	<p>District Council of Coober Pedy</p> <p>DG Requirements – Rev 7</p>	<p>Issued: 1/8/17 Updated: 10/01/2023 Next Review: 10/01/26</p>
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Distributed Generation Requirements for Connecting to the Coober Pedy Grid

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1. GENERAL

Any customer or contractor wishing to connect to Coober Pedy's electricity distribution network (the grid) must first advise and be granted permission by the District Council of Coober Pedy (Council). Council are the retailer and distributor of electricity around the town and operate under the auspices of ESCOSA. An application process by the customer or contractor is required in order to ensure that the proposed connection of equipment meets the requirements of the Council.

In particular, these requirements are designed around business and resident requests to connect generation capability such as Solar Photovoltaic (PV) panels in combination with inverters, batteries, a battery management system, back up diesel generator, wind turbine or other generator. Any other request to connect to the grid in any way whatsoever must also be approved by Council prior to any works commencing.

Council undertake to supply safe, reliable, and quality electricity, and in order to do this, it is essential that residents and business ensure approval of proposed systems and also ensure proper maintenance and operation of said equipment.

Council endeavor to act in the interests of residents and business who wish to lower their electricity bills by improving efficiency, introducing solar hot water and grid connected generation aimed at self-consumption.

In this regard, it is important to understand that Council impose no limits on the amount of self-generation, while being grid connected as long as there is no export into the grid. Uncontrolled export of electricity could lead to grid instability and outages.

Council also allow some generators to export to the grid, however this export is subject to limits. Such special exceptions require special motivation and are subject to Council's discretion.

Council provides the following documents to guide those wishing to connect to the Coober Pedy Grid:

- DCCP Distributed Generation Policy – Connection of Electrical Equipment and Distributed Generation. Provides the policy settings and process for application and connection.
- Distributed Generation Requirements for Connecting to the Coober Pedy Grid (this document which provides technical requirements to support system design decisions)
- Distributed Generation Application Form

2. PROTECTION SETTINGS AND REQUIREMENTS

2.1 Anti-Islanding

The generator installation must incorporate both voltage and frequency protection, which allow automatic reconnection in the event of an outage once distribution supply has been established and maintained for a minimum of 2 minutes. Anti-islanding shall be to the appropriate Australian standard and fit for purpose.

2.1.1 Voltage Requirements

District Council of Coober Pedy requires the automatic disconnection of the generator after a sustained voltage, across all phases, outside the over/under voltage parameters. These values shall be determined by the distribution network operating requirements, as per section 4.

2.1.2 Frequency Requirements

Over/Under frequency limits must be maintained by a controller within the generator system. In the event of frequencies occurring outside of these limits the controller must disconnect the generator from the distribution network. These values shall be determined by the distribution network operating requirements, as per section 4.

Any and all power quality measures, and assurance systems, shall be to the Australian standards and fit for purpose.

2.2 Voltage Imbalance

Three phase inverters must have load balance settings that ensure a reasonable load balance to all three phases which must simultaneously disconnect in the event of out of balance phase to phase voltage.

Where multiple single- p h a s e inverters are being used; interlocking and configuration settings must ensure all corresponding inverters to simultaneously disconnect from the distribution network. If internal controls are unavailable, a phase balance relay must be used to automatically and immediately disconnect the associated inverters.

Reasonable load balance is to be considered to have a maximum difference of 25 amps or 10% between any two phases of the agreed maximum demand.

Any and all power quality measures, and assurance systems shall be to the Australian Standards and fit for purpose.

2.3 Equipment Requirements

All protection equipment must comply with the relevant IEC and Australian Standards.

All protection equipment and settings must be tested and commissioned by a licensed and competent person. A copy of the Certificate of Compliance and commissioning results must be sent to the District Council of Coober Pedy prior to connection to the distribution system.

The consumer or installer must keep a record of all protection settings and test results. Council requires that maintenance and operation of the system comply with the design and specifications, and Council reserve the right to inspect a property and test the system to ensure satisfactory operations.

