



## **INTRODUCTION**

Suzlon Energy Australia Pty Ltd (SEA) is a subsidiary of ultimate parent company Suzlon Energy Limited (SEL), who is based in India and manufactures modern wind turbine generators. SEL is currently the world's sixth largest Wind Turbine Generator (WTG) manufacturer by installed capacity, as recognized by wind industry leader BTM and published in their 2004 World Market Update.

SEA was established in Australia in 2004 to provide EPC delivery, operations and maintenance services to Wind Farm projects in Australia and has been empowered with a strategic direction to develop into a major participant in the Australian wind industry in the coming years.

SEA has had recent experience in offering WTGs for wind farm developments in Australia, which has included a detailed interaction with the technical and regulatory requirements of the NEC. Generally, SEA has found that the technical requirements of the NEC provide a reasonable basis for design of wind farms and the connections to wind farms

We have engaged the services of Professor Peter Wallace as our consultant for all Electrical and Grid Connection issues. Professor Wallace has reviewed the Wind Energy Technical Advisory Group (WETAG) Report on Integrating Wind Farms into the NEM and prepared on our behalf the following comments which we trust will assist in development of the Code.

### **1 CONSULTATION WITH WETAG**

The membership of the WETAG is drawn from the electricity supply industry. SEA wishes to be involved in consultation with the work of WETAG to ensure the development of technical clauses include an understanding of Suzlon's technology.

### **2 NSP GUIDELINES FOR CONNECTION**

The effective and economic design of the connection of wind farms to networks has to be based on the required performance of the network. This involves such quantities as the range of operating voltages, the power factor at the point of connection, voltage range under network outage conditions, permissible fault level infeed.

NSPs should be required to provide this information within a reasonable time of the notification of intent to study the viability of a connection. Within the time frames for wind farms, an appropriate time would be one month after notification of intent to study a connection.

### **3 NSP INFORMATION FOR CONNECTION**

The capability of a network for connection of generation is determined by the network characteristics including line thermal rating. Consideration should be given to NSPs being required to provide this data and to fund any investigations to determine this data.



#### **4 DATA REQUIREMENTS**

Sections 5.5.1 – 5.5.5 detail a great deal of detailed information that must be submitted by the proponent. This data has been developed from the characteristics of large synchronous machines. It can be confusing for developers when a substantial portion of the data has to be masked as "not applicable." The list of data requirements should be reviewed to be more appropriate to wind energy technologies.

#### **5 DYNAMIC MODELS AND VALIDATION**

The NEC requirements for dynamic models are not clear. Similarly, the requirements for validation of models are not clear. The definitions of both these quantities need to be clarified. This should be done in consultation with the equipment manufacturers. SEA seeks to be involved in this process.

#### **6 TECHNICAL STANDARDS**

The technical standards for harmonics and flicker are described in AS/NZS61000.3.6 and AS/NZS61000.3.7 derived from IEC61000.3.6 and 61000.3.7.

Standards Australia has been considering adoption of IEC61400 Part 21 which deals with the testing of WTGs for flicker levels and the interpretation of the tests as flicker levels in a network with wind turbines. As the IEC standard has not been adopted and there is no other standard for this topic, IEC61400 Part 21 has been used to evaluate flicker levels.

Standards Australia should be urged to complete the issue of this standard for Australia.

#### **7 AGGREGATE VERSUS DEVICE CONSIDERATIONS**

The flicker evaluation standard (IEC 61400 Part 21) is expressed in terms of individual machines. This can pose difficulties in high impedance situations in which the method of 61400 Part 21 could predict unit flicker levels in excess of that specified in 61000.3.7. In those cases some form of flicker filtering would be installed to achieve the flicker levels. In such cases the important factor would be the flicker at the point of connection to the network including the effect of any filtering.

It would be useful if the application of the standard could be modified to reflect the external requirements of the wind farm.

#### **8 APPROACHES TO OTHER CODES, E.G. EON**

The northern German electric power utility, EON, has developed a Code of Practice for wind farms, which has been widely discussed in the wind energy and electricity industry. Other Codes have also been developed.

It would be useful if the applicability of the EON or other national Codes to Australia could be indicated.



## **9 SIMULATION REQUIREMENTS**

NSPs and NEMMCO usually require static and dynamic system studies to determine the impact of the wind farm on system performance. The extent of simulation required is not specified in NEC.

The development of connections and the costing of the works would be expedited if the degree of simulation were specified.

## **10 CONFIDENTIALITY OF DESIGN DATA**

SEA understands the requirement to protect the intellectual property of wind farm developers. This intellectual property is represented by design of the wind turbine generator controls. SEA could not submit the detailed design documents for public access. However SEA is prepared to provide the block diagram representation of the whole wind turbine generator and an object file of the machine development suitable to determine the interaction with the connected network.

The Code should clearly specify the requirements for providing technical data for access by existing and potential future wind farm developments.

## **11 FAULT RIDE-THROUGH**

Suzlon wind turbine generators will normally achieve fault ride-through for connection to reasonably strong systems. However they can require external dynamic reactive plant to achieve fault ride-through for connection of large wind farms to weak systems such as 132kV and 66kV rural systems.

The amount of dynamic reactive compensation is affected by the severity of the fault imposed on the network. Clause S5.2.5.3 of the NEC implies that wind farms should ride-through for three phase faults under all generating conditions.

Such fault conditions would be extremely rare to the low level of occurrence of three phase faults and the low probability of operation at maximum generation output.

SEA suggests that this requirement be reviewed with the objective of determining a requirement based on probable operating and fault conditions.

## **12 CONTACT DETAILS**

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