

MARLBOROUGH  
LINES

DISTRIBUTED GENERATION INFORMATION  
PACK

**For generators rated below 10kVA  
Issue 7 - April 2015**

**Marlborough  
Lines**

# Introduction to distributed generation

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Distributed generators, also known as 'embedded generators', are generators located at a home or business which are capable of generating electricity for that home or business's own use. They may also be capable of putting surplus electricity back into Marlborough Lines' electricity distribution network. These generators can take many forms; diesel generators, wind turbines and solar panels are the most common.

If you are interested in operating distributed generation and connecting it to our network, there are some things you need to know. This guide contains information designed to help you understand distributed generation and how to apply to connect it to our network.

Please note that any reference made to the regulations in this document refers to Part 6 of the Electricity Industry Participation Code 2010 which can be found at [www.ea.govt.nz](http://www.ea.govt.nz).

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# 1 Connecting distributed generation with capacity of 10kVA or less

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This information is for people who want to connect small distributed generation systems (10kVA or less) to Marlborough Lines' electricity network to generate electricity and possibly export energy into our network. These systems are usually single-phase, but may be three-phase. They are typically installed at residential or small commercial premises.

This information does not apply to generation systems that are not connected to our network, or which are greater than 10kVA.

For information about connecting larger distributed generation, see the separate document 'Distributed Generation Information Pack for Generators over 10kVA'.

## Talk to us about your proposed distributed generation

If you intend to install distributed generation that is capable of exporting any excess energy from the generator into our network (even if this seems unlikely), then you will need to involve us in the process as early as possible. You will need to talk to us, even though small generation quantities may have little impact on our network.

Distributed generation must meet all relevant statutory and regulatory requirements and comply with all applicable safety standards. If you connect distributed generation to our network, safety equipment and procedures must be in place to ensure safe interaction between your distributed generator and our network.

## Process to connect distributed generation of 10kVA or less to our network

The steps that you will need to take to connect distributed generation of 10kVA or less to our network. This information complies with Part 6 of the Electricity Industry Participation Code 2010.

### Select your system

Usually distributed generation of 10kVA or less will be solar powered (photovoltaic panels). Less frequently, it will be wind or micro-hydro generators. Your system must conform to the relevant standards in particular:

- AS 4777.1 Grid connection of energy systems via inverters – Installation requirements
- AS 4777.2 Grid connection of energy systems via inverters – Inverter requirements
- AS 4777.3 Grid connection of energy systems via inverters – Grid protection requirements
- AS/NZS 3000 Electrical installations (known as the Australian/New Zealand Wiring Rules)

In addition, The generator should be automatically disconnected from the supply if the mains line to neutral voltage drops below 200 volts or rises above 250 volts. It must remain disconnected for 120 seconds. The maximum that can be connected to any phase is 5kVA and ideally systems greater than 5kVA will be 3 phase.

which you can purchase and download from [www.saiglobal.com](http://www.saiglobal.com). or view for free at your public library. While these standards have been created with solar powered systems in mind, they can be applied to other systems.

### **Contact your electricity retailer**

You must discuss your proposed distributed generation installation with your electricity retailer (or the Electricity Commission's clearing manager, although this approach is less common), as any surplus energy that you generate may be sold to them. Unless you have contractual arrangements for purchase of any surplus electricity generated, and an electricity retailer is responsible for the connection, you will not be able to connect to our network.

### **Notify us**

Generation systems of 10kVA or less are unlikely to have significant impacts on our network. However we need to know where they are connected for safety and administrative reasons. Ideally, you should contact us as soon as you have decided which system you intend to install. The impact of small generation systems increases when several systems are located in close proximity, or when systems are located in remote locations.

### **Your application**

You will need to complete an application form (see Appendix A) and return it to us, along with the detailed information requested in the form. For example, we need to know the location, type, size and specification of your proposed distributed generation system, plus the name of the electrician who will install your system. We also need to know which electricity retailer is responsible for your connection.

You can speed up the processing of your application if your inverter conforms to AS 4777.2 and AS 4777.3 and has been pre-approved by Marlborough Lines. A list of pre-approved inverters is included in Appendix C.

### **Application fees**

We require an application fee to be paid. See Section 3 of this information pack.

### **Confirmation that your application is complete**

Within five business days of receiving your application we will advise you in writing whether or not your application is complete.

### **Our acceptance of your application for generation**

Within 30 business days of receiving your application we will give written notice of our decision to approve or decline your application for generation. We may request an extension of a further 20 business days. However, usually we will notify you of our decision within 10 business days. You must not connect your distributed generator to our network without our written consent.

