sound power level is limited to 90dBA. Where the substation unit is louder than this, acoustic treatments (e.g. acoustic barriers) maybe required.

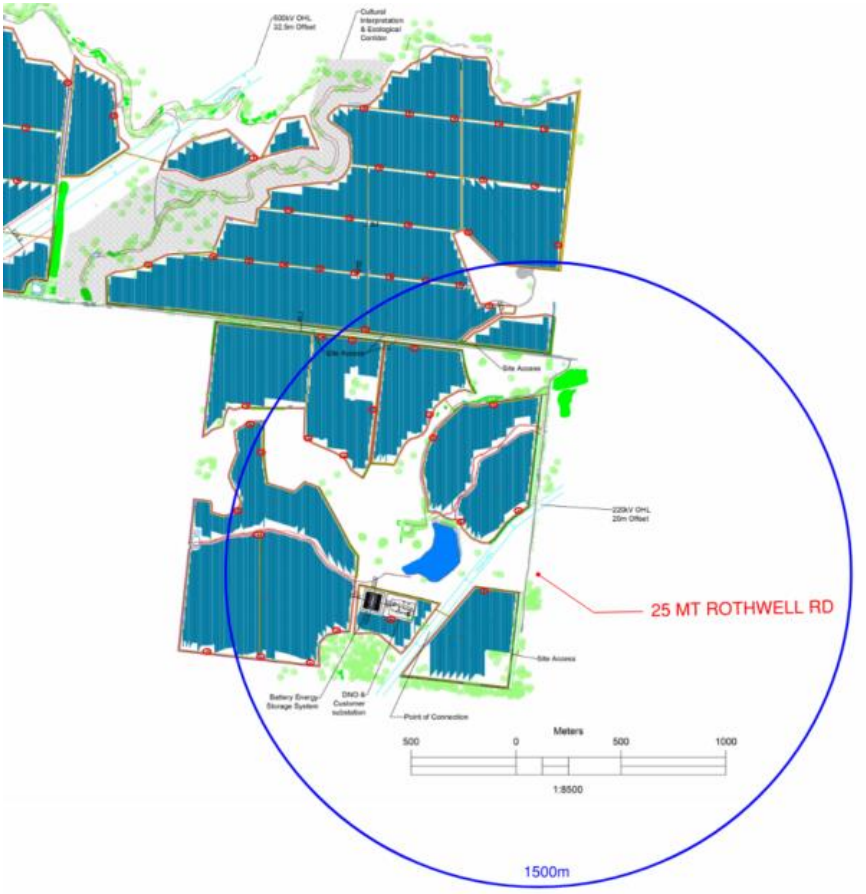


Figure 4 Inverters within the blue circles will require acoustic barriers

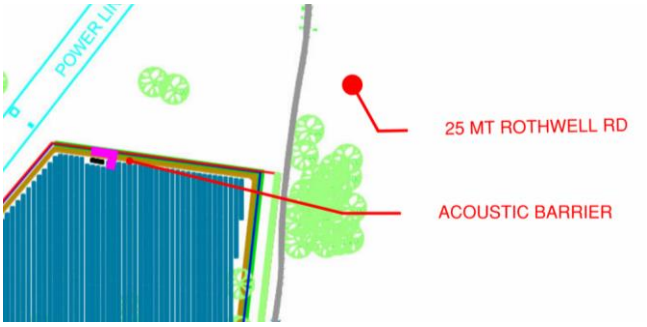


Figure 5 Acoustic barrier example

130 Little River-Ripley Rd:

- No treatment required to the BESS
- Inverters within 600m of 1340 Little River-Ripley Rd require a two-sided acoustic barrier blocking line of sight between inverter and 1340 Little River-Ripley Rd
- No treatments required to the substation if the overall sound power level is limited to 90dBA. Where the substation unit is louder than this, acoustic treatments (e.g. acoustic barriers) maybe required.

3.4.1 Acoustic Barrier Details

Acoustic barriers are to be constructed as follows:

- Min. 2.5m in height
- Material of surface weight 8.5 kg/m^2 or greater
- All joints are sealed with acoustic sealant and provide minimal gap at the bottom
- Located no more than 2m from inverter
- In the case of the BESS, the barrier should be located no more than 2m from the outer-most storage units. Access doors should be located on the western side of the barrier.

Table 3 provides the predicted noise levels at each receiver with the acoustic treatment in place.

