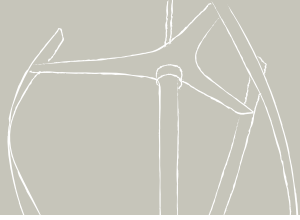


quietrevolution

qr5 - Vertical Axis Wind Turbine **GRID CONNECTION**



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CONNECTING TO THE GRID

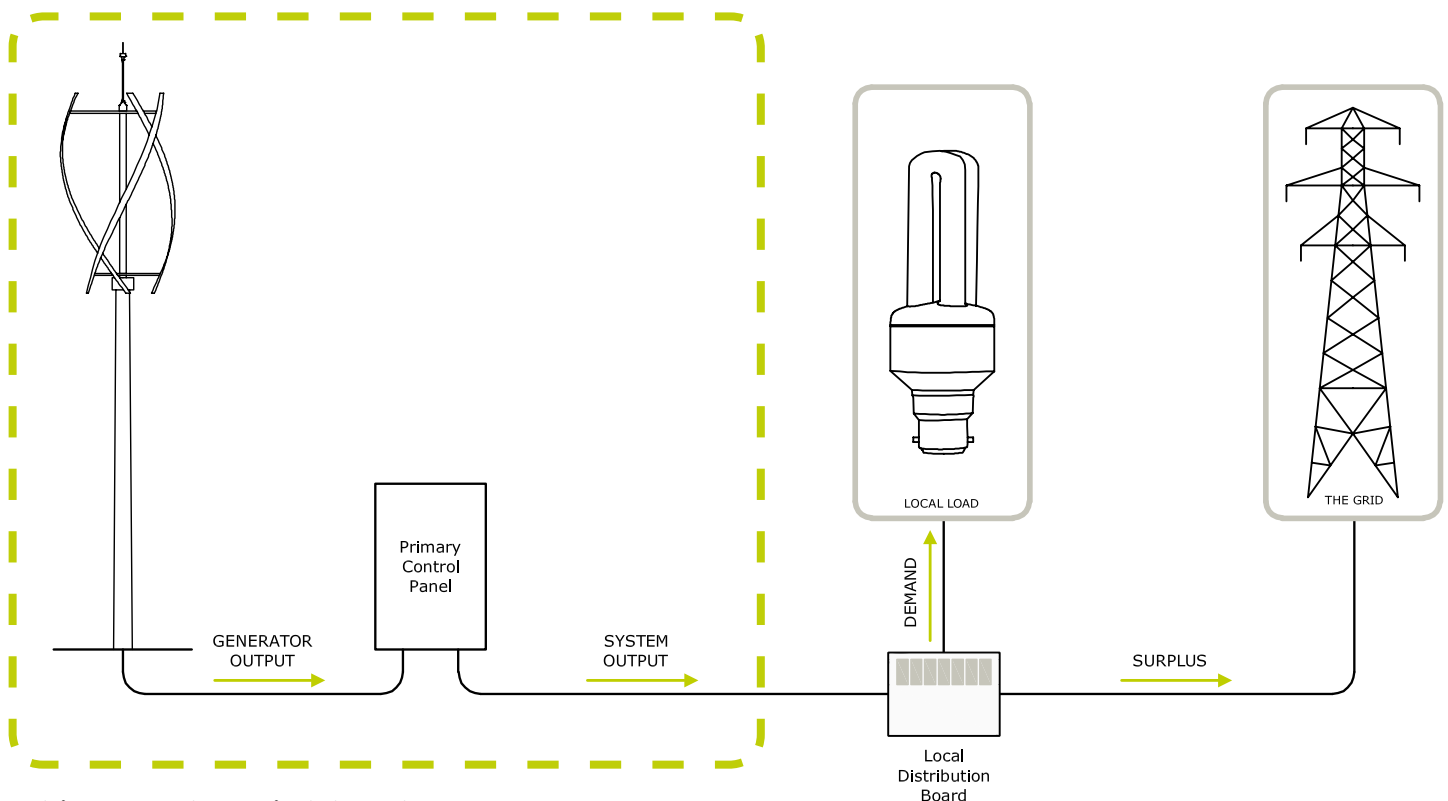
Connecting Wind Turbines to an Electricity Supply

Wind energy must be harnessed and controlled to make it compatible with everyday energy needs. Because wind is, by nature, variable in both intensity and direction, there are problems associated with doing this. In order to make best use of wind energy within the urban environment, it must be integrated seamlessly within the existing infrastructure, and currently this means transforming the wind turbine output into a form compatible with the UK's electricity network.

The requirements for connecting to the National Grid are strict and any equipment that generates electricity must meet specific standards. The quietrevolution qr5 wind turbine control and electrical system has been designed to fully comply with these standards, in addition to safely controlling the wind turbine in all wind conditions and ensuring the wind turbine is shut down when the wind speed is either too high or too low.