### **If we decline your application**

If we decline your application we will detail our reasons and, if you choose to make a new application, detail the steps that you can take to ensure your application will be successful. If you disagree with our decision, a dispute resolution process is provided in Schedule 6.3 of the Regulations.

### **Your intention to proceed**

After we approve your final application you have 10 business days (or a mutually agreed longer period) to notify us in writing if you want to proceed with the distributed generation connection, and if so, confirming the details of the distributed generation to be connected.

Notice can be extended under the provisions outlined in Schedule 6.1 of the Regulations. Please note that if you choose not to proceed, and then apply to connect the same generation at a later date, we may charge an application fee as prescribed in the attached schedule of fees.

### Connection of generation

We have 30 business days to negotiate a connection contract with you after you notify us in writing of your intention to proceed. The contract will be based on the connection contract set out in Schedule 6.2 of the Regulations.

### Metering

As a generator of electricity, you are responsible for your metering installation. Your electricity retailer can arrange this for you. When you contact your retailer about your proposed distributed generation, they may arrange for a metering service provider to call and fit a second meter. This meter must separately measure the amount of electricity imported and exported.

Your retailer will advise of any rental charge for the meter, which may only be a few cents per day. You may also be charged a tariff / meter change fee, depending on your location and your existing metering.

### Minimum metering requirements

For your information, our minimum requirement for metering of distributed generation is illustrated in the diagram below. Figure 1 shows normal “reverse run stop” disc-type meters. However, some new electronic meters may also be capable of measuring flow in each direction as well. While Figure 1 shows single-phase metering, three-phase metering could be connected in a similar manner. Your retailer may use a variation of this system depending on your tariff option.

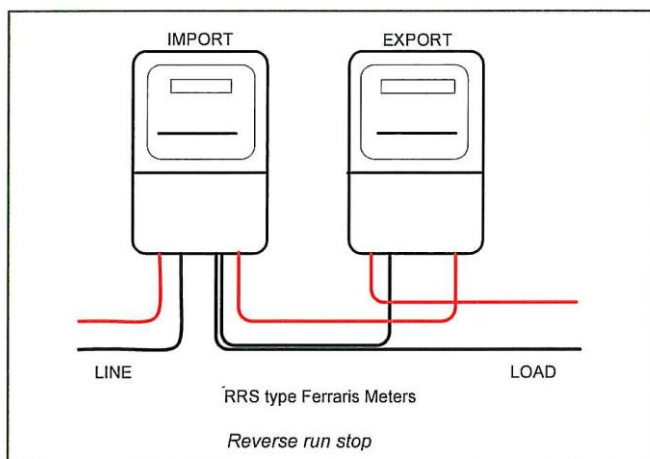


Figure 1: Metering diagram

### Installation

Any distributed generation equipment which you purchase should come with manufacturer’s installation instructions. Installation must be undertaken by qualified tradespersons to ensure compliance with all relevant building and electrical codes and standards. All wiring associated with the system must be undertaken by a registered electrician, and comply with AS/NZS 3000 or any successive standard or legislation. You must also check with your local Council whether any building or other consents are required.

If your generator continued to operate when there was a power cut, this would pose a serious safety threat on our network. It could have serious consequences for anyone working on the network and/or could damage your equipment. A system manufactured to Australian Standard 4777.2 and with protection systems installed in accordance with the Australian Standard 4777.3, will provide isolation and prevent this happening.

Your registered electrician should closely follow AS 4777.1 when installing your equipment. This standard can be purchased and downloaded at [www.saiglobal.com](http://www.saiglobal.com).

While AS 4777.1 deals primarily with connection of inverter based systems, its principles should also be followed for distributed generation systems that do not employ inverters.

We will advise if there are any specific conditions or work required to allow connection of your generation.

### **Testing and inspection before connection**

Please note that after your application has been approved and the steps outlined above are complete, as a minimum you must:

- test and inspect your distributed generation before connection;
- give us adequate notice of the tests and inspection – we may send qualified personnel to the site to observe the testing and inspection; and
- provide us with a written test report after testing and inspection.

In addition to your electrician's testing and inspection, we may send qualified personal to the site to observe the testing and inspection. We may charge a fee for observing the testing and inspecting.

### **Payments and charges**

Your retailer may credit you for the amount of electricity that you export into our network.

Information on lines charges for energy can be found on our website [www.marlboroughlines.co.nz](http://www.marlboroughlines.co.nz) under "About Us", "Disclosures".

