The Certification Mark for Onsite Sustainable Energy Technologies

Microgeneration Installation Standard: MIS 3003

# REQUIREMENTS FOR CONTRACTORS UNDERTAKING THE SUPPLY, DESIGN, INSTALLATION, SET TO WORK COMMISSIONING AND HANDOVER OF MICRO AND SMALL WIND TURBINE SYSTEMS

Issue 2.0

This standard has been approved by the Steering Group of the MCS.

This standard was prepared by the MCS Working Group 3 'Micro and Small Wind Turbine Systems'.

**REVISION OF MICROGENERATION INSTALLATION STANDARDS**

Microgeneration Installation Standards will be revised by issue of revised editions or amendments. Details will be posted on the website at www.microgenerationcertification.org

Technical or other changes which affect the requirements for the approval or certification of the product or service will result in a new issue. Minor or administrative changes (e.g. corrections of spelling and typographical errors, changes to address and copyright details, the addition of notes for clarification etc.) may be made as amendments.

The issue number will be given in decimal format with the integer part giving the issue number and the fractional part giving the number of amendments (e.g. Issue 3.2 indicates that the document is at Issue 3 with 2 amendments).

Users of this Standard should ensure that they possess the latest issue and all amendments.

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## FOREWORD

This standard identifies the evaluation and assessment practices undertaken by the certification bodies of the MCS for the purposes of approval and listing of contractors undertaking the supply, design installation, set to work, commissioning and handover of micro and small wind turbine systems. The listing and approval is based on evidence acceptable to the certification body:

- that the system or service meets the standard
- that the contractor has staff, processes and systems in place to ensure that the system or service delivered meets the standard

And on:

- periodic audits of the contractor including testing as appropriate
- compliance with the contract for the MCS listing and approval including agreement to rectify faults as appropriate

This standard shall be used in conjunction with MCS 001 scheme document.

Government defines Microgeneration as the production of heat and/or electricity on a small-scale from a low carbon source. The various technologies have the potential to help us achieve our objectives of tackling climate change, ensuring reliable energy and tackling fuel poverty.

The objective of Government's Microgeneration strategy is to create conditions under which Microgeneration becomes a realistic alternative or supplementary energy generation source for the householder, for the community and for small businesses.

NOTES:-

Compliance with this Microgeneration Installation Standard does not of itself confer immunity from legal obligations.

Users of Microgeneration Installation Standards should ensure that they possess the latest issue and all amendments.

The MCS Steering Group welcomes comments of a technical or editorial nature and these should be addressed to “The Secretary” at mcs@gemserv.com.

Listed products and services may be viewed on our website: www.microgenerationcertification.org

# 1. SCOPE

This standard specifies the requirements the MCS for Contractors undertaking the supply, design, installation, set to work, commissioning and handover of micro and small wind turbine systems located on dedicated free-standing / guyed towers or building mounted, supplying permanent buildings and either linked to the electricity distribution grid or off-grid battery charging systems. For the purposes of this standard, Micro and Small Wind Turbines are defined as those having an electrical output in the range 0.3kW to 50kW (measured at a wind speed of 11.0 metres per second).

# 2. DEFINITIONS

| | |
|---|---|
| Contractor | An individual, body corporate or body incorporate, applying for or holding certification for the services detailed in the Scope, Clause 1, above. |
| Contract | A written undertaking for the design, supply, installation, set to work and commissioning of Microgeneration systems and technologies |
| Design | The formulation of a written plan including a specific list of products and fixings to form a completed system for a defined Microgeneration technology. Including extensions and alterations to existing Microgeneration systems. |
| Installation | The activities associated with placement and fixing of a Microgeneration system. |
| Set to work | The activities necessary to make the Microgeneration system function as a completed system. |
| Commissioning | The activities to ensure that the installed system operates within the boundaries and conditions of the design and the product manufacturers' claims. |
| Sub-contract | A written contract between a certificated contractor and another Firm for supply of products and services in connection with the fulfilment of a contract. |
| Handover | The point in a contract where commissioning and certification of the system have been satisfactorily completed to the contract specification so enabling the installation to be formally handed over to the client. |