3. EXPORT CAPACITY

Export to the grid is prohibited under the Grid-tied No Export connection option as referred to in the Council Distributed Generation Policy.

Council do under special circumstances allow a limit on the amount of export to the grid. This grid export is limited to 3kW for a domestic installation and 10kW for a commercial installation.

Installations that wish to export greater than this limit are not permitted unless the approval to do so occurred prior to 1 May 2017.

Council are considering smart meters, demand management and other generation opportunities, and in time, this policy may be changed to accommodate and even encourage electricity export – particularly at times when demand is high and diesel generation is required.

At this stage, there is no monetary value (or feed in tariff) for any export of electricity to the grid by a customer.

Subject to Council approval, requiring a larger capacity than that stated above, will be at the discretion of the District Council of Coober Pedy and Coober Pedy Power station Contractor, subject to engineering and network design. At the discretion of the District Council of Coober Pedy and Coober Pedy Power station Contractor, load capacity limitations and/or remote monitoring and control may be required for larger installations.

Export of power shall be on a 12-month basis, where the available capacity is shared equally among all distributed generators as far as is practicable.

4. REACTIVE POWER CONTROL

Generators connected to the District Council of Coober Pedy's distribution network must have reactive power control set to 0.9 power factor with a tolerance of +/-2% to ensure network voltages are maintained within limitations. Subject to a network design and engineering report, generator installations may still be considered acceptable, however it is noted, that all inverters on the market today will meet these criteria which are part of Australian Standards.

5. QUALITY OF SUPPLY

Electricity quality refers to electricity being provided to a user; however, it is subject to voltage, phase or frequency effects that can cause flickering, tripping, damage, or reduced life to appliances. A customer's generator installation should not unduly impact on the grid such that the network and power station cannot accommodate these impacts. To ensure the quality of power supply, a customer shall in addition to other requirements pay particular attention to voltage and frequency requirements as set out below:

5.1 Voltage Requirements

District Council of Coober Pedy requires the automatic disconnection of the generator after a sustained voltage of no higher than 250VAC. The anti-islanding protection setting must be set lower to ensure compliance and not expose the consumer's installation to potentially damaging voltages.

5.2 Frequency Requirements

Frequency limits must be maintained between 48Hz and 52Hz. Parameters outside of these limits must disconnect the generator from the distribution network. Should the grid frequency breach these limits, it is incumbent on the customer to ensure their equipment (inverter), protects itself through its own tripping requirements.

6. OPERATING POLICIES AND PROCEDURES

All installations shall ensure they comply with Council directives and operating policies and procedures as per below.

A. Connection and disconnection procedures

Procedures for safe isolation and reconnection of generating supply under maintenance and inspection shall comply with Australian Standards and any particular requirements imposed by Council.

B. Emergency protocols

Procedure and policy for emergency switching of the generating supply, including requirements for isolation, earthing and tag out shall comply with Australian Standards.

C. Maintenance

To ensure safe and reliable power and grid stability, Council reserves all rights to inspect and if necessary, instigate mandatory testing and maintenance, where it is believed that non-compliance has or is likely to occur.

D. Access permits

Council reserves its right to access all generating equipment, inverters, and connections to ensure that compliance and safety.

E. Amendments

Any customer with an approved generating supply connection wishing to amend an existing installation shall seek Council approval prior to undertaking any works. Council will endeavor to respond as quickly and efficiently as possible but reserves the right to insist on a re-application under the Distributed Generation Policy.

7. EARTHING/BONDING AND PROTECTION

The consumer must ensure the generator supply has an adequate earthing, bonding and current protection and is compliant with the Australian Standards. All protection system designs must be to the applicable Australian standard, fit for purpose for the Coober Pedy Network and be presented within the application process.

