



# LICENCE CONDITIONS FOR WIND GENERATORS DRAFT DECISION

**June 2009**

The Essential Services Commission of South Australia

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**ELECTRICITY**

## REQUEST FOR SUBMISSIONS

The Essential Services Commission of SA (the Commission) invites written submissions from interested parties in relation to the issues raised in this paper. Written comments should be provided by 24 July 2009. It is highly desirable for an electronic copy of the submission to accompany any written submission.

It is Commission policy to make all submissions publicly available via its website ([www.escosa.sa.gov.au](http://www.escosa.sa.gov.au)), except where a submission either wholly or partly contains confidential or commercially sensitive information provided on a confidential basis and appropriate prior notice has been given.

The Commission may also exercise its discretion not to exhibit any submission based on their length or content (for example containing material that is defamatory, offensive or in breach of any law).

Responses to this paper should be directed to:

### **Licence Conditions for Wind Generators – Draft Decision**

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### ***Public Information about ESCOSA's activities***

Information about the role and activities of the Commission, including copies of latest reports and submissions, can be found on the ESCOSA website at [www.escosa.sa.gov.au](http://www.escosa.sa.gov.au).

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## GLOSSARY OF TERMS

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AEMC	Australian Energy Market Commission, established under section 6A of the <i>Trade Practices Act 1974 (Cth)</i>
AEMO	Australian Energy Markets Authority
AWEFS	Australian Wind Energy Forecasting System
COMMISSION	The Essential Services Commission of SA, established under the ESC Act
ELECTRICITY ACT	<i>Electricity Act 1996 (SA)</i>
ESC ACT	<i>Essential Services Commission Act 2002 (SA)</i>
ESCOSA	The Essential Services Commission of SA, established under the ESC Act
ESIPC	Electricity Supply Industry Planning Council, established under the Electricity Act
FCAS	Frequency Control Ancillary Services
MCE	Ministerial Council on Energy
MW	Mega Watt
NEM	National Electricity Market
NEMMCO	National Electricity Market Management Company
NER	National Electricity Rules
PASA	Projected Assessment of System Adequacy
WETAG	Wind Energy Technical Advisory Group

# 1 INTRODUCTION

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Under Part 3 of the Electricity Act 1996, the Essential Services Commission of South Australia (the Commission) issues licences to entities carrying on electricity generation operations within the South Australian electricity supply industry.

A person carrying on the generation of electricity is required to hold a licence under the Electricity Act if the generating plant has a rated nameplate output of > 100 kVA (or about 0.1 MW)<sup>1</sup>.

While the Electricity Act makes no distinction between generating plant using renewable or non-renewable energy sources, the Commission presently imposes a set of specific licence conditions on wind generators based on licensing principles set out in its Statement of Principles for Wind Generation Licensing<sup>2</sup>, issued in September 2005.

The Commission developed the Statement of Principles in response to an unprecedented interest in the development and operation of large scale wind generators across wide areas of South Australia and to meet the imperatives of the statutory licensing regime which requires the Commission to have regard to the potential impacts of such proposed wind generator operations on the long-term interests of South Australian electricity consumers with respect to price, quality and reliability of electricity supply (refer section 6(1) of the Electricity Act).