Table 3 - Predicted noise levels at receivers with acoustic treatment in place

Receiver	Predicted Noise Levels (with treatment)	Criteria (Night Period)	Comment
25 Mt Rothwell Rd	Day/Evening - 36 dBA Night- 24 dBA	Day/Evening – 39 dBA Night - 34 dBA	Compliant
2430 Bacchus Marsh Rd	Day/Evening - 35 dBA Night- 26 dBA	Day/Evening – 39 dBA Night - 34 dBA	Compliant
1340 Little River-Ripley Rd	Day Evening- 36 dBA Night- 29 dBA	Day/Evening – 39 dBA Night - 34 dBA	Compliant

4 CONCLUSION

A 300 MW solar farm is proposed at Little River-Ripley Rd, known as the Barwon Solar Farm. NDY have conducted a noise emission assessment to determine if the predicted noise levels from the site are below the noise limits. The noise limit was determined as 34 dBA at night and 39 dBA in the evening/day periods in accordance with EPA publication 1826.4. The noise sources analysed were inverters, each with sound levels of 63 dBA at 10m, BESS storage units, with SPL 65 dBA at 10m, and a substation with an assumed sound power level of 90 dBA. The three most affected residential receivers range between 70m and 840m from the project boundary. The combined noise levels from all sources at the most affected residential receivers is predicted to be compliant at 36dBA during the day period and 29 dBA during the night period. Acoustic treatment includes barriers installed around the BESS and some inverters. Substation equipment shall be selected with a maximum sound power level of 90 dBA. Where the substation equipment noise levels are higher than this, it may require additional acoustic treatments in the form of acoustic barriers.

APPENDIX A - SOLAR INVERTER TECHNICAL DATA

SC 4000 UP / SC 4200 UP / SC 4400 UP / SC 4600 UP

Efficient

- Up to 4 inverters can be transported in one standard shipping container
- Overdimensioning up to 150% is possible
- Full power at ambient temperatures of up to 25°C

Robust

- Intelligent air cooling system OptiCool for efficient cooling
- Suitable for outdoor use in all climatic ambient conditions worldwide

Flexible

- One device for all applications
- PV application, optionally available with DC-coupled storage system

Easy to Use

- Improved DC connection area
- Connection area for customer equipment
- Integrated voltage support for internal and external loads

SUNNY CENTRAL UP

The new Sunny Central: more power per cubic meter

With an output of up to 4600 kVA and system voltages of 1500 V DC, the SMA central inverter allows for more efficient system design and a reduction in specific costs for PV and battery power plants. A separate voltage supply and additional space are available for the installation of customer equipment. True 1500 V technology and the intelligent cooling system OptiCool ensure smooth operation even in extreme ambient temperature as well as a long service life of 25 years.

