



## SA Power Networks Commissioning Witnessing Checklist

**CUSTOMER NAME:**

**SOLAR PV APPROVED CAPACITY:** kVA (AC)

**BATTERY APPROVED CAPACITY:** kVA (AC)

**OPERATING PHILOSOPHY:** Non-Export/Export

**MAXIMUM EXPORT:** kW (AC)

**ADDRESS:**

**TECHNICIAN:**

**INSTALLER:**

**INSTALLED DATE:**

**WITNESSING DATE:**

**CONTACT:**

Revision:

Commissioning Officer:

Engineering Report Issue and Date:

Checklist Release Date: 4/12/2018

**PART A: Pre-Connection Off-Line Testing**

Table 1 details all required documentation that must be provided prior to SA Power Networks commissioning officer attending site for commissioning witnessing.

Documentation Provided	Customer/ Proponent	SAPN Approved
Electrical Certificate of Compliance for the Generating System(s)	Date:	Date:
Protection test results for the protection relay(s)	Date:	Date:
Written statement from protection technician	Date:	Date:
Protection Settings	Date:	Date:
Commissioning Plan	Date:	Date:
Compliance Monitoring Plan	Date:	Date:
Single Line Diagrams (as-built)	Date:	Date:
(New HV sites) Incomer CB injection testing, earth grid testing results	Date:	Date:

**Table 1:** Documentation Checklist

Table 2 details the required pre-connection checks carried out by the SA Power Networks commissioning officer prior to proceeding to compliance testing in Part B.

Pre-Connection Checks	Customer/ Proponent	SAPN
All inverters are DC isolated (via DC isolators) from network		
Bi-directional/import/export meter installed		
Protection relay installed and ready for testing		
National Meter Identifier (NMI)		
Power quality logger installed for 7-day measure (2 days prior to gen online)		
Go ahead has been received from all parties		

**Table 2:** Pre-Connection Checklist

Are there any interlock arrangements on site?  
 E.g. incomer CB to solar distribution board locked open if site supplied by back-up feeder

Summary of interlock/inhibit arrangement:

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Interlock arrangement demonstrated?

For new or altered installations, the installation is subject to electrical checks as per table 3 below. The connection of generation (without altering the supply) is to be regarded as an alteration to the installation (but not the connection) and must not compromise any existing functionality or compliance. The marker (M) denotes mandatory compliance for witness procedure, while (D) denotes defect or concern to be noted with record of communication to REC to be kept (this paperwork). Note that these checks **do not** constitute approval of compliance to the Service & Installation Rules by the SA Power Networks commissioning officer and the onus remains on the Customer/Proponent to ensure the installation complies with the relevant rules.

Item	Rule	Comment	Checked
<b>Main Switchboard</b>			
Confirm revenue meter aligns with NMI. (Available from PM) (M)	Aligns with SEG/LEG approval		
Meter, CTs, voltage taps etc. physically and electrically located correctly. (M)	S&IR 7.5.1, 8.5, 8.14		
PV labels at MSB. (M)	AS/NZS 4777.1 6.5		
'Main Switch' label(s). (M)	AS/NZS 4777.1 - 6 AS/NZS3000 - 2.3.3.5		
Main Switch for inverter able to be secured in the open position. (M)	AS/NZS 4777.1 – 3.4.3(b) AS/NZS3000 - 2.3.3.6		
Motorised CB or isolator used as isolator must be able to be secured in the open position and not able to be overridden. (M)	AS/NZS3000 - 2.3.3.6		
No unmetered equipment or connections. (M)	S&IR - 7.8.2.3		
Drawing at MSB showing inverter location (difficult or large installations). (D)	AS/NZS 4777.1 6.4		
Any observed defects affecting safety (i.e. AS/NZS3000/S&IR non-compliance) communicated to owner/installer (D) Note: also apply DEI process if required			
<b>Solar Distribution Board</b>			
Main Isolator Label. (M)	AS/NZS 4777.1 - 6		
Main Isolator Isolates Entire Board. (D)	AS/NZS 4777.1 - 3.4.3		
Number of Main Isolators. (D)	AS/NZS 4777.1 - 5.5.1 AS/NZS 3000 - 2.3.3.3		
Protection Relay Label. (M)	SAPN Requirement		
Shut Down Procedure Label. (M)	AS/NZS 4777.1 - 6.7		

**Table 3:** Electrical Checklist

## PART B: Compliance Testing

Table 4 details the required anti-islanding protection setting check on the installed inverters to ensure compliance to AS4777.2 and the requirements in the Engineering Report.

Inverter Anti-Islanding Protection	Setting	Trip Time	Customer/Proponent	SAPN
Over Voltage Level (V)	260 V	1 Sec		
Over Voltage Level (V)	265 V	0.2 Sec		
Under Voltage Level (V)	180 V	1.0 Sec		
Over Frequency (f)	52 Hz	0.2 Sec		
Under Frequency (f)	47 Hz	1.0 Sec		
Active anti-islanding	Enabled			
Soft Ramp Up after Reconnect	Enabled			
Reconnect Time	60 Sec			

**Table 4:** Inverter Settings Checklist

SA Power Networks commissioning officer to check multiple inverters. Ensure at least one is checked for every string of inverters. Total number of inverters: \_\_\_\_\_ Inverters checked:

Inverter 1  Inverter 2  Inverter 3  Inverter 4  Inverter 5   
 Inverter 6  Inverter 7  Inverter 8  Inverter 9  Inverter 10

Table 5 details the power quality response setting check on the installed inverters to ensure compliance to AS4777.2 and the requirements in the Engineering Report, **if applicable**.