# 3. REQUIREMENTS FOR THE CERTIFICATED CONTRACTOR

## 3.1 Capability

Certificated contractors shall have the capability and capacity to undertake the supply, design, installation, set to work, commissioning and handover of micro and small wind turbine systems. Where contractors do not engage in the design or supply of micro and small wind turbine systems, but work solely as an installer for a client who has already commissioned a system design; then the contractor must be competent to review and verify that the design would meet the design requirements set out in this standard and this should be recorded.

## 3.2 Quality management system

Contractors shall operate a satisfactory quality management system which meets the additional requirements set out in the scheme document MCS 001.

## 3.3 Sub contracting

In installations for private customers, any work within the scope of the scheme not undertaken by employees of the Contractor shall be managed through a formal subcontract agreement between the two parties in accordance with the policies and procedures employed by the certificated Contractor. These procedures shall ensure that the subcontractor undertakes the work in accordance with the requirements of this standard.

In other situations (for example new build, or for commercial customers), it is permissible for the physical installation, setting to work and commissioning to be undertaken by others (i.e. not sub-contracted to the Contractor) provided that:

3.3.1 A contract between the Contractor and the commercial client details obligations on the client to include that evidence of skills and training of those employed by the client to do elements of work not undertaken by the Contractor are to be made available to the Contractor to ensure that the competence requirements of this standard are met and that access to the site for training and supervision in accordance with the following sections is agreed in advance.

3.3.2 The certificated Contractor provides additional product-specific training for those undertaking the work not undertaken by the certificated Contractor.

3.3.3 The certificated Contractor assesses a sample number of installations under the contract which is not less than the square root of the number of installations rounded up to the nearest whole number (e.g. a new build site of 50 installations then a minimum of 8 are assessed).

3.3.4 The certificated Contractor assumes responsibility at handover that the installation is in full compliance with the standard.

## 3.4 Consumer code of practice

The Contractor shall be a member of and, when dealing with domestic consumers, comply with a code of practice (consumer code), which is relevant to the scope of their business in the Microgeneration sector and which is approved by the Office of Fair Trading (OFT). In the absence of any approved codes the MCS will accept codes that have completed stage 1 of the OFT approval process (e.g. REAL Code).

# 4. DESIGN AND INSTALLATION REQUIREMENTS

## 4.1 Regulations

All applicable regulations and directives must be met in full. It should be noted that regulations that must be applied may be different in England and Wales, Scotland and Northern Ireland. Some guidance on applicable regulations is given in the guidance document MCS 002. This guidance is not necessarily exhaustive and may change from time to time. Certificated contractors must ensure they have a system to identify all applicable regulations and changes to them.

All work, and working practices, shall be in compliance with all relevant Health and Safety regulations and a risk assessment shall be conducted before any work on site is commenced.

## 4.2 Design and installation

Wind Turbine systems shall be designed and installed in accordance with the Energy Saving Trust publication CE72 – 'Installing small wind-powered electricity generating systems', with the following exception and the additional requirements specified in this standard. Particular attention is drawn to the requirement that an inverter supplied by a wind turbine must be connected via a dedicated circuit, to a spare fuseway in the main distribution unit, or to a fuseway in an additional dedicated distribution board:

- The scope of CE72 is defined as wind turbines with power outputs ranging from 500W to 25kW. For the purposes of this standard this range is extended to between 300W and 50kW (measured at a wind speed of 11.0 m $s^{-1}$).