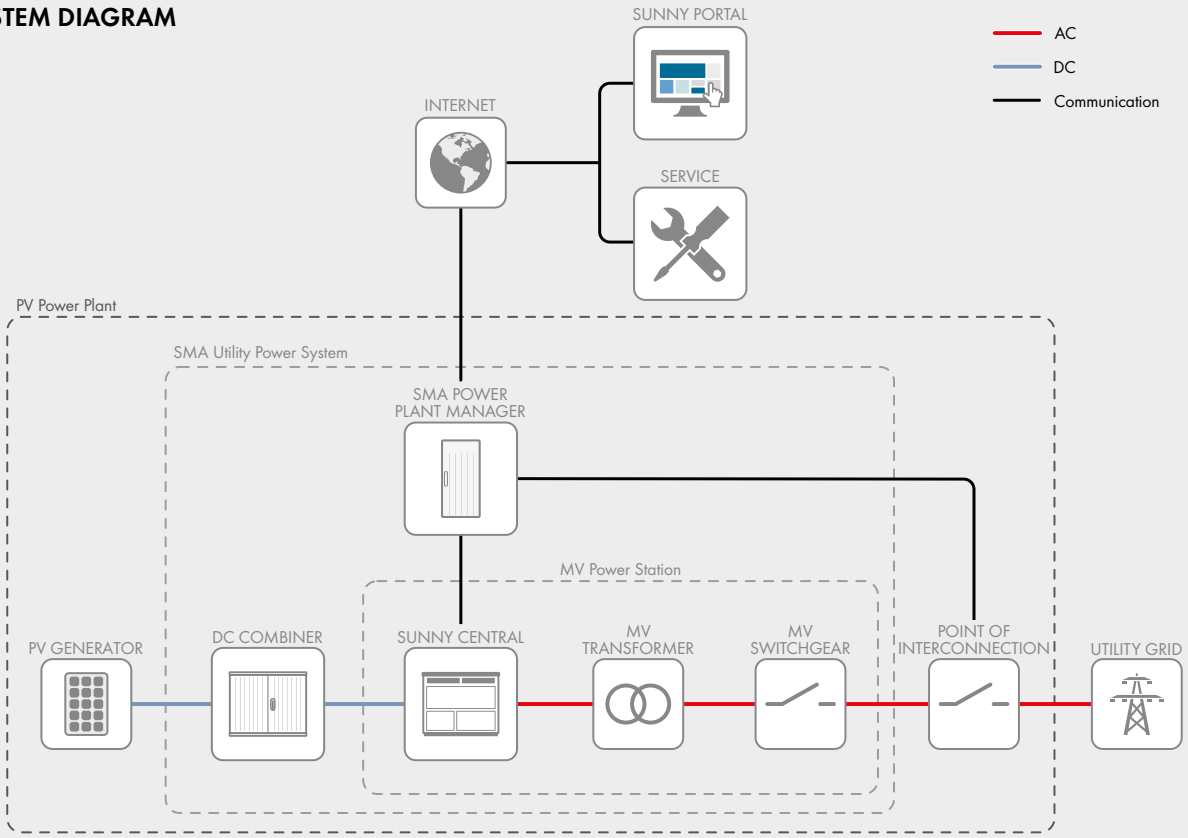
SUNNY CENTRAL UP

Technical Data	SC 4000 UP	SC 4200 UP
DC side		
MPP voltage range V_{DC} (at 25 °C / at 50 °C)	880 to 1325 V / 1100 V	921 to 1325 V / 1100 V
Min. DC voltage $V_{DC, min}$ / Start voltage $V_{DC, Start}$	849 V / 1030 V	891 V / 1071 V
Max. DC voltage $V_{DC, max}$	1500 V	1500 V
Max. DC current $I_{DC, max}$	4750 A	4750 A
Max. short-circuit current $I_{DC, SC}$	6400 A	6400 A
Number of DC inputs	Busbar with 26 connections per terminal, 24 double pole fused (32 single pole fused)	
Number of DC inputs with optional DC coupled storage	18 double pole fused (36 single pole fused) for PV and 6 double pole fused for batteries	
Max. number of DC cables per DC input (for each polarity)	2 x 800 kcmil, 2 x 400 mm²	
Integrated zone monitoring	○	
Available PV fuse sizes (per input)	200 A, 250 A, 315 A, 350 A, 400 A, 450 A, 500 A	
Available battery fuse size (per input)	750 A	
AC side		
Nominal AC power at cos φ =1 (at 25°C / at 50°C)	4000 kVA / 3400 kVA	4200 kVA / 3570 kVA
Nominal AC power at cos φ =0.8 (at 25°C / at 50°C)	3200 kW / 2720 kW	3360 kW / 2856 kW
Nominal AC current $I_{AC, nom}$ (at 25°C / at 50°C)	3850 A / 3273 A	3850 A / 3273 A
Max. total harmonic distortion	< 3% at nominal power	< 3% at nominal power
Nominal AC voltage / nominal AC voltage range[1) 8)]	600 V / 480 V to 720 V	630 V / 504 V to 756 V
AC power frequency / range	50 Hz / 47 Hz to 53 Hz 60 Hz / 57 Hz to 63 Hz	
Min. short-circuit ratio at the AC terminals[9)]	> 2	
Power factor at rated power / displacement power factor adjustable[8) 10)]	1 / 0.8 overexcited to 0.8 underexcited	
Efficiency		
Max. efficiency[2)] / European efficiency[2)] / CEC efficiency[3)]	98.8% / 98.6% / 98.5%	98.8% / 98.7% / 98.5%
Protective Devices		
Input-side disconnection point	DC load break switch	
Output-side disconnection point	AC circuit breaker	
DC overvoltage protection	Surge arrester, type I & II	
AC overvoltage protection (optional)	Surge arrester, class I & II	
Lightning protection (according to IEC 62305-1)	Lightning Protection Level III	
Ground-fault monitoring / remote ground-fault monitoring	○ / ○	
Insulation monitoring	○	
Degree of protection: electronics / air duct / connection area (as per IEC 60529)	IP54 / IP34 / IP34	
General Data		
Dimensions (W / H / D)	2815 / 2318 / 1588 mm (110.8 / 91.3 / 62.5 inch)	
Weight	< 4000 kg / < 8818.5 lb	
Self-consumption (max.[4)] / partial load[5)] / average[6)])	< 8100 W / < 1800 W / < 2000 W	
Self-consumption (standby)	< 370 W	
Internal auxiliary power supply	○ Integrated 8.4 kVA transformer	
Operating temperature range[8)]	−25°C to 60°C / −13°F to 140°F	
Noise emission[7)]	63.0 dB(A)*	
Temperature range (standby)	−40°C to 60°C / −40°F to 140°F	
Temperature range (storage)	−40°C to 70°C / −40°F to 158°F	
Max. permissible value for relative humidity (condensing / non-condensing)	95% to 100% (2 month/year) / 0% to 95%	
Maximum operating altitude above MSL[8)] 1000 m / 2000 m[11)] / 3000 m[11)]	● / ○ / ○	● / ○ / –
Fresh air consumption	6500 m³/h	
Features		
DC connection	Terminal lug on each input (without fuse)	
AC connection	With busbar system (three busbars, one per line conductor)	
Communication	Ethernet, Modbus Master, Modbus Slave	
Enclosure / roof color	RAL 9016 / RAL 7004	
Supply for external loads	○ (2.5 kVA)	
Standards and directives complied with	CE, IEC / EN 62109-1, IEC / EN 62109-2, AR-N 4110, IEEE1547, UL 840 Cat. IV, Arrêté du 23/04/08	
EMC standards	IEC 55011, FCC Part 15 Class A	
Quality standards and directives complied with	VDI/VDE 2862 page 2, DIN EN ISO 9001	
● Standard features ○ Optional – not available * preliminary		
Type designation	SC 4000 UP	SC 4200 UP