## 2 Regulated terms for connection of distributed generation

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Part 6 of the Electricity Industry Participation Code 2010 contains regulated terms for the connection of distributed generation. In general we use these terms, however we are prepared to discuss alternate terms where they provide mutual benefit.

A copy of the regulated terms is contained in schedule 6.2 of the Code which can be found at

<https://www.ea.govt.nz/code-and-compliance/the-code/part-6-connection-of-distributed-generation/>



## 3 Credits and charges

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### Delivery credits

Distributed wind generation does not effectively reduce our peak loadings, and photovoltaic generation does not reduce our significant winter evening peaks. On this basis, we do not generally provide credits for these forms of generation.

Where Generation is effective in reducing the peak loading on MLL Network, credits may be paid. These will be based on the effective reduction in peak loading and the consequential reduction in costs to MLL.

### Energy credits

Generators are able to contract with electricity retailers (or the Electricity Commission's clearing manager) to sell any generation that is injected back into our network.

### Charges

We charge the following fees, in accordance with the Code and the associated clauses listed below.

Description of fee	\$ (exclusive of GST)
<b>Part 1 of Schedule 6.1 application</b>	
Application fee under clause 2(2)(c)	200
Fee for observation of testing and inspection under clause 7(5)	60
<b>Part 1A of Schedule 6.1 application</b>	
Application fee under clause 9B(2)(c)	100
Fee for inspection under clause 9C(3)	60
Deficiency fee under clause 9E(4)	80

# Metering

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You (the generator) are responsible for ensuring that suitable metering is installed which meets the minimum requirements for the size of the generator, and is also suitable for the pricing options applicable for the generator. This metering must be certified and compliant with the metering standards set out in Part 6 of the Electricity Industry Participation Code 2010.

You must ensure that arrangements are in place to read meters and provide this metering information to Marlborough Lines in a suitable format.

## Minimum metering requirements

Total generation capacity installed	Metering category of the connection	Marlborough Lines' minimum metering requirement
10kVA or less- or -30kVA or less (with no export, or minimal export)	1 or 2	Separate import/export metering of accumulated kWh flows at the network connection point.

## 4 Connection and Operation standards

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Marlborough Lines' Connection and Operation Standards as they relate to Distributed Generation consist of:

- a) Distributed Generation Information Pack – For Generators rated below 10kVA
- b) Distributed Generation Information Pack – For Generators over below 10kVA (this booklet)
- c) The application forms contained in a) and b) and the congestion management policy below
- d) Applicable legalisation, industry rules and standards, specifically the New Zealand Electricity Act, New Zealand Wiring Rules and New Zealand Codes of practise.

### **Congestion management policy**

New forms of distributed generation, such as solar power reduce the amount of electrical energy required from the Network. With the continued growth in solar power, significant amounts of energy can be exported into the system, in particular in the summer when people may be at work or away from home.

Our network is mainly engineered so that electricity flows in one direction. The growth in the amount of exported energy has the potential to create reverse power flows and congestion on our networks. One possible consequence of this is high voltage, which can damage customer's appliances and equipment. To limit the effect of this, all inverters are required to have an overvoltage shutdown and this is currently to be set to 250 volts.

At present small distributed generators are not causing any congestion on our network. We will regularly review this and publish any areas which may become congested.

During the distributed generation connection application phase we will assess (using our database of distributed generation installations and network capacity) the likelihood that the new distributed generation proposal will cause network congestion.

Distributed generation can be provided in many different forms, with wide variations in the business model and operational requirements. How to manage network congestion is best determined on a case-by-case basis during the network application process. There are two main ways to manage network congestion:

- Prevent network congestion by ensuring that distributed generation connection only occurs in unconstrained areas or is always accompanied by an appropriate network upgrade.
- Prevent network congestion by agreeing on a case-by-case basis the real-time operational rules that will apply.

The outcome will depend on the nature of the network congestion, the distributed generation operational characteristics and the business model of the proposal.

In line with the pricing principles in Part 6 of the Electricity Industry Participation Code 2010, in situations where a proposed generator will add to (rather than relieve) network congestion, and where this congestion is likely to lead to a future requirement to reinforce the network, we will assess the long run incremental cost of this network capacity and include this in the connection charges for the generator. In this way, all generators will pay an equitable share of network reinforcements that are required to relieve or avoid network congestion.

In some instances events on Transpower's national transmission grid may restrict distributed generation.