## 4.3 System Performance

An estimate of annual energy performance shall be calculated using the procedure detailed below:

**Step 1** - Establish 10m altitude mean wind speed for proposed location using the NOABL (Numerical Objective Analysis of Boundary Layer) database. The national database of approximate wind speeds published by the DTI (referred to as NOABL) can be found here: *http://www.dti.gov.uk/energy/sources/renewables/*

**Step 2** - Where a wind turbine cannot be located at a distance greater than 10 times the height of the nearest obstruction away from that obstruction (measured in the direction of the prevailing wind) then the wind speed obtained in step 1, above, shall be reduced using the appropriate

NOABL correction factor as given in Appendix B. Otherwise the unadjusted NOABL mean wind speed can be used.

**Step 3** - Apply the wind speed figure from Step 2. to the wind turbine manufacturer's Annual Energy Performance Curve (*note: this is not the Power Curve*) to obtain an estimate of the annual energy output. At the discretion of the system designer, further factors to reduce the estimated annual energy output, due to turbulence or obstructions in other directions, may be applied.

This information should be communicated with the client at or before the point that the contract is awarded and shall be accompanied by the following disclaimer:

*"The performance of wind turbine systems is impossible to predict with any certainty due to the variability in the wind from location to location and from year to year. This estimate is based upon the best available information but is given as guidance only and should not be considered as a guarantee. For a greater level of certainty, it is recommended that on-site wind speed monitoring is undertaken for at least a year."*

In addition to the above standard estimate of annual energy performance, additional estimates may be provided using an alternative methodology or additional adjustment factors in the standard methodology. Any such estimates must clearly describe and justify the approach taken and factors used, must not be given greater prominence than the standard estimate and must have an associated warning that it should be treated with caution if it is significantly greater than the result given by the standard method.

## 4.4 Site specific issues

The following issues shall be addressed in the design of the wind turbine system for each installation:

4.4.1 The suitability of a given site shall be assessed, by a qualified professional experienced in micro and small wind systems, using a site survey form including at least the details given in Appendix A. All contractors shall make their customers aware of all permissions and approvals required for the installation. Where required, planning and/or building control approval should be obtained before work is commenced.

4.4.2 The class of turbine selected for installation shall be appropriate for the conditions at the proposed site as identified through the site survey (see Appendix A).

4.4.3 For wind turbines mounted directly on a building, in addition to section 3.1 of CE72, the fixing method used shall not compromise the weather resistance or structural integrity of the building. If there is any doubt, a structural engineer must be consulted.

4.4.4 Wind turbines, especially those mounted on buildings, shall not be located in such a way as to have an adverse affect on the performance of any flue which serves fuel burning equipment (e.g. gas fire).

*Note: where any flue exists above gutter level (e.g. from a chimney) and a wind turbine is to be mounted on the building then additional analysis shall be undertaken and documented.*

4.4.5 The Contractor shall ensure the customer is aware from the outset that metering will be required if the customer wishes to access certain financial incentive schemes. The contractor will ensure the customer has the opportunity to take account of this when awarding the contract.

*Note: for guidance on metering requirements please follow the MCS Metering Guidance v1.0, available from the Standards section of http://www.microgenerationcertification.org/*

## 4.5 Commissioning

The wind turbine system shall be commissioned according to a documented procedure to ensure that the system is safe, has been installed in accordance with the requirements of this standard and the manufacturers' requirements, and is operating correctly in accordance with the system design. See also Clause 5 of the Energy Saving Trust publication CE72.

## 4.6 Documentation

Certificated contractors shall provide customers with a comprehensive document pack as soon as is practicable and that pack shall be in accordance with CE72 plus:

- The structural engineer's report for a building mounted wind turbine or for the generic fixing system for the wind turbine and type of construction of the building.

- Advice to the customer to inform their insurer of the installation.

### 4.7 Equipment

Wind turbines system used in installations shall be listed under the MCS (http://www.microgenerationcertification.org)

Equipment shall be suitable for its application and have a manufacturer's declaration of conformity for the appropriate standard.