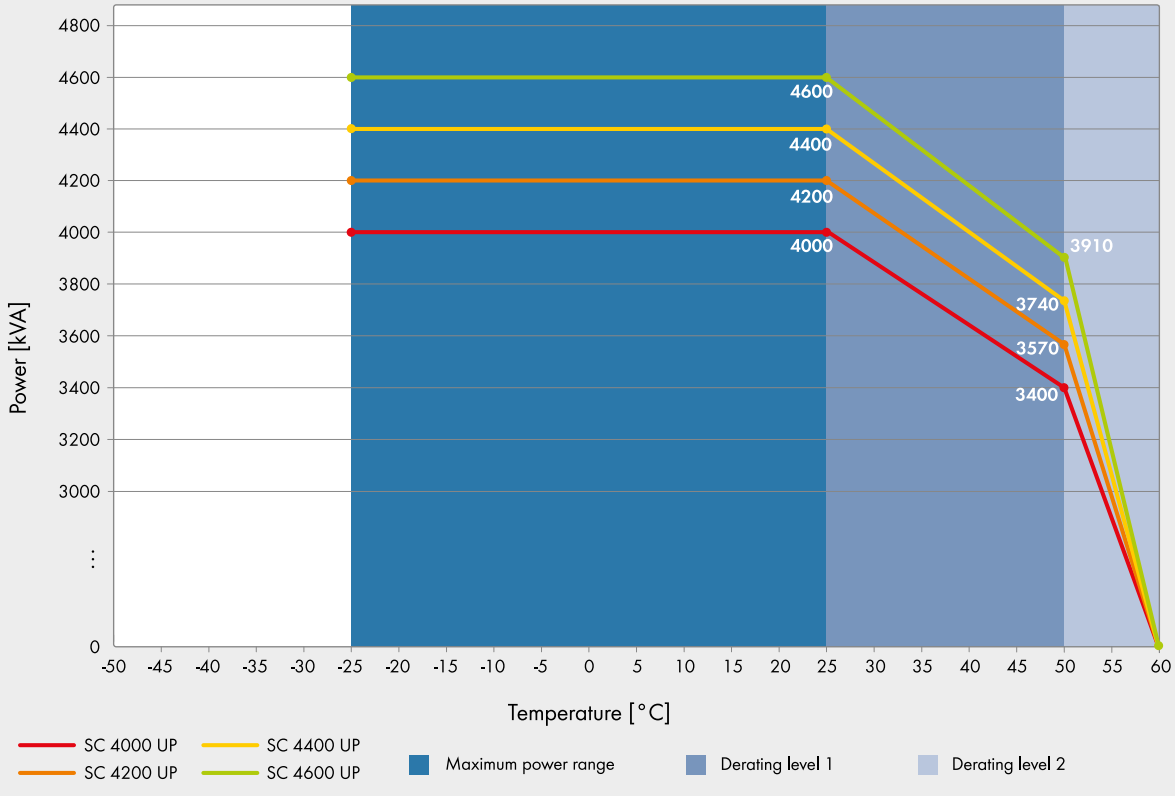
1) At nominal AC voltage, nominal AC power decreases in the same proportion
2) Efficiency measured without internal power supply
3) Efficiency measured with internal power supply
4) Self-consumption at rated operation
5) Self-consumption at < 75% Pn at 25°C
6) Self-consumption averaged out from 5% to 100% Pn at 25°C
7) Sound pressure level at a distance of 10 m
8) Values apply only to inverters. Permissible values for SMA MV solutions from SMA can be found in the corresponding data sheets.
9) A short-circuit ratio of < 2 requires a special approval from SMA
10) Depending on the DC voltage
11) Earlier temperature-dependent de-rating and reduction of DC open-circuit voltage