## **Emergency response policies**

We provide a 24hr 365 days a year fault service. Faults are dealt with as soon as practical. In the event of multiple faults, safety is our first consideration, followed by restoration of supply to critical customers, e.g. hospitals, first, then followed by prioritising work by the number of affected customers.

More information on our emergency response policies and network management are detailed in our Asset Management Plan, available on our website ([www.marlboroughlines.co.nz](http://www.marlboroughlines.co.nz)) and from our offices at 1 Alfred Street, Blenheim.

## **Asset Management Plan**

Our Asset Management Plan is available on our website ([www.marlboroughlines.co.nz](http://www.marlboroughlines.co.nz)) and from our offices at 1 Alfred Street, Blenheim.

## 5 Glossary

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**Australian/NZ Standards (AS/NZS):** Standards that apply jointly to Australia and New Zealand, available from [www.standards.co.nz](http://www.standards.co.nz).

**Australian Standards (AS):** Standards that apply in Australia and are optional for use in New Zealand, available from [www.saiglobal.com](http://www.saiglobal.com).

**Black start:** Certain generators have the ability to black start, meaning they can restart their generation plant with no electrical input if the system has blacked out. Generators without this capability require power from the grid to restart their generating plant.

**Certificate of compliance (COC):** Registered electrical workers must audit their own work and fill out a certificate of compliance as proof that they have complied with electrical safety standards and codes. A customer should request the COC from their electrical contractor when work is completed. We will need to see the COC before we can connect the electrical installation to our network.

**Code of practice:** The codes of practice are those parts of the Electricity Industry Participation Code 2010 which cover the accuracy of metering installations, requirements for approved test houses, requirements of metering installations, data-logger requirements, requirements for data administrators and profile administration.

**Connection:** A point at which Marlborough Lines' network connects to a customer's electrical system.

**Distributed generation:** Generation installed at a customer's installation that is capable of exporting electricity back into the local network.

**Distributed generator:** A distributed generator, also known as an 'embedded generator', is a generator located at a home or business which is capable of generating electricity for that home or business use. It may also be capable of putting surplus generation back into the distribution network.

**Distributor:** Also called 'lines companies', 'network companies' or 'distribution companies', distributors such as Marlborough Lines own and operate the lower voltage power lines and distribution networks in local areas. These connect to the national grid to deliver electricity to homes and businesses.

**Electrical contractor:** In the context of new connections to Marlborough Lines' network or upgrades to existing connections, an electrical contractor is a person or organisation contracted by either the customer, or the customer's consultant, to install part or all of the works required to achieve the new or upgraded electricity supply. This work generally involves low voltage construction on the customer's property.

**Electricity Industry Participation Code 2010:** The Electricity Authority's Electricity Industry Participation Code 2010 governs how the electricity market operates.

**Electricity retailer:** An electricity retailer (sometimes referred to as a 'power company') purchases electricity from the wholesale market to sell to residential and business users

**Generator customer islanding:** Generator will automatically isolate from the network and only supply a local load (normally emergency supply within a building).

**Generator network islanding:** Generator network islanding occurs when a fault on the network is isolated by network switches and the generator continues to supply power to the isolated network.

**Generator islanding protection:** A complex protection system that detects an islanding situation and executes prescribed generator control and isolation functions.

**(ICP), Installation control point:** A point of connection on a local network or an embedded network which the distributor nominates as the point at which a retailer will be deemed to supply electricity to a customer.

**Import/export of electricity:** 'Import' refers to electricity bought by the customer from an electricity retailer in the normal manner. 'Export' refers to electricity generated by the distributed generation system and injected back into the power network, where it can be sold to others (by a retailer).

**Installation:** A complete electrical installation from the point of a service main connection to the network, to the most remote circuit supplied by the switchboard.

**Installed capacity:** The electrical size of the system. A 1kVA system can supply 1kWh (or one unit) of electricity in an hour.

**Intermittent generation:** Generation for which the source is intermittent and not easily predicted, e.g. wind or wave generation.

**Inverter:** An electronic device that converts DC electricity to AC electricity.

**kVAr, kilo-volt-amperes (reactive):** Measurement of reactive power.

**kVA, kilo-volt-amperes:** Measurement of total power (combined real and reactive power), also called apparent power.

**kWh, Kilowatt-hour:** A kilowatt-hour is also known as a unit of electricity and is the basis of retail sales of electricity.