## 5. COMPETENCE OF STAFF

All personnel employed by, or sub-contracted to, the contractor must be able to demonstrate that they are trained and competent in the disciplines and skills, appropriate to the activities required for their role, in accordance with this standard.

Complete records of training and competence skills of personnel must be maintained by the certificated contractor, in particular:

- Design staff, carrying out full conceptual design, must be able to demonstrate a thorough knowledge of the technologies involved and the interaction of associated technologies.
- All personnel engaged in the actual installation are expected to have technical knowledge and installation skills, to install components and equipment within the designed system, in accordance with all appropriate codes of practice, manufacturer's specifications and regulations.
- All personnel engaged in the final inspection, commissioning, maintenance or repair, must have a comprehensive technical knowledge of the products, interfacing services and structures to complete the specified processes.

Examples of the underpinning knowledge areas required to show competence are given in Appendix C.

*Note: Due to the current development of the Sector Skills Agreement and the review in progress of the National Occupational Standards for this technology, the indicated suggested scope in Appendix C, may change.*

# 6. HANDOVER REQUIREMENTS

At the point at which the micro and small wind turbine system is handed over to the client, the documentation as detailed in 4.6 should be provided and explained along with:

- the maintenance requirements and maintenance services available
- a certificate signed by the contractor containing at least the following:
  - a statement confirming that the wind turbine system meets the requirements of this standard
  - client name and address
  - site address (if different)
  - contractors name, address etc
  - list of key components installed
  - estimation of system performance , calculated according to 4.3
  - A certificate obtained from the MCS Installation Database, showing that the installation has been registered with the scheme (to be provided within 10 working days of the commissioning date).

*Note: all MCS Installations must be notified to the MCS Licensee through the MCS Installation Database, where a certificate will be generated and sent to the customer. There is a £5 per installation fee levied on installers for each installation added to the database.*

# 7. REGIONAL OFFICES

Where the contractor wishes to design and commission under the Certification Scheme in regional offices, then these offices shall meet the requirements of this standard to be eligible for Certification.

# 8. PUBLICATIONS REFERRED TO

In the following list reference to undated publications implies the latest edition and amendments:

- EN 61400-2: 2006 Wind Turbines – Part 2: Design requirements for small wind turbines. Available from British Standards Institution (BSI): www.bsi-global.com
- BS 7671 Requirements for Electrical Installations. Available from: The Institution of Engineering and Technology: www.iee.org/Shop/
- CE 72 – Installing small wind-powered electricity generating systems. Available from: www.est.org.uk/download.cfm?p=1&pid=336

- G59/1: 1991 Recommendations for the connection of embedded generating plant to the public electricity suppliers' distribution systems. Available from The Energy Networks Association: www.energynetworks.org
- G83/1: 2003 Recommendations for the connection of small scale embedded generators (up to 16 A per phase) in parallel with public low voltage distribution networks. Available from The Energy Networks Association: www.energynetworks.org
- MCS 001 –Microgeneration Certification Installer certification scheme. . Available from www.microgenerationcertification.org
- MCS 002 – Guidance on regulations and directives for microgeneration installations. . Available from www.microgenerationcertification.org
- MCS Metering Guidance v1.0.

# 9. APPENDIX A: Site Survey Form

The site survey form used by contractors prior to the preparation of a quotation shall include at least the following elements:

1. Customers name, address and contact details
2. Site address, grid reference and site usage (e.g. residential, agricultural, commercial, school etc.)
3. Client expressed preferences, where applicable, to include:
    a. make / model of wind turbine
    b. Electrical connection type (grid connect, battery charging etc.)
    c. building or mast mounted
    d. location on building if building mounted or location on site if tower mounted
    e. comment regarding limitations of client preferences as discussed with the client
4. An assessment of the wind resource to include:
    a. Average wind speed according to NOABL for the height above ground nearest to the proposed hub height (10m or 25m)
    b. Appropriate highest class of wind turbine in accordance with EN 61400-2, from the following table

| **Class** | **I** | **II** | **III** | **IV** |
|---|---|---|---|---|
| $V_{ave}$ (m/s) | 10 | 8.5 | 7.5 | 6 |

