The National Small Wind Turbine Centre: Activities in Standards and Labelling

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ABSTRACT

In August 2008, the Federal government announced funding for a National Small Wind Turbine Centre (NSWTC) to be operated by the Research Institute of Sustainable Energy (RISE), based at Murdoch University in Perth, Western Australia. The aim of the NSWTC is to promote the small wind turbine (SWT) market and industry in Australia by providing services in the areas of Testing, Standards and Labelling, Professional Development and Training, and Research. This paper summarises the work that has been carried out to date by the NSWTC in the area of Standards and Labelling. Existing certification and labelling schemes for SWTs are summarised and an overview is given of the NSWTC participation in the International Energy Agency (IEA) Task 27, a task aimed at research that will advance standards, improve the quality of SWT testing around the globe and lead to an international consumer label for SWTs. Options for certification and labelling for the emerging Australian SWT industry are analysed and the idea of introducing an Australian consumer label for SWTs is discussed.

Keywords – small wind turbines, recommended testing practices, standards, certification, consumer label

INTRODUCTION

The global market for small wind turbines (SWTs) - those with capacities less than 100 kW - has shown tremendous growth over the last three years. The US market accounts for 50% of the global market and grew by 78% in 2008. The growth has been attributed to a number of factors including increased private equity investment in manufacturing, raised electricity prices and heightened public awareness of small wind technology. The new long-term federal Tax Credits, implemented in February 2009, are expected to produce a 30-fold growth in the industry within 5 years (AWEA, 2009). In the UK, streamlining of the permitting system and the introduction of feed-in-tariffs in 2010 are expected to produce a 60-fold growth by 2020 (BWEA, 2009).

In addition to the growth in the industry, the growth in the number of global manufacturers of SWTs has been phenomenal, rising from an estimated 69 manufacturers in 2006, 133 in 2007 and at least 219 in 2008 (AWEA 2008, AWEA 2009). It has to be

noted that these figures include companies that have not yet commenced manufacturing. To place these figures into perspective, there are 36 companies that have actually begun product sales (14 of these are US-based and capture approximately 1/3 of the global small wind market). In Australia the small wind turbine industry is in its infancy with only one fully commercial SWT manufacturer and two other manufacturers in the final stages of commercialising their product. As per the US and UK, there are also signs of dramatic growth of small wind in Australia with approximately 12 early stage manufacturers, often with less than one year of experience.

There has also been a change in the typical configuration and location of installed SWTs. In the past, the majority of SWT installations were off-grid. The fastest growing segment of the US market today, however, is that of residential-scale grid connected small wind (1 –11 kW). The concern of businesses and households to install micro-generation to combat climate change and reduce greenhouse gas emissions has led to the growth of the use of small wind turbines in the urban environment. In 2007 a catalogue of urban wind turbines was published, featuring 32 manufacturers and 57 different models (WINEUR, 2007). In the UK it is predicted that of the estimated 12,125 small wind systems to be installed in 2010, over half will be building mounted.

The International Energy Agency (IEA) has expressed concern that not all models of SWTs that are now being produced are reliable or safe (Ruin and Thor, 2006). This is of paramount concern given the proportion of SWTs being deployed in the urban environment in some countries. Large wind turbine manufacturers have to obtain certification for their products and often have to sign a legally binding contract with the purchaser that guarantee a minimum performance level. Small wind turbines do not have to undergo the same stringent certification process and don't have the same range of standards as the large wind industry. Although there are some standards that have applicability to SWTs, there is a call from SWT manufacturers to improve the standards and make them more relevant. From the point of view of the consumer, there is often confusion over the variety of products on the market and there is a call for a product label to reduce consumer confusion and enable easier product comparison.