Inverter Power Quality Response	Setting	Customer/Proponent	SAPN
10min Average Sustained Voltage, $V_{nom-max}$	258 V (3 sec delay)		
Volt-VAr response mode	As per Table 6		
Volt-Watt response mode	As per Table 7		
Fixed Power Factor mode (as per Engineering Report if stated)	pf		

**Table 5:** Power Quality Response Setting Checklist

Reference	Voltage in Volts	VAr % rated VA
V <sub>1</sub>	207 (90% of nominal)	31% leading (sourcing vars, 2.4%/volt)
V <sub>2</sub>	220 (96%)	0
V <sub>3</sub>	248 (108%)	0
V <sub>4</sub>	253 (110%)	44% lagging (sinking vars, 8.8%/volt)

**Table 6:** Volt-VAr response mode (Table 11 of AS 4777.2-2015)

Reference	Voltage in Volts	Power % rated Power
V <sub>1</sub>	207 (90% of nominal)	100% (default)
V <sub>2</sub>	220 (96%)	100% (default)
V <sub>3</sub>	250 (109%)	100% (default)
V <sub>4</sub>	265 (115%)	20% (default, 5.3%/volt)

**Table 7:** Volt-Watt response mode (Table 10 of AS 4777.2-2015)

Table 8 details the required protection setting check on the installed protection relay to ensure compliance to AS4777.1 and the requirements in the Engineering Report.

Protection Relay Make/Model: \_\_\_\_\_ Relay Serial Number: \_\_\_\_\_

Voltage, (Ø-N): (R) \_\_\_\_\_ V, (W) \_\_\_\_\_ V, (B) \_\_\_\_\_ V Grid frequency before inverter system on: \_\_\_\_\_ Hz

Relay Protection	Setting <sup>1</sup>		Trip Time	Customer/Proponent	SAPN
Over Voltage	113%	260 V	2 Sec		
Under Voltage	80%	180 V	2 Sec		
Over Frequency	104%	52 Hz	2 Sec		
Under Frequency	94%	47 Hz	2 Sec		
Current Unbalance <sup>2</sup>	21.7 A		30 Sec		
Select one: ROCOF Stage 1 (preferred) or ROCOF Stage 2	N/A	±4 Hz/Sec	0.25 Sec		
	N/A	±3 Hz/Sec	1 Sec		
Vector Shift	Disabled <sup>3</sup>				
Sustained Overvoltage (average 10 mins)	112%	258V	Instantaneous		
Minimum Import / Zero Export (if applicable)					
Auto Fault reset	Enabled		60 Sec		

**Table 8:** Protection Relay Settings Checklist

Injection Testing  (Applicable only to installations above 200kVA and/or if controlled testing could not be performed)

If the protection elements in the relay are to be demonstrated via an injection test kit, SA Power Networks commissioning officer to witness the correct settings being applied and the appropriate breaker being operated. A copy of the log of events are to be provided to SA Power Networks at the end of the testing.

Controlled Testing

If the protection elements are to be demonstrated via set-point manipulation on the relay, the set-points will be adjusted to cause a trip under normal operational conditions. I.e. Under Voltage will be tested by setting the trip point to 245 V. Table 8 details the manipulated settings and whether the breaker has operated and all IES isolated from the Network.

Circuit breaker ID: \_\_\_\_\_

Relay Protection	Manipulated Setting		Trip Time	Customer/Proponent	SAPN
Over Voltage	%	V	2 Sec		
Under Voltage	%	V	2 Sec		
Over Frequency	%	Hz	2 Sec		
Under Frequency	%	Hz	2 Sec		

**Table 9:** Controlled Testing Settings Manipulation

Ensure that all set points are returned to correct settings as listed in table 8.

Check fail-safe operation of relay: Inverters isolated on loss of supply to the relay.

<sup>1</sup> Settings are for LV connected systems only and the V% is based on 230V nominal.  
<sup>2</sup> Only applicable for installations of single phase inverter capacity above 5kVA.  
<sup>3</sup> Vector Shift must remain disabled unless special SA Power Networks approval is given.

**PART C: On-Line Commissioning**

Table 10 details tests (if applicable) that are to be demonstrated to SA Power Networks that the generating system meets the requirements of the Engineering Report after connection to the network.

Time and date system online: \_\_\_\_\_

Online Tests	Setting	Customer/Proponent	SAPN
Reactive Power Capability (manual adjustment)			
Permission Granted & Denied (for SCADA)			
Generator Dispatch Limiter (for SCADA)			
Power Factor Set Point (for SCADA)			

**Table 10:** Online Tests

Table 11 details post-connection checks before SA Power Networks commissioning officer leaves site.

Checks	Customer/Proponent	SAPN
Tamper seal in place		
Tamper seal serial number		
Protection relay password protection		

**Table 11:** Post-Connection Checks

**Outstanding issues:**

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Customer/Proponent Representative	
Name:	
Signed:	
Date:	

SA Power Networks Representative	
Name:	
Signed:	
Date:	

**DISCLAIMER:**

SA Power Networks takes no responsibility for any damage to any of the customer/proponent’s infrastructure during periods when the inverter(s) may be operating at voltages outside of the current Australian Voltage standard.