*Note: $V_{ave}$ is the average annual wind speed at hub height and highest class means a Class I would be suitable for all sites but Class III would not be suitable where the average annual wind speed is likely to be greater than 7.5 m/s. Please refer to EN61400-2 for the full table of information.*

    c. Prevailing wind direction or wind rose
    d. Details and distances to any obstacles to the wind
5. An assessment of the site for mechanical installation to include:
    a. For building mounted, full details of type of construction (e.g. brick/block with cavity, solid brick, timber frame etc.) including type of mortar (e.g. lime or cement mortar).
    b. For mast mounted, full details of ground conditions, cable distances and necessary types (e.g. armoured for buried cable runs)
6. An assessment of the electrical systems to include:
    a. Method of connection to consumer unit (e.g. dedicated fuseway)
    b. Earth testing
    c. Proposed location of inverter
    d. Metering arrangements (location, meter type)
    e. Details of electricity supplier and network operator

7. Planning considerations
    a. proximity of proposed location to nearby residents and assessment of potential nuisance from noise or flicker
    b. details of listed buildings or if conservation area
    c. ecology (e.g. impact on bats' roost)
8. Health and Safety considerations necessary for a risk assessment to include:
    a. access arrangements for working at height
    b. electrical hazards such as live overhead cables
    c. underground utilities (e.g. gas, electric, water, telephone)
    d. details of public access and any congregation zones
    e. locations of any flues serving fuel burning equipment.
9. A place for both the surveyor and the customer to sign off the document

# 10. APPENDIX B: Wind Resources in Urban Areas

Approximate correction factors for mean wind speed for turbines mounted on or near buildings

The national database of approximate wind speeds published by the DTI (referred to as NOABL, Numerical Objective Analysis of Boundary Layer) can be found here: *http://www.dti.gov.uk/energy/sources/renewables/*

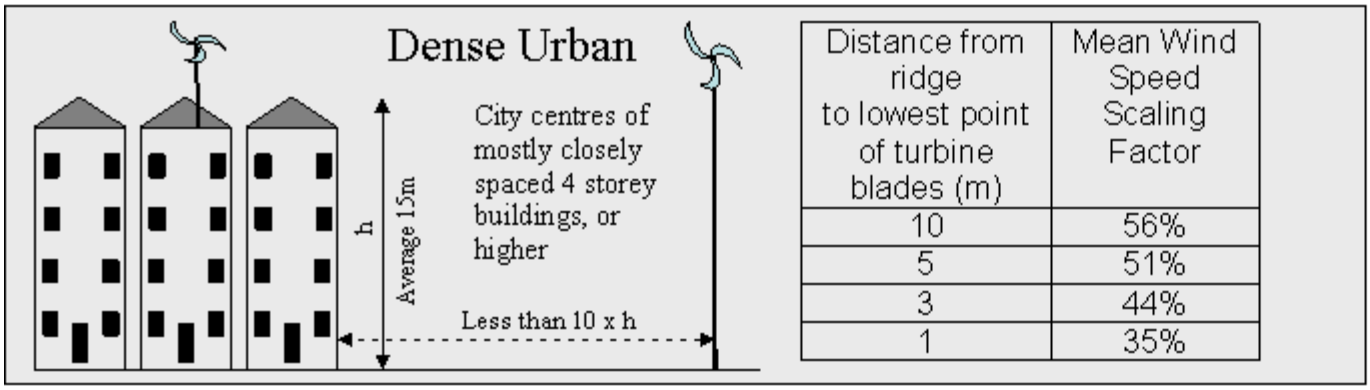
The factors on the following page may be used to correct NOABL wind speeds given for 10m above ground level where a wind turbine is located at a distance of less than 10 times the height of upwind obstructions (for example buildings or trees) or mounted directly on buildings.