Despite the existence of standards, it is estimated that out of the 36 SWT manufacturers that have begun sales around the world, less than 5 are currently certified to any kind of standard. In many cases the only test data available is provided by the manufacturer (e.g. as displayed in the WINEUR catalogue) and there can often be discrepancies between the performance figures stated by the manufacturer and that observed by the consumer (Gipe, 2009). There is a need for independent, third-party testing of small wind turbines to capture key information related to the safety, noise and performance of the turbine.

The National Small Wind Turbine Centre (NSWTC) commenced operation in December 2008 and aims to stimulate the small wind market and industry in Australia and address some of the issues mentioned above by focussing its activities in four areas: Testing, Standards and Labelling, Professional Development and Training, and Research. The main activity of the NSWTC will be in providing independent testing services to wind turbine manufacturers but the work in Standards and Labelling is important to improve the quality of products and harmonise with overseas standards so that Australian manufacturers can enter export markets. The timing and scope of NSWTC activities in Standards and Labelling coincided with the current combined International

Electrotechnical Committee (IEC) and IEA Small Wind Turbine Liaison Program to such an extent that it was sensible for the NSWTC to join the IEC/IEA Liaison Program and some activities are now being conducted via this international network.

The aim of this paper is to give an overview of the activities of the NSWTC to date in the area of Standards and Labelling for SWTs. The specific objectives are to:

(1) discuss some of the reasons as to why so few SWTs have undergone certification,

(2) summarise existing certification and labelling schemes for SWTs,

(3) give an overview of the IEC/IEA Small Wind Turbine Liaison Program and review the benefits for the Australian SWT industry of participation of the NSWTC in this Program,

(4) discuss the concept of an international labelling scheme for SWTs and the benefits and drawbacks associated with such a scheme,

(5) outline options for Australian SWT manufacturers in terms of certification and labelling.

NSWTC ACTIVITIES IN STANDARDS AND LABELLING

Milestone 3.2 of the NSWTC is to develop a testing facility in order to provide third-party, independent testing of SWTs. The first task was to identify a new site in Perth, Western Australia, which would be suitable for independent field testing of small wind turbines in the range 1 to 10kW. At the time of writing, an agreement for use of the land has been signed by the landowners and an announcement as to the location of the test site is expected to be announced in June 2009. Construction of the testing facility at the chosen site is scheduled to be completed by December 2009.

Review of Existing Standards

Milestone 4.4 of the NSWTC involves a review of existing standards in order to determine the set of testing practices to be used at NSWTC Testing Facility. The NSWTC is particularly concerned with standards that are relevant to the safety, reliability, power performance, acoustic testing and certification of SWTs. Currently, the main international standards that are relevant to the work of the NSWTC are IEC61400-2 (2006), IEC61400-11(2006), IEC61400-12-1(2005) (with particular reference to Annex H) as well as the forthcoming second edition of IEC WT 01 (2001) (with particular reference to Annex E). The IEC develops the IEC61400 series of wind energy standards through the working groups of Technical Committee-88 (TC-88) and these standards are maintained through Maintenance Teams (e.g. MT2 for IEC61400-2). In Australia, the main national standard that is relevant to the work of the NSWTC is AS61400.2 (Int.) (2006), which is identical with IEC 61400 -2 (2006) with the exception of some minor editorial corrections.The relevant technical committees within Standards Australia that develop standards related to wind energy are EL-048 Wind Turbine Systems and EV-016-Acoustics-Wind Turbine Noise. In 2007 the EV-016 Committee developed a draft Australian wind turbine noise standard DR 07153 CP (2007). The methodology of this standard, however, deals specifically with noise of wind turbines in wind farms and does not cover noise from SWTs in stand-alone power systems.

The most recently developed standards that deal specifically with SWTs are from the American Wind Energy Association (AWEA 9.1, 2009) and from the British Wind Energy Association (BWEA, 2008), both of which specifically aim to "account for technical differences between large and small wind turbines". The AWEA and BWEA standards heavily refer to the group of IEC standards mentioned above but aim to "streamline their use, and to present their results in a more consumer-friendly manner". As a result, the AWEA and BWEA standards have differing criteria compared to the relevant IEC61400 standards, ranging from clauses in the IEC standards that are indirectly referenced by the AWEA and BWEA standards to clauses that are definitely excluded. In addition there are variations between the AWEA and BWEA standards themselves, particularly in relation to the analysis and presentation of noise data.