8. COMMISSIONING AND TESTING REQUIREMENTS

In conjunction with the application process, Council requires the signed connection contract and relevant documentation prior to connection to the distribution network. If necessary, Council shall witness the commissioning procedure tests to ensure safety to the distribution network.

The equipment shall need to pass performance testing to be allowed on the network.

8.1 Relevant Documentation

The relevant documentation must be provided 2 weeks prior to connection and must consist of:

F. Final Protection Settings

This is inclusive of the protection settings of the inverters and other anti-islanding equipment.

G. Commissioning Program

All information of testing required that may impact the LV Distribution.

H. Safety Documentation

A pro-forma Certificate of Compliance from a licensed and authorised electrician that will be signed off within 1 month of Council granting approval to connect.

I. Other Relevant Documentation

Any other documentation requested by Council in the application process.

A copy of the results must be submitted to the Council no later than 1 month after testing and commissioning have been completed.

9. METERING OF DISTRIBUTED GENERATORS

Any installation that includes embedded power generation must have metering that facilitates importation and exportation of power consumption. Meters remain the property of Council.

Council supplies:

Liberty 120 for single phase metering up to 100A,

Sprint 211 for three phase metering up to 100A and

Premier 211 for current transformer metering for larger demand installations.

Council reserves the right to charge for the installation of metering if it is outside the Council's metering plan.

10 STANDARDS AND PRE-APPROVED EQUIPMENT

10.1 Standards and References

The following standards are likely applicable depending on the circumstances for PV systems, gensets, grid connection, wiring and batteries. The list of standards is intended to be a guide only, and it is the responsibility of the installer to ensure they are using the appropriate standards:

- AS1768 – Lightning Protection
- AS3000 – The wiring rules
- AS3008 – Selection of cables
- AS3011 – Electrical installations – secondary batteries installed in buildings
- AS4086.2 – Secondary batteries for use with stand-alone power systems
- AS4509 – Standalone power systems
- AS4777 – Grid connection of energy systems via inverters (only in some circumstances)
- AS5033 – Installation of Photovoltaic Arrays
- AS62040.1 – Uninterruptable power systems (UPS)
- AS IEC 61400.2 Design Requirements for Small Wind Turbines
- Any standards that apply to or are referenced in the above-mentioned standard.

Other references or guides that could be of interest are:

- Electricity Service and Installation Rules February 2013 -
- Electricity General Regulations 2012
- Electricity Act 1996
- SAPN Service and Installation Rules 2014 (this is a guide only)

10.2 Compliant or Pre-approved Equipment

All PV panels, batteries, battery management systems and gensets that meet Australian Standards and have been approved by relevant Australian Authorities are considered compliant.

All new inverters are to have a Zero Export capability so that they meet the Council requirements of Grid-tied Zero Export.

Modern inverters have built in capability to enforce Zero Export, while allowing import whenever required. The essential part of this system topology is a smart monitor that is

normally manufactured by the inverter manufacturer. The location of the monitor is along the feed-in path before the main switch on the consumption side. The monitor is connected to the solar system inverter using CAT5 or CAT6 cable using Modbus RTU or RS485 topology. The distance between the smart monitor and the inverter has to be considered, as the cable choice is a limiting factor. Installations on sheds away from the Council meter at the main building is one example where this could be an issue.

The smart monitor is usually configured locally via a web browser using Wi-Fi or LAN Port using LAN cable.

It is likely that Council will be the owner and operator of smart meters that can serve the same function, however this is still to be determined.

As part of the application process, Council will review proposed equipment and may chose that certain equipment is not acceptable, however the onus of equipment being fully compliant rests completely with the installer. Council has reviewed certain equipment, and for the purposes simplifying the process has pre-approved certain equipment.