PLEASE NOTE:

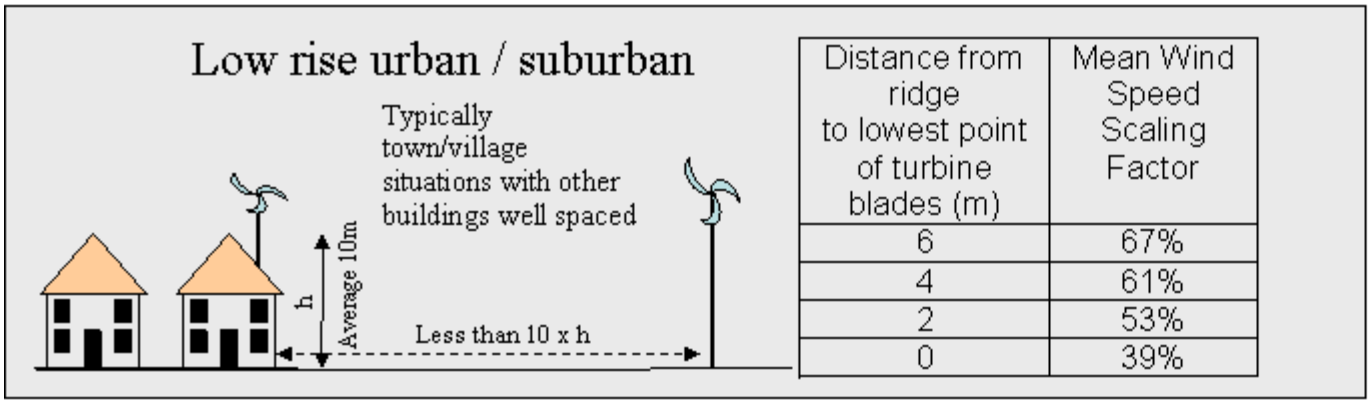
- The power available from the wind falls rapidly as the wind speed reduces (**power is proportional to the cube of the wind speed**). Therefore the location of a wind turbine is critical to its performance.
- Any performance estimate calculated using the factors given here is for guidance only and will not be accurate for all situations. The factors given here are to estimate **probable** mean wind speeds above **buildings of average height for the area**. If the buildings are lower or higher than average, the mean wind speed will be correspondingly affected.
- For **building-mounted turbines**, the factors assume there are **no other obstructions** significantly larger than the building within a radius of 10 x the building height. If there are such obstructions, the wind will be less predictable and more turbulent.
- The factors take no account of the particular **building size or shape**, which can affect the air flow significantly. The wind energy above flat roofs is particularly difficult to predict and is very sensitive to the location on the roof.
- **Turbulence** of the wind reduces performance (and turbine life). If you suspect high turbulence levels at your site, consult an expert before installing a turbine.
- Turbines mounted **lower than the average roof height** are likely to experience more turbulent winds.
- Under certain circumstances, the **shape of the roof can enhance the wind speed** and thus the power available. To take advantage of this effect you will need expert advice and may need to measure the average annual wind at the proposed location on the roof.
- **Accurate measurement** over a period of 1 year is the preferred method for determining the actual wind speed in a given location and should always be

considered.