Technical Data	SC 4400 UP	SC 4600 UP
DC side		
MPP voltage range V_{DC} (at 25 °C / at 50 °C)	962 to 1325 V / 1100 V	1003 to 1325 V / 1100 V
Min. DC voltage $V_{DC, min}$ / Start voltage $V_{DC, Start}$	934 V / 1112 V	976 V / 1153 V
Max. DC voltage $V_{DC, max}$	1500 V	1500 V
Max. DC current $I_{DC, max}$	4750 A	4750 A
Max. short-circuit current $I_{DC, SC}$	6400 A	6400 A
Number of DC inputs	Busbar with 26 connections per terminal, 24 double pole fused (32 single pole fused)	
Number of DC inputs with optional DC coupled storage	18 double pole fused (36 single pole fused) for PV and 6 double pole fused for batteries	
Max. number of DC cables per DC input (for each polarity)	2 x 800 kcmil, 2 x 400 mm²	
Integrated zone monitoring	○	
Available PV fuse sizes (per input)	200 A, 250 A, 315 A, 350 A, 400 A, 450 A, 500 A	
Available battery fuse size (per input)	750 A	
AC side		
Nominal AC power at cos φ =1 (at 25°C / at 50°C)	4400 kVA / 3740 kVA	4600 kVA / 3910 kVA
Nominal AC power at cos φ =0.8 (at 25°C / at 50°C)	3520 kW / 2992 kW	3680 kW / 3128 kW
Nominal AC current $I_{AC, nom}$ (at 25°C / at 50°C)	3850 A / 3273 A	3850 A / 3273 A
Max. total harmonic distortion	< 3% at nominal power	< 3% at nominal power
Nominal AC voltage / nominal AC voltage range[1) 8)]	660 V / 528 V to 759 V	690 V / 552 V to 759 V
AC power frequency / range	50 Hz / 47 Hz to 53 Hz 60 Hz / 57 Hz to 63 Hz	
Min. short-circuit ratio at the AC terminals[9)]	> 2	
Power factor at rated power / displacement power factor adjustable[8) 10)]	● 1 / 0.8 overexcited to 0.8 underexcited	
Efficiency		
Max. efficiency[2)] / European efficiency[2)] / CEC efficiency[3)]	98.8% / 98.7% / 98.5%	98.9% / 98.7% / 98.5%
Protective Devices		
Input-side disconnection point	DC load break switch	
Output-side disconnection point	AC circuit breaker	
DC overvoltage protection	Surge arrester, type I & II	
AC overvoltage protection (optional)	Surge arrester, class I & II	
Lightning protection (according to IEC 62305-1)	Lightning Protection Level III	
Ground-fault monitoring / remote ground-fault monitoring	○ / ○	
Insulation monitoring	○	
Degree of protection: electronics / air duct / connection area (as per IEC 60529)	IP54 / IP34 / IP34	
General Data		
Dimensions (W / H / D)	2815 / 2318 / 1588 mm (110.8 / 91.3 / 62.5 inch)	
Weight	< 4000 kg / < 8818.5 lb	
Self-consumption (max.[4)] / partial load[5)] / average[6)])	< 8100 W / < 1800 W / < 2000 W	
Self-consumption (standby)	< 370 W	
Internal auxiliary power supply	○ Integrated 8.4 kVA transformer	
Operating temperature range[8)]	−25°C to 60°C / −13°F to 140°F	
Noise emission[7)]	63.0 dB(A)*	
Temperature range (standby)	−40°C to 60°C / −40°F to 140°F	
Temperature range (storage)	−40°C to 70°C / −40°F to 158°F	
Max. permissible value for relative humidity (condensing / non-condensing)	95% to 100% (2 month/year) / 0% to 95%	
Maximum operating altitude above MSL[8)] 1000 m / 2000 m[11)] / 3000 m[11)]	● / ○ / –	
Fresh air consumption	6500 m³/h	
Features		
DC connection	Terminal lug on each input (without fuse)	
AC connection	With busbar system (three busbars, one per line conductor)	
Communication	Ethernet, Modbus Master, Modbus Slave	
Enclosure / roof color	RAL 9016 / RAL 7004	
Supply for external loads	○ (2.5 kVA)	
Standards and directives complied with	CE, IEC / EN 62109-1, IEC / EN 62109-2, AR-N 4110, IEEE1547, UL 840 Cat. IV, Arrêté du 23/04/08	
EMC standards	IEC 55011, FCC Part 15 Class A	
Quality standards and directives complied with	VDI/VDE 2862 page 2, DIN EN ISO 9001	
● Standard features ○ Optional – not available * preliminary		
Type designation	SC 4400 UP	SC 4600 UP

SYSTEM DIAGRAM



TEMPERATURE BEHAVIOR (at 1000 m)



SUNNY CENTRAL STORAGE UP-XT
EXTENDED GRID-FEED POWER

SCS 3450 UP-XT / SCS 3600 UP-XT / SCS 3800 UP-XT / SCS 3950 UP-XT

Efficient

- Up to 4 inverters can be transported in one standard shipping container
- Higher power density
- Higher power in grid feed direction
- Higher short circuit contribution