**kW, kilo-watts:** Measurement of real power.

**Meter:** Equipment that measures electricity quantity, usually in kilowatt-hours.

**Micro hydro:** Small water-powered generation systems, typically able to operate on low head pressure sources.

**Net billing:** The effective result of the cost of purchased electricity being offset by the same price being received for any exported electricity.

**Network:** A network (also called an electricity distribution network) is the lower voltage power lines and other assets in a local area which are used to carry electricity from the national grid to homes and businesses.

**Peak period:** Period during which Marlborough Lines operates its load management system to control network peaks.

**Photovoltaic panels:** Silicon panels that convert sunlight to DC electricity.

**Power Factor:** The ratio of the real power (W) to the apparent power (VA).

**Regulations:** Within this document refers to Part 6 of the Electricity Industry Participation Code 2010.

**Spot price:** The half-hour price of wholesale electricity.

**Time of use metering:** Metering that records the amount of energy either imported, exported, or both, in half hour time segments and is interrogated.

**Transpower:** The state-owned enterprise that operates New Zealand's transmission network. Transpower delivers electricity from electricity generators to various electricity distribution networks around the country.



## Appendix A – Application to connect and operate distributed generation with capacity of 10kVA or less on Marlborough Lines network

For all existing electricity connections, and when applying for a new electricity connection, we will evaluate the total export capacity of your proposed distributed generation (i.e. the maximum amount of electricity that your generation is able to inject into our network) to assess whether your proposed generation will exceed the capacity of your electricity connection.

To complete this evaluation, we will need evidence of your generation capacity – normally a kVA rating. Please attach to your application a copy of the manufacturer’s specifications and/or a photograph of the ‘name plates’ for your proposed generation, as evidence of its capacity. Additional information may be required if the manufacturer’s specifications are not comprehensive.

### **You must obtain our written agreement before you can connect distributed generation to our network**

Details of person/organisation applying to connect distributed generation		Details of customer at premises where distributed generation is to be connected	
<b>Name:</b>		<b>Name:</b>	
<b>Company:</b>		<b>Company:</b>	
<b>Address:</b>		<b>Address:</b>	
<b>Phone:</b>		<b>Phone:</b>	
<b>Facsimile:</b>		<b>Facsimile:</b>	
<b>Email:</b>		<b>Email:</b>	

ICP number from your power account (if new or upgraded connection): \_\_\_\_\_

Proposed date to connect your distributed generation: \_\_\_\_\_

## Details of your proposed distributed generation

Connection: Existing  New  Residential  Commercial

Manufacturer's rating of equipment: Amps \_\_\_\_\_ Volts \_\_\_\_\_

kW \_\_\_\_\_ kVA \_\_\_\_\_

Type: Solar PV  Gas turbine  wind turbine  Steam turbine   
Micro hydro  Fuel cell  other (specify) \_\_\_\_\_

Number of phases: One  Two  Three  (Note the maximum that can be connected to any phase is 5kVA).

Name of electrical contractor: \_\_\_\_\_

Energy retailer who has agreed to purchase your electricity: \_\_\_\_\_

Distributed generation system complies with AS 4777 (where appropriate): Yes  No

Distributed generation system complies with Marlborough Lines' network standards: Yes  No .

Details of any inverter and / or battery storage: \_\_\_\_\_

\_\_\_\_\_

Please attach the technical specifications of your equipment to show that your proposed distributed generation would automatically disconnect from our network during a power outage (it is important that distributed generation systems isolate from the network to avoid injury to line workers).

Is inverter on list of pre-approved inverters : Yes  No .

### Protection

The distributed generator should be equipped with the following protection elements where appropriate:

- Generation Circuit Breaker
- Disconnection Switch
- Earth-fault protection
- Synchronisation
- Loss of mains

The generator should be automatically disconnected from the supply if the mains voltage drops below 200 volts or rises above 250 volts. It must remain disconnected for 120 seconds. The values for the undervoltage and overvoltage shutdowns must be adjustable as these values may be altered in the future. The time delay must also be adjustable. Note that the mains supply may be automatically relivened in the following sequence: trip – reliven after 0.5 seconds – trip – reliven after 10 seconds – trip, remains tripped until the fault is repaired. All generator controls and protection shall be capable of handling this.

## Signage

Suitable signage shall be attached to all switchboards that can be supplied from any generation in accordance with AS/NZS3000. Typical signage is shown in Appendix A.

**If you do not complete all sections of this form and supply the requested information, your application may be delayed and an additional fee of \$80 will be charged.**

I apply to connect a distributed generator to Marlborough Lines New Zealand Limited's electricity network and confirm that the above information is correct.