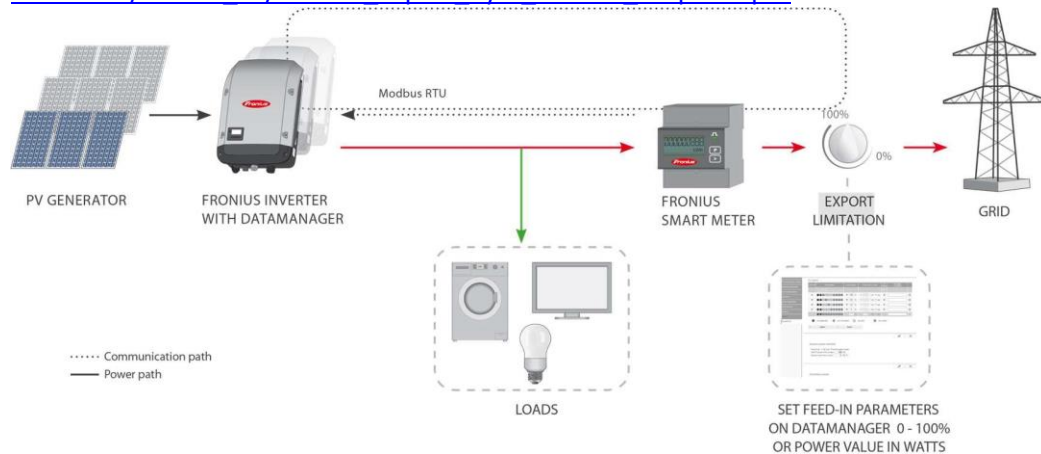
A list of approved inverters includes:

Selectronic

http://download.selectronic.com.au/brochure/BR0009_06%20Solar%20Hybrid%20Web.pdf

Fronius

http://www.fronius.com/cps/rde/xbcr/SID-EE664BA0-3DEE6C59/fronius_uk/Limited_Export_flyer_972848_snapshot.pdf



Enphase

<https://enphase.com/sites/default/files/downloads/support/Tech-Brief-Planning-Enphase-Storage-System-EN-US.pdf>

SMA

http://blog.sol-distribution.com.au/wp-content/uploads/2016/05/ZeroRiskwithZeroExport_TI-en-10.pdf

Redback

https://redbacktech.com/wp-content/uploads/2015/08/RBT004_data_sheet_Inverter-System-v11.pdf

Sungrow

<http://en.sungrowpower.com/uploads/soft/160808/1-160PP91U9.pdf>

SolarX

<https://www.solarchoice.net.au/blog/wp-content/uploads/Solax-X-Hybrid.pdf>

SolarEdge

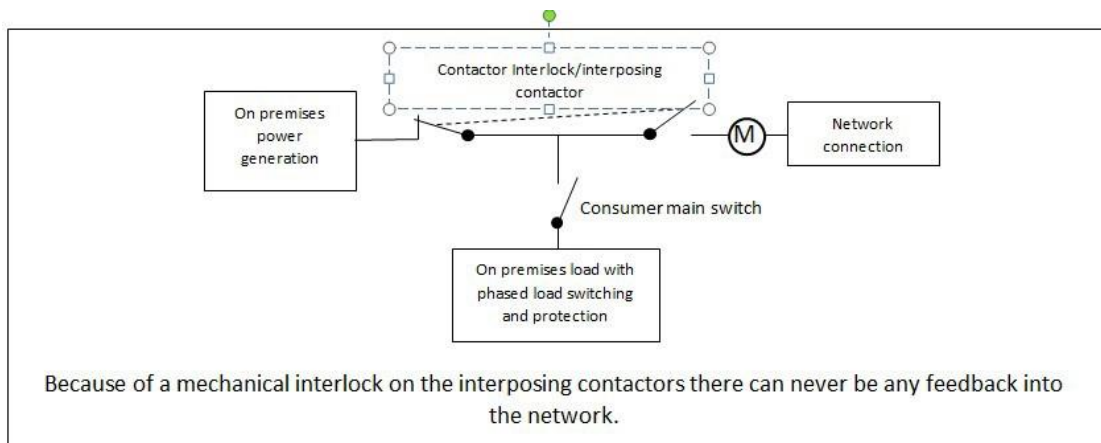
https://www.solaredge.com/sites/default/files/feed-in_limitation_application_note.pdf