Robust

- Intelligent air cooling system OptiCool for efficient cooling
- Suitable for outdoor use in all climatic ambient conditions worldwide

Flexible

- One device for all applications
- Stand-alone device or turnkey solution with SMA medium-voltage system

Versatile

- Integrated battery communication
- Customized monitoring and control of inverters
- Grid management functions for dynamic grid support
- Integrated voltage supply for internal consumption and external loads

SUNNY CENTRAL STORAGE UP-XT

Battery inverter for large-scale storage systems

With a max. output of up to 4600 kVA and system voltages up to 1500 V DC, the SMA Sunny Central Storage allows for more efficient and flexible system design for battery power plants. The SCS UP-XT versions allow a system design with higher output power and higher short-circuit current contribution. The intelligent cooling system OptiCool ensure smooth operation even in extreme ambient temperature.

SUNNY CENTRAL STORAGE UP-XT

Technical Data	SCS 3450 UP-XT	SCS 3600 UP-XT
Battery side (DC)		
Operating DC voltage range V_{DC}	880 V to 1500 V	921 V to 1500 V
Max. DC current $I_{DC, max}$	4750 A	
Fuse characteristic for battery connection - pre-arcing integral limit single DC busbar / split DC busbar [12) 15)]	10.75 MA^2s / 8.0 MA^2s	
Single DC busbar 26 connections per pole / split DC busbar 6/5/6 connections per pole	● / ○	
DC connection	with terminal lug	
Grid side (AC)		
Nominal AC power at 1200 Vdc and cos φ =1.0 (at 25°C)	4000 kW	4200 kW
Grid-Feed mode: AC apparent power at 1200 Vdc (at 25°C / at 40°C / at 50°C)[3)13)14)]	4000 kVA / 3640 kVA / 3400 kVA	4200 kVA / 3822 kVA / 3570 kVA
Charging mode: AC apparent power at 1200 Vdc (at 25°C / at 40°C / at 50°C)[3)13)14)]	3589 kVA / 3268 kVA / 3001 kVA	3769 kVA / 3432 kVA / 3152 kVA
Max. AC current $I_{AC, max}$ (at 25°C / at 40°C / at 50°C)	3850 A / 3504 A / 3273 A	
Max. total harmonic distortion	< 3% at nominal power	
Nominal AC voltage / nominal AC voltage range[1) 8)]	600 V / 480 V to 720 V	630 V / 504 V to 756 V
AC power frequency / range	50 Hz / 47 Hz to 53 Hz 60 Hz / 57 Hz to 63 Hz	
Min. short-circuit ratio at the AC terminals[9)]	> 2	
Cos Phi at rated power / displacement Cos Phi adjustable[8) 10)]	1 / 0.0 overexcited to 0.0 underexcited	
AC connection	with busbar system (three busbars, one per line conductor)	
Efficiency		
Max. efficiency[2)]	98.8%	
Protective Devices		
Input-side disconnection point	DC load break switch	
Output-side disconnection point	AC circuit breaker	
DC overvoltage protection	Surge arrester, type I	
AC overvoltage protection (optional)	Surge arrester, class I	
Lightning protection (according to IEC 62305-1)	Lightning Protection Level III	
Insulation monitoring	●	
Degree of protection: electronics / air duct / connection area (as per IEC 60529)	IP54 / IP34 / IP34	
General Data		
Dimensions (W / H / D)	2815 / 2318 / 1588 mm (110.8 / 91.3 / 62.5 inch)	
Weight	< 3700 kg / < 8200 lb	
Self-consumption (max.[4)] / partial load[5)] / average[6)])	< 8100 W / < 1800 W / < 2000 W	
Self-consumption (standby)	< 370 W	
Internal (8.4 kVA transformer) / external auxiliary power supply	● / ○	
Noise emission[7)]	65.0 dB(A)	
Operating temperature range (optional)[8)]	(−40°C) −25°C to 60°C / (−40°F) −13°F to 140°F	
Temperature range (standby)	−40°C to 60°C / −40°F to 140°F	
Temperature range (storage)	−40°C to 70°C / −40°F to 158°F	
Max. permissible value for relative humidity (condensing / non-condensing)	95% to 100% (2 month/year) / 0% to 95%	
Maximum operating altitude above MSL[8)] 1000 m / 2000 m[11)]	● / ○	
Fresh air consumption	6500 m^3/h	
Features		
Grid forming / black start ready	○ / ○	
Communication	Ethernet, Modbus Master, Modbus Slave	
Communication with SMA string monitor (transmission medium)	Modbus TCP / Ethernet (FO MM, Cat-5)	
Enclosure / roof color	RAL 9016 / RAL 7004	
Supply transformer for external loads	○ (2.5 kVA)	
Standards and directives complied with	CE, IEC / EN 62109-1/-2, AR-N 4110 / 4120, Arrêté du 23/04/08	
EMC standards	IEC 61000-6-2, EN 55011, CISPR11	
Quality standards and directives complied with	VDI/VDE 2862 page 2, DIN EN ISO 9001	
Type designation	SCS 3450 UP-XT	SCS 3600 UP-XT