Review of Existing Certification and Labelling Schemes

An important task for the NSWTC is to review international and national certification schemes order to have a vision for how such schemes can be implemented in Australia. Tab. 1 shows there are two main national SWT certification schemes, one in the United Kingdom, which has adopted the BWEA standard, and one in the United States, which has adopted the AWEA standard[†]. Each scheme has labelling "to be deployed on any product literature or advertising in which product specifications are provided" (AWEA 2009, BWEA 2008). Alternatively, SWT manufacturers can obtain full international certification of their products by testing to the IEC standards.

Despite the existence of standards only a handful of manufacturers of SWTs have actually certified their machines in accordance with the standards and the main reason for this is that the cost of gaining certification is beyond the financial means of the vast majority of SWT manufacturers. Compared to large wind turbine manufacturers, SWT manufacturers have small budgets as well as turbines and many simply cannot afford the cost of certification. As Tab. 1 shows, the cost of certification depends a great deal on what standard is being used; whether it is full certification to IEC61400-2 resulting in a type certificate for the machine or certification to the more streamlined AWEA and BWEA standard, resulting in a mark and label. The confusion over the different standards (with their variations) and the different certification options could be another reason for the lack of certified small wind turbines. Many SWT manufacturers feel that the existing national and international standards for SWTs are confusing due to their differing requirements and the fact that in some cases the standards continue to be more relevant to large rather than small wind turbines. From manufacturers there is a call to improve and harmonise existing standards for SWTs and to make certification more affordable.

In 2008, in an effort to increase the number of certified small wind turbines, the National Wind Technology Center of the US instigated the testing of 4 SWTs through a competitive solicitation process. The results of the tests conducted on each of the SWTs will be publicly available and will be used by the US Small Wind Certification Council (SWCC) to certify SWTs. Interim results were presented at WindPower 2009 conference in Chicago (Bowen et. al. 2009).

[†] Note that there exist other national certification schemes for SWTs e.g. in the Netherlands (Ingreenious B.V., 2008), but most adopt standards similar to those developed in the USA and UK.

Tab. 1: Overview of key certification schemes for SWTs

	SWT Certification Schemes		
	International	**UK**	**USA**
Certification Mechanism	Tested and evaluated by an accredited certification test organization**.** Examined by a registered certification agent to ensure compliance.	Via Microgeneration Certification Scheme (MCS).	Via Small Wind Certification Council (SWCC) Certification Commission.
Relevant Documentation	IEC WT 01: IEC System for Conformity Testing and Certification of Wind Turbines, Rules and Procedures (2001).	MCS 006: Product Certification Scheme Requirements: Micro and Small Wind Turbines (2008).	To be announced.
Current Testing Standard	IEC 61400 standards relevant to SWTs.	BWEA Small Wind Turbine Performance and Safety Standard (2008).	AWEA Small Wind Turbine Performance and Safety Standard (2009).
Testing Body	Test organisation accredited to certify wind turbines in accordance with ISO/IEC 17025 (2005).	UKAS* accredited test laboratory or equivalent. Results from other testing bodies permitted if assessed for compliance by the Certification Body as per MCS 011 (2008).	Any party (including manufacturer) may record and analyse test data, subject to review and acceptance from SWCC.
Certification Body	Registered Certification Agent.	UKAS* accredited test laboratory or equivalent.	SWCC.
Output of Certification Process	Statement of Compliance and Type Certificate.	Certification Mark and Label from MCS with reference to Certification Body and BWEA.	Certification Mark and Label from SWCC.
Ratings on Label (if applicable)	N/A	Rated Annual Energy, Rated Power, Estimated Sound Level.	Rated Annual Energy, Rated Power, Estimated Sound Level.
Estimated Cost for Testing and Certification	US $200,000 – US $250,000 for testing and certification (To be confirmed).	US$80,000 – US$110,000 for testing and US$16,000 for certification.	US$12,000 for certification.