During normal operation, the qr5 control system measures wind speed using an anemometer mounted at the top of the turbine. When the wind speed is high enough the control system will allow the turbine to spin, turning a generator housed at the base of the turbine. The generator outputs electricity, which is carried via cabling back to the control system. Here it is converted into a form suitable for connection to the National Grid. The output from the qr5 can be used in exactly the same way as electricity drawn from the grid, supplying everyday needs. When the turbine is not generating sufficient electricity to cover local usage the shortfall is drawn from the Grid. Similarly, when the output from the turbine is greater than local usage, the surplus is exported to the grid. This system is automated, so no human intervention is required to make this switch between turbine and normal grid supply.

In many countries, including the UK, it is currently most efficient and cost-effective to use energy delivered by the turbines locally rather than exporting it, as electricity exported back to the Grid and sold to local suppliers is not purchased for as high a price as a customer pays, though this situation may change (see notes on Feed in Tarrifs below).



Grid Connection Administration

Grid connection of small scale embedded generation (SSEG) in the UK is governed by the G59 and G83 Engineering Recommendations. In order to grid connect a qr5 system an application must be made to the local electricity Distribution Network Operator (DNO) in accordance with these recommendations. Generally, single turbine qr5 installations are handled via the (less onerous) G83 application process whilst multiple turbine installations require a G59 application, which can require witness testing by the Network Operator and incur additional fees.

ROCs and LECs

Exporting Electricity - FITs, ROCs and LECs

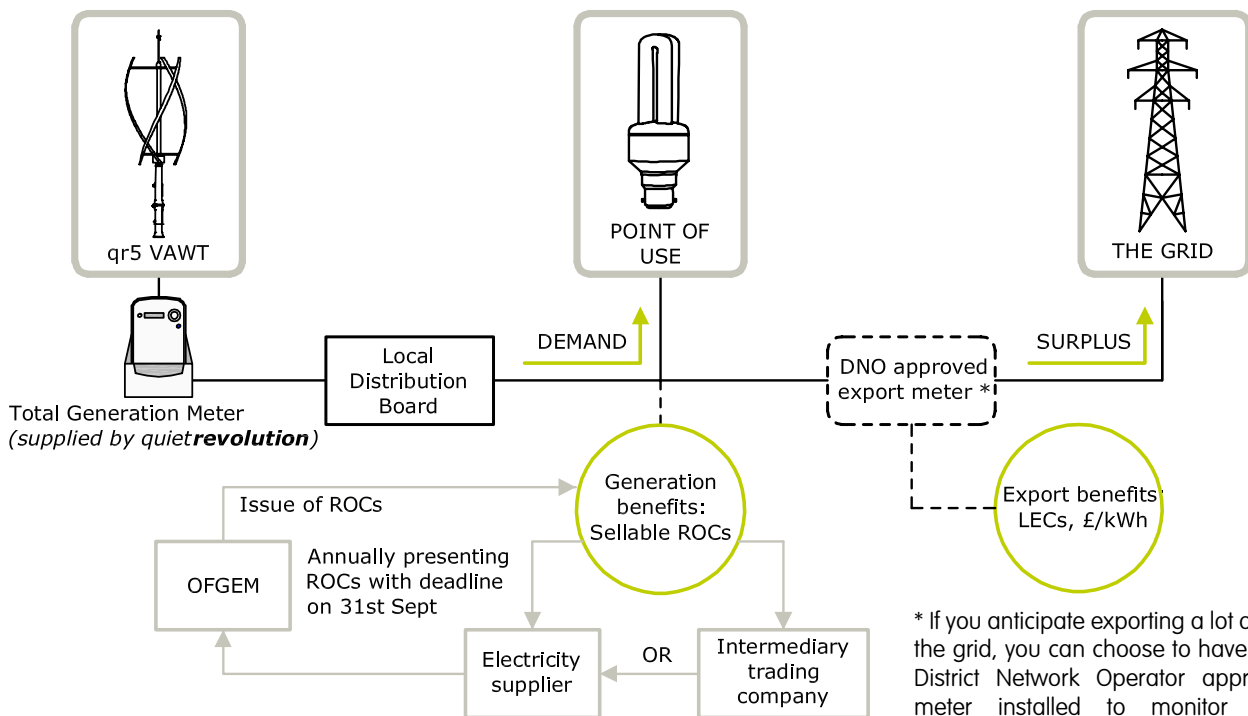
FITs (Feed-in tariffs) are not currently available in the UK, but are a government incentive structure set up in some parts of the world to encourage the adoption of renewable energy. The regional or national electricity utilities are obligated to buy renewable electricity at a price set by the government, which in some cases is above the rate you pay for electricity. The ability to sell at a higher price improves the payback on renewable technologies so encouraging uptake.

At present, export tariffs do not favour the production of small scale energy or 'microgeneration' for grid connected wind turbines. However there are additional financial incentives for microgeneration in the UK in the form of 'Renewable Obligations Certificates' and 'Levy Exemption Certificates'.