● Standard features ○ Optional – Not available

1) At nominal AC voltage, nominal AC power decreases in the same proportion
2) Efficiency measured without internal power supply
3) AC apparent power at higher dc voltages on request
4) Self-consumption at rated operation
5) Self-consumption at < 75% Pn at 25°C
6) Self-consumption averaged out from 5% to 100% Pn at 25°C
7) Sound pressure level at a distance of 10 m
8) Values apply only to inverters. Permissible values for SMA MV solutions from SMA can be found in the corresponding data sheets
9) A short-circuit ratio of < 2 requires a special approval from SMA
10) Max. power values (S/P/Q) can be requested based on project specific design
11) Earlier temperature-dependent de-rating and reduction of DC open-circuit voltage
12) Battery short circuit disconnection has to be done on the battery side with ultra rapid battery string or group fuses, e.g. fuse type aR/aBat & DC time constant Tau (L/R) <=1ms
13) The specified services can be provided on a long-term basis. Depending on the ambient temperature and the inverter temperature, the maximum temperature-dependent AC power can also occur on short notice
14) Depending on the ratio of reactive power (cos φ), an extended power derating may occur.
15) Please check the manual for further information

Technical Data	SCS 3800 UP-XT	SCS 3950 UP-XT
Battery side (DC)		
Operating DC voltage range V_{DC}	962 V to 1500 V	1003 V to 1500 V
Max. DC current $I_{DC, max}$	4750 A	
Fuse characteristic for battery connection - pre-arcing integral limit single DC busbar / split DC busbar [12) 15)]	10.75 MA²s / 8.0 MA²s	
Single DC busbar 26 connections per pole / split DC busbar 6/5/6 connections per pole	● / ○	
DC connection	with terminal lug	
Grid side (AC)		
Nominal AC power at 1200 Vdc and cos φ =1.0 (at 25°C)[14)]	4400 kW	4600 kW
Grid-Feed mode: AC apparent power at 1200 Vdc (at 25°C / at 40°C / at 50°C)[3)13)14)]	4400 kVA / 4004 kVA / 3740 kVA	4600 kVA / 4186 kVA / 3910 kVA
Charging mode: AC apparent power at 1200 Vdc (at 25°C / at 40°C / at 50°C)[3)13)14)]	3949 kVA / 3596 kVA / 3302 kVA	4129 kVA / 3759 kVA / 3453 kVA
Max. AC current $I_{AC, max}$ (at 25°C / at 40°C / at 50°C)	3850 A / 3504 A / 3273 A	
Max. total harmonic distortion	< 3% at nominal power	
Nominal AC voltage / nominal AC voltage range[1) 8)]	660 V / 528 V to 759 V	690 V / 552 V to 759 V
AC power frequency / range	50 Hz / 47 Hz to 53 Hz 60 Hz / 57 Hz to 63 Hz	
Min. short-circuit ratio at the AC terminals[9)]	> 2	
Cos Phi at rated power / displacement Cos Phi adjustable[8) 10)]	1 / 0.0 overexcited to 0.0 underexcited	
AC connection	with busbar system (three busbars, one per line conductor)	