https://www.solaredge.com/sites/default/files/se_feed_in_limitation_flyer_sa.pdf

An alternative low cost system that is deemed acceptable to Council in principle, however still requires full Council approval is a switchover system where the consumers load is either connected to the net or its own power generation. This could be considered a binary

switchover system with two interlocking contactors, whereby the system is fully islanded (isolated) or fully connected using a manual or automatic switchover as described in AS3000, paragraph 7.3.8.1. and the single line diagram below.

This system would meet the Grid-tied Zero Export requirements; however, the customer should be aware that it will not operate in ‘top up mode’. For example, if the demand is 4 kW and a PV generator/battery is providing 3kW, the system cannot draw the additional 1 kW from the grid. It would have to switch over.



10.3 Examples of a system setup

A Zero Export inverter system requires a smart meter at the connection point or additional smart monitor configured to play the same role. The role of a smart meter is to measure the loads and amount of energy to be exported to the grid. In a situation when the smart meter measures that PV generation exceeds consumption it can send a signal to the inverter to activate a standby load within the site (eg dishwasher, washing machine, hot water heat pump, air conditioning or similar) or reduce the solar system generation to match the site load.

Systems with battery storage can also become part of the solution to the grid operator’s problems. In times of excess power, electricity from the grid could be absorbed into the residential battery storage systems and held until required by the grid. The council/operator could then potentially pay for this electricity to be released into the grid when required. In the National Electricity Market (NEM), generators pay a penalty for over-production so having a solution to this problem in the form of distributed battery storage would be invaluable.

Design Guidelines and Methodology

Residential solar systems for working family (ie no-one home during the day) should be limited to 2kW peak power capacity and should include a battery storage system. If people are home during the day, a 3kW system with active household management would be suitable.

This design principle will grant the best outcome for end users, as all solar generated electricity will be consumed at the site of installation. Most zero export solutions come with a smart monitor, which could be installed before system installation.

A more effective approach would be to install new meters 3-6 months before solar. This data, visible to the householder, can then be used to profile the household consumption and guide energy efficiency adjustments and behavioral change first. This will enable accurate sizing of a solar system to meet each household’s daytime electricity needs or with the correct sized battery storage.

Designing a system using this process will result in smaller systems which are obviously cheaper to buy and result in optimal self-consumption. For optimum system operation and performance each site will need to have a connection to the internet and a switchboard with capacity/space to take 5 MCBs. If the installation site does not meet these criteria, alternatives do exist. In a residential environment with single-phase supply PV solar systems are limited to maximum inverter output of 5kW.

The following table shows the output of different sized systems throughout the year. Please note designs are based on north-facing roofs at 20° inclination, using solar irradiation data for Coober Pedy. Outputs are therefore indicative only as real-world situations will differ.

System Capacity (W)	Average Daily Output (kWh)												
	Jan	Feb	Ma	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Ave.
2030	11.00	10.51	9.81	8.96	8.29	7.94	8.04	9.05	10.29	10.81	10.98	10.98	9.72
2900	15.71	15.01	14.02	12.80	11.84	11.35	11.49	12.93	14.70	15.44	15.68	15.68	13.89
3480	18.86	18.01	16.82	15.36	14.21	13.62	13.78	15.52	17.64	18.53	18.82	18.82	16.67
4060	22.00	21.01	19.63	17.92	16.57	15.88	16.08	18.10	20.58	21.62	21.96	21.95	19.44
4640	25.14	24.02	22.43	20.49	18.94	18.15	18.38	20.69	23.52	24.71	25.09	25.09	22.22
5220	28.28	27.02	25.23	23.05	21.31	20.42	20.68	23.27	26.46	27.80	28.23	28.23	25.00