ROCs (Renewable Obligation Certificates) are digital certificates which hold details of exactly how a unit of electricity was made, by whom and finally who bought and consumed it. These certificates are effectively guarantees and are traded separately to the actual electricity itself. ROCs constitute a mechanism used by the Government to stimulate the production and take up of renewable energy within the UK, up to a national target of 10.4% by 2010.¹ **ROCs are issued for the total amount of renewable electricity generated and not simply the amount exported.**

Currently 1 ROC is allocated for every 1000kWhs (1MWh). However, from the 1st April 2009, regardless of the installation date, all renewable generators under 50kW will be eligible for 2ROCs/MWh.² The value of these ROCs fluctuates according to market conditions but E-roc showed an average pricing of £53.27/ROC in July 2008.³

LECs (Levy Exemption Certificates) are certificates which prove exactly how the electricity was generated and who generated it, thus authenticating the fact that the power comes from a renewable source. They do not have any intrinsic value themselves, but are a commodity for energy suppliers, to whom the Climate Change Levy tax (CCL) applies.



* If you anticipate exporting a lot of electricity to the grid, you can choose to have an electricity District Network Operator approved export meter installed to monitor the excess generation.

This service is not provided by quietrevolution.

1 See: The Department For Business Enterprise & Regulatory Reform ("BERR"), "Microgeneration and the Renewables Obligation", available at: <http://www.berr.gov.uk/energy/sources/renewables/policy/renewables-obligation/microgeneration/page39851.html>.

2 See: The Department For Business Enterprise & Regulatory Reform ("BERR"), "Reform of the Renewables Obligation, Statutory Consultation on the Renewables Obligation Order2009", available at: <http://www.berr.gov.uk/files/file46838.pdf>.

3 Prices available at "E-Roc", the on-line ROC auction service provided by the Non-Fossil Purchasing Agency Limited, available at: www.e-roc.co.uk/trackrecord.htm. See also: <http://www.nfpa.co.uk/>.

ROCs






Overview

To be eligible to trade in ROCs an Office of Gas and Electricity Markets ("OFGEM")⁴ registered ROC meter is required to be installed and registered in your name. The meter will measure the total amount of energy produced by your installation and is installed as standard with the quietrevolution qr5 wind turbine control system. You are eligible for ROCs on all of the electricity you produce, including that used on site. Part of the process of becoming OFGEM registered includes the administration of a 'sell and buy-back' agreement. Usually, the sell and buy-back agreement will be taken care of by the company you sell your ROCs to.

All eligible renewable energy producers currently receive 1 ROC for every 1MWh (1,000kWh) of electricity they produce annually (as mentioned above, this will double to 2ROCs/MWh from 1st April 2009). ROCs are rounded to the nearest MWh, so a wind turbine producing 9,600kWh of electricity per year will currently be eligible for 10 ROCs, whilst one producing 9,400kWh of electricity per year will be eligible for 9 ROCs.⁵

ROCs have traded at an average of around £46.00 since they were introduced into the UK in 2002. At the NFPA's July 2008 ROC auction, the average selling price was £53.27. The value of a ROC is driven by Government targets for the amount of energy produced from renewable sources. UK licensed electricity suppliers are required to provide a proportion of their electricity supply from renewables. This proportion was 6.7% in 2007 and is set to rise steadily to 10.4% in 2010 and 15.4% by 2015.⁶ To meet these rising targets, it is likely that electricity suppliers will need to buy extra ROCs. They may choose to either purchase these from renewable energy producers or instead pay a 'buyout fee' which is the rate which a producer must pay if it does not present sufficient numbers of ROCs to meet its obligations under the Scheme. The buy-out price for 2007-2008 was £34.30 and was set at £35.76 for 2008-2009 per ROC (this fluctuates annually according to movements in the retail price index ("RPI")).⁷ Once you own ROCs, you can either sell them to a renewable energy supplier, or to an intermediary company set up to deal with ROC trading.

For more information on tariffs available for both ROCs and LECs please see the following links:

	Ecotricity	www.ecotricity.co.uk
	Good Energy	www.good-energy.co.uk
	Green Energy UK	www.greenenergy.uk.com
	Smartest Energy	www.smartestenergy.com
	Tradelink Solutions	www.tradelinksolutions.com

⁴ See further: www.ofgem.gov.uk

⁵ ROC meters are read by the installation owner and reported on trust. This can be done annually or monthly although there are often random installation inspections carried out.

⁶ See: The British Wind Energy Association, "The Renewables Obligation", available at: <http://www.bwea.com/business/roc.html>.

⁷ See: OFGEM, "The Renewables Obligation Buy-Out Price and Mutualisation Ceiling", 28th January, 2008, available at: http://www.ofgem.gov.uk/Sustainability/Environment/RenewablObl/Documents/Buy-out_and_mutualisation_press_release1.pdf.