*United Kingdom Accreditation Service

Participation in the IEC/IEA Small Wind Turbine Liaison Program

Task 4.2 of the NSWTC is to participate in the IEA Wind R&D Task 27 on Small Wind Turbines. IEA Task 27 has been combined with an IEC Task of revising the existing international small wind turbine standard IEC61400-2 and together they are referred to as the IEC/IEA Small Wind Turbine Liaison Program. The IEC part of the program consists of a number of workshops during 2009 which aim to update IEC61400-2 to edition 3 by incorporating the latest developments of the AWEA and BWEA standards. The less mature topics e.g. building-mounted wind turbines will be advanced as IEA research, to form guidelines that can be incorporated into later editions of the IEC61400-2 standard.

IEA Task 27 has been tentatively titled "Quality Labelling of Small Wind Turbines" as one key topic under Task 27 is to review the proposed SWCC label (see Fig. 1) and proposed BWEA labels (see Figs. 2 and 3) and develop an internationally standardised product label for small wind turbines. This would also involve examining the various SWT standards and establishing a common underlying methodology. Then this information must be distilled to determine a base set of technical parameters to be used on the international label to give the consumer essential information about the performance of the turbine.

The outputs from this workshop should clarify the various standards for the SWT community and also clarify product choice for consumers. Participating in this task is of benefit to the NSWTC in order to become familiar with the various testing methodologies to aid in developing a set of recommended testing practices. Through peer review, participation in IEA Task 27 will raise the quality of SWT testing at the NSWTC and at other test sites around the globe.

It is the NSWTC's intention to test and label Australian manufacturers in order to improve the quality of home-grown SWTs and stimulate the Australian SWT industry. Given the IEA Task 27 schedule, however, the international label, however may not be available before 2012. The scope of work for the NSWTC is to start testing and labelling turbines in 2010. One option for the NSWTC is to develop or adopt a set of in-house recommended testing practices and look to receive nationwide endorsement for the testing practices. Similarly, an interim label could be developed while the international label is being approved.

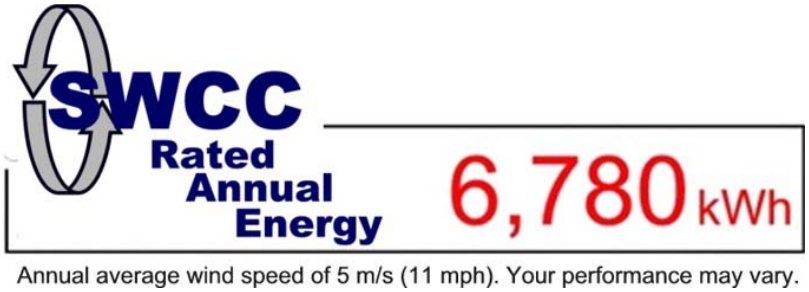

Fig. 1: Proposed consumer label for SWTs by the

U.S. Small Wind Certification Council (SWCC)

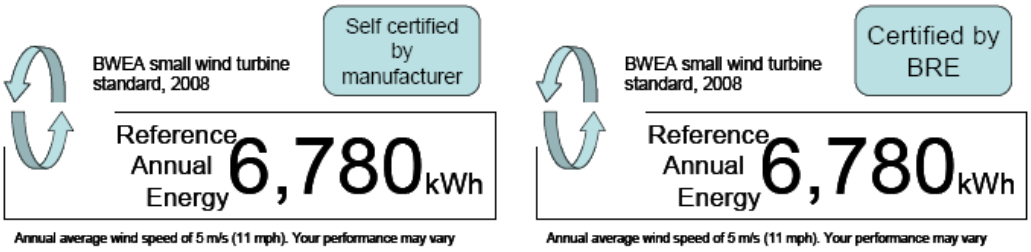

Fig. 2. Proposed BWEA label for Reference Annual Energy.