Efficiency		
Max. efficiency[2)]	98.8%	
Protective Devices		
Input-side disconnection point	DC load break switch	
Output-side disconnection point	AC circuit breaker	
DC overvoltage protection	Surge arrester, type I	
AC overvoltage protection (optional)	Surge arrester, class I	
Lightning protection (according to IEC 62305-1)	Lightning Protection Level III	
Insulation monitoring	●	
Degree of protection: electronics / air duct / connection area (as per IEC 60529)	IP54 / IP34 / IP34	
General Data		
Dimensions (W / H / D)	2815 / 2318 / 1588 mm (110.8 / 91.3 / 62.5 inch)	
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Self-consumption (standby)	< 370 W	
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Noise emission[7)]	65.0 dB(A)	
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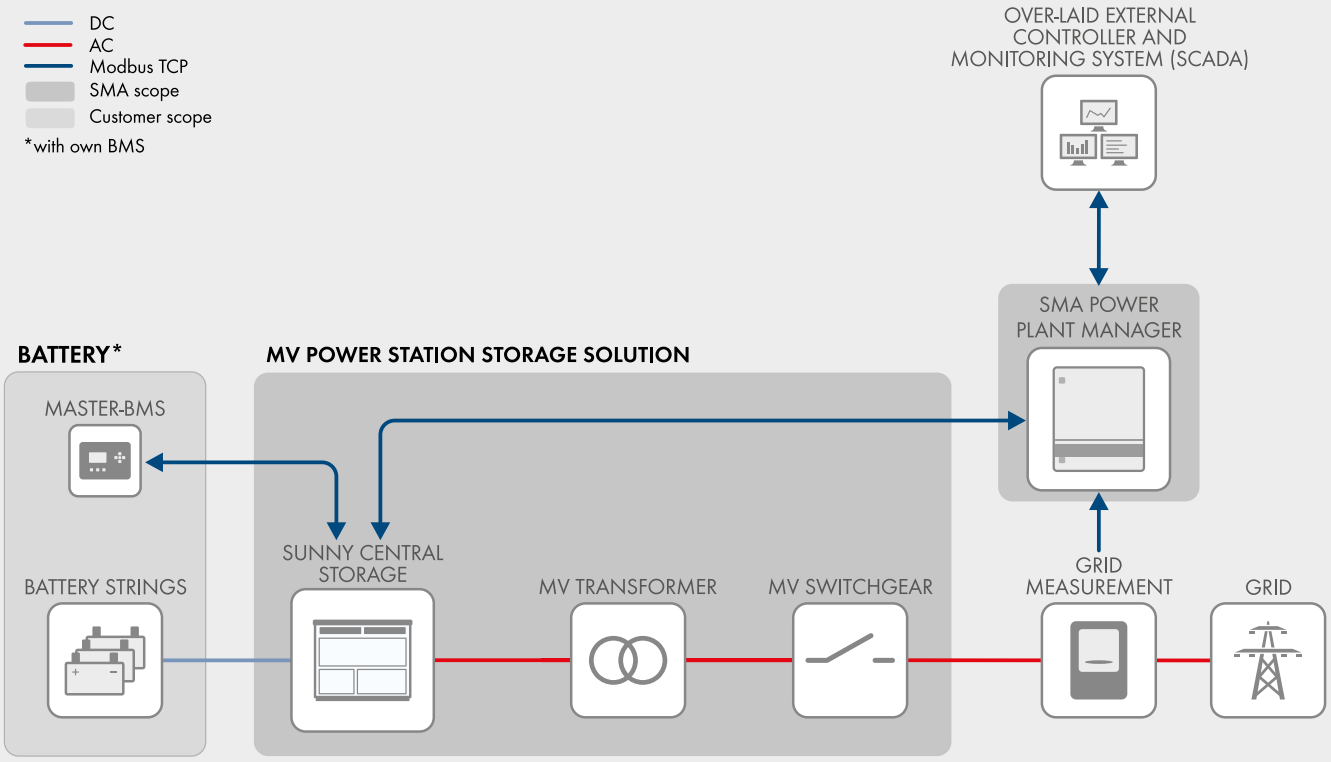
Temperature range (standby)	−40°C to 60°C / −40°F to 140°F	
Temperature range (storage)	−40°C to 70°C / −40°F to 158°F	
Max. permissible value for relative humidity (condensing / non-condensing)	95% to 100% (2 month/year) / 0% to 95%	
Maximum operating altitude above MSL[8)] 1000 m / 2000 m[11)]	● / ○	
Fresh air consumption	6500 m³/h	
Features		
Grid forming / black start ready	○ / ○	
Communication	Ethernet, Modbus Master, Modbus Slave	
Communication with SMA string monitor (transmission medium)	Modbus TCP / Ethernet (FO MM, Cat-5)	
Enclosure / roof color	RAL 9016 / RAL 7004	
Supply transformer for external loads	○ (2.5 kVA)	
Standards and directives complied with	CE, IEC / EN 62109-1/-2, AR-N 4110 / 4120, Arrêté du 23/04/08	
EMC standards	IEC 61000-6-2, EN 55011, CISPR11	
Quality standards and directives complied with	VDI/VDE 2862 page 2, DIN EN ISO 9001	
Type designation	SCS 3800 UP-XT	SCS 3950 UP-XT

● Standard features ○ Optional — Not available

SYSTEM DIAGRAM



Grid-connected functions

- Setpoints for active and reactive power
- Static grid support Q(U), P(f)
- Dynamic grid support (FRT)
- Active islanding detection (AID)
- High compatibility with different battery types

Compatible with energy management system functionalities

- External static grid supporting functions
- Ramp-rate control of PV power
- Peak shaving
- Energy shifting
- Genset optimization control
- Reducing necessary spinning reserve of gensets
- Battery start-up and stop sequence
- Operates the battery within optimal operation window
- Grid Forming
- Black Start

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NDY QA SYSTEM

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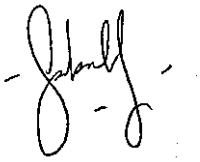

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