Name: \_\_\_\_\_

Signature: \_\_\_\_\_

Date: \_\_\_\_\_

Marlborough Lines New Zealand Limited agrees to the connection of the distributed generator described above to its electricity network.

Name: \_\_\_\_\_

Signature: \_\_\_\_\_

Date: \_\_\_\_\_

## Appendix B – Warning Signs/Labels

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**WARNING**

**-DUAL SUPPLY-**

ISOLATE BOTH NORMAL AND  
GENERATOR SUPPLIES BEFORE  
WORKING ON THIS  
SWITCHBOARD

Sign on switchboard to which generator is connected

**WARNING**

**-DUAL SUPPLY-**

ISOLATE GENERATOR SUPPLY AT  
GENERATOR DISTRIBUTION  
BOARD BEFORE WORKING ON  
THIS SWITCHBOARD

Sign on intermediate distribution switchboard

## Appendix C – Pre- approved inverters

Ref	Make	Approved Model	Size (kW)	Compliance
1	Afore	HNS3000TL-1	3	AS4777.2:2005 & AS4777.3:2005
2	Afore	HNS5000TL	5	AS4777.2:2005 & AS4777.3:2005
3	Afore	HNS6000TL	6	AS4777.2:2005 & AS4777.3:2005
4	APS	YC500-SAA (micro-inverter)	0.5	AS4777.2:2005 & AS4777.3:2005
5	Delta	Solivia 2.5TR	2.5	AS4777.2:2005 & AS4777.3:2005
6	Delta	Solivia 3.0TR	3	AS4777.2:2005 & AS4777.3:2005
7	Delta	Solivia 3.3TR	3.3	AS4777.2:2005 & AS4777.3:2005
8	Duraluxe	DS2800TL	3	AS4777.2:2005 & AS4777.3:2005
9	Enasolar	1.5KWGT-AUNZ	1.5	AS4777.2:2005 & AS4777.3:2005
10	Enasolar	2KWGT-AUNZ	2	AS4777.2:2005 & AS4777.3:2005
11	Enasolar	3KWGT-AUNZ	3	AS4777.2:2005 & AS4777.3:2005
12	Enasolar	3.8KWGT-AUNZ	3.8	AS4777.2:2005 & AS4777.3:2005
13	Enasolar	4KWGT-AUNZ	4	AS4777.2:2005 & AS4777.3:2005
14	Enasolar	5KWGT-AUNZ	5	AS4777.2:2005 & AS4777.3:2005
15	Enphase	M215 (micro-inverter)	0.215	AS4777.2:2005 & AS4777.3:2005
16	Goodwe	GW2000-SS	2	AS4777.2:2005 & AS4777.3:2005
17	Goodwe	GW3000-SS	3	AS4777.2:2005 & AS4777.3:2005
18	Goodwe	GW3600-DS	3.6	AS4777.2:2005 & AS4777.3:2005
19	Goodwe	GW4000-SS	4	AS4777.2:2005 & AS4777.3:2005
20	Goodwe	GW4600-DS	4.6	AS4777.2:2005 & AS4777.3:2005
21	Goodwe	GW4600-SS	4.6	AS4777.2:2005 & AS4777.3:2005
22	Goodwe	GW5048D-ES	4.6	AS4777.2:2005 & AS4777.3:2005
23	Goodwe	GW10K-DT	10	AS4777.2:2005 & AS4777.3:2005
24	Growatt	Sungold 1500	1.6	AS4777.3:2005

25	Involar	MAC250A (micro-inverter)	0.235	AS4777.2:2005 & AS4777.3:2005 & AS4777.2:2005 &
26	MKSKY	3300TL	3	AS4777.3:2005 & AS4777.2:2005 &
27	RenaSola	Replus-250 (micro-inverter)	0.22	AS4777.3:2005 & AS4777.2:2005 &
28	Samil	Solar River 5200TL-D	5	AS4777.3:2005 & AS4777.2:2005 &
29	SMA	Sunny Boy 3000TL-21	3	AS4777.3:2005 & AS4777.2:2005 &
30	SMA	Sunny Boy 4000TL-21	4	AS4777.3:2005 & AS4777.2:2005 &
31	SMA	Sunny Boy 5000TL-21	5	AS4777.3:2005 & AS4777.2:2005 &
32	SMA	Sunny Tripower 5000TL	5	AS4777.3:2005 & AS4777.2:2005 &
33	SMA	Sunny Tripower 6000TL	6	AS4777.3:2005