(Example of self-certified form on left, externally-certified form on right)

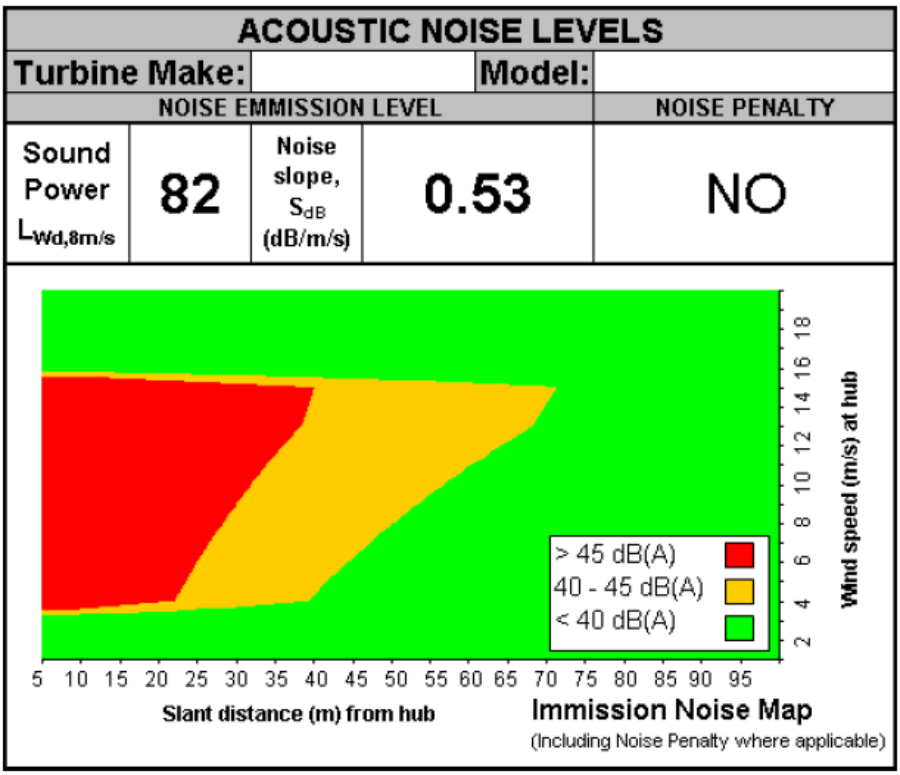

Fig. 3: Proposed BWEA Noise Label

DISCUSSION

The development of an international label for small wind turbines raises a number of issues. Crucially, the outcome of the IEA Task 27 may allow SWT manufacturers to test their turbine to a set of recommended testing practices and receive an international label as a mark of quality testing for consumers without necessarily having to certify their machine. This could be an interim step for SWT manufacturers with pre-commercial products or in the early stages of commercialisation so that they can get their turbines tested and labelled until increased production for the manufacturer is such that certification becomes affordable.

Initially the idea by the IEA was that of a quality label for small wind turbines. This has raised concerns by manufacturers of certified turbines that the label might be misinterpreted by the public as a sign of certification for non-certified turbines. There are also concerns about how this labelling is to be administered and policed to prevent the proliferation of fake labels. A key issue to resolve will be the appointment of a suitable labelling body that will administer and police the labelling.

NSWTC recommends that the name of the label be changed from a *quality* label to a *consumer* label. This reflects the fact that the label is aimed at summarising the information held in the technical test report to provide an overview of the tested performance of the turbine for the benefit of the consumer. The label should also make it clear that the label itself is *not* recognition of certification. That said, consumer labelling of turbines should indirectly improve the quality of the turbines since consumers will compare the performance e.g. energy yield and noise between turbines. Hence it is in the interests of the turbine manufacturers to improve machines so that the information on the label reflects the quality of the machine.

In the meantime, participation of the NSWTC in the Liaison Program and subsequent development of an internationally-recognised label for SWTs may open up affordable paths to certification of products for Australian manufacturers of SWTs for both domestic and international markets. Two main options for the Australian small wind industry in terms of certification are:

1) Use of overseas certification bodies. With this option there would be a possibility of significantly reducing testing costs if the product was tested in Australia and the data was then sent to the certification committee to validate. For example, if a representative from the SWCC visited the NSWTC and reviewed the test site and data collection procedures and recognised the NSWTC as meeting the requirements of SWCC for product testing. The NSWTC would then effectively to operate as a regional test centre for the SWCC. One advantage of this option is timing, in that the overseas certification bodies are already established and their technical committees have a lot of collective experience with SWTs. Another advantage is impact, in that it will aid Australian manufacturers in marketing their machines in overseas countries. One disadvantage of this option is that the manufacturers will be certified by an overseas body which might not be recognised at home by Australian bodies e.g. the Standards, Training and Accreditation committee of the Clean Energy Council. In this option the introduction of an international consumer label would be vital so that Australian consumers were not confused about the use of labels associated with overseas schemes. Finally, at present, the main certification schemes are available only through the SWCC and the MCS. This could cause bottlenecks in the certification process if the 219+ SWT manufacturers around the world all started to rely solely on these schemes.

2) Establish a SWT certification body in Australia. With this option there is the possibility of Australia being self-reliant for all its SWT testing and certification needs. This body would require a technical committee to perform the checking of the test site and data collection procedures. For international acceptance (including participation in an international labelling scheme) the Australian organisation needs to be recognised as being equivalent to the SWCC/MCS as a certification body. During the time taken to achieve international accreditation, use of an Australian labelling system could be used.

The advantage of establishing a SWT certification body in Australia would be that a process of certification could be developed that complies with Australian laws and regulations. In addition the use of an Australian label (or an international label) would cause less confusion for Australian consumers. The main disadvantages are the time taken to establish a certification body and the small body of people in Australia with the relevant expertise on small wind turbines to form the technical committee. That said the EL-048 committee of Standards Australia that adopt IEC wind standards and have familiarity with IEC61400-2 could be one example of a technical committee with the necessary expertise to perform this role.

CONCLUSION

The NSWTC has been established to help stimulate the small wind market and industry in Australia. Their activities in the area of Standards and Labelling during the first 6 months of operation include reviewing existing SWT standards and certification and labelling schemes and the benefits of participation in IEA Task 27. The following conclusions were reached by this review:

(1) The most recently developed standards that pertain to SWT are from AWEA and BWEA and the methodologies behind these standards are to be incorporated into edition 3 of IEC61400-2 by 2012.

(2) There are 2 main national certification schemes; the SWCC in the USA, which has adopted the AWEA standard and the MCS in the UK, which has adopted the BWEA standard.

(3) The benefits of participation in IEA Task 27 are to produce high quality testing procedures for the new NSWTC test facility, have input into the development of an international label for SWTs and to investigate options for overseas certification of Australian SWTs.

The following recommendations can be made:

(1) Suggest to the IEA to consider using the term “consumer label” rather than “quality label” to distinguish between labelling and certification.

(2) In the light of the timeframe of the IEA Task 27, pursue an Australian labelling scheme as an interim measure, and explore the viability of establishing a national certification body for SWTs in Australia.

ACKNOWLEDGEMENTS

Funding for the Testing, Standards and Labelling and Training activities of the National Small Wind Turbine Centre is from the Federal Department of Environment, Heritage, Water and Arts via the RRPGP. Funding for research activity within the Centre to date has been separately sourced. The authors would like to acknowledge the support of current and former RISE staff, in particular, David Harries, Matt Walsh, Sandie Rawnsley and Andrew Beveridge.

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