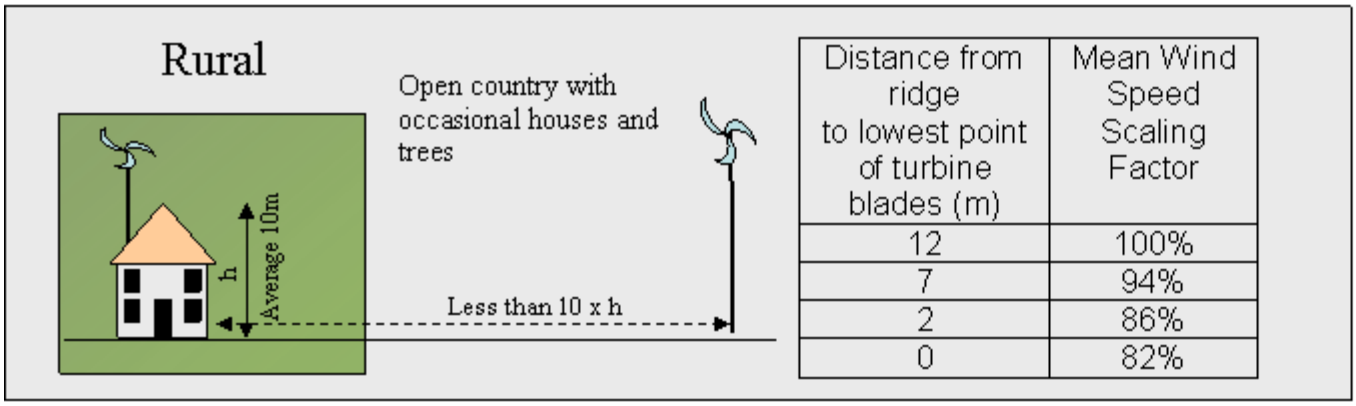
***Please read the notes on the previous page in conjunction with these diagrams***




| Distance from ridge to lowest point of turbine blades (m) | Mean Wind Speed Scaling Factor |
|---|---|
| 10 | 56% |
| 5 | 51% |
| 3 | 44% |
| 1 | 35% |




| Distance from ridge to lowest point of turbine blades (m) | Mean Wind Speed Scaling Factor |
|---|---|
| 6 | 67% |
| 4 | 61% |
| 2 | 53% |
| 0 | 39% |




| Distance from ridge to lowest point of turbine blades (m) | Mean Wind Speed Scaling Factor |
|---|---|
| 12 | 100% |
| 7 | 94% |
| 2 | 86% |
| 0 | 82% |

Scaling factors derived from data given in Harris R I & Deaves D M, The structure of strong winds, Wind engineering in the eighties, proc. CIRIA conference, 12-13 November 1980, London, 1981.

# 11. APPENDIX C: Competence of Staff

Assessments of competence will cover the following under pinning knowledge areas:

- Mechanical Engineering (understanding of static and dynamic stresses and loads involved with wind turbines)
- Environmental impacts of wind turbines (e.g. noise, flicker)
- Resource assessment and performance calculation (inc understanding of limitations of NOABL and impact of turbulence)
- Non-conventional AC output (variable voltage, variable current, variable frequencies) of wind turbine
- DC Electrical systems
- Conventional AC Electrical Systems (BS 7671)
- Grid connection requirements (G83/1, G59/1)
- Battery systems for off-grid applications (sizing, depth of discharge, ventilation, dump loads etc.)

# AMENDMENTS ISSUED SINCE PUBLICATION

| Document Number: | Amendment Details: | Date: |
|---|---|---|
| 1.2 | Amended 3.4 Consumer Code of Practice wording<br>Updated e-mail and website addresses | 25/02/2008 |
| 1.3 | Gemserv details added as Licensee.<br>Document reformatted to reflect brand update.<br>References to BERR updated to DECC, MCS logo updated accordingly.<br>Website and email addresses updated to reflect new name. | 01/12/2008 |
| 1.4 | Quality review | 10/01/2009 |
| 1.5 | MCS Mark Updated | 25/02/09 |
| 1.6 | Additional contacting options were added to clause 3.3. As agreed in the MCS Steering on 27/10/2009.<br>References to Clear Skies have been removed from clause 4.7 and a link to the MCS website added. | 28/01/2010 |
| 2.0 | Addition of text under section 4.4 – site specific issues, (see 4.4.5) surrounding metering requirements and also under section 6 – handover with regards to MCS Certificates and the MID, as agreed at SG Meeting of May 27th 2010. | 28/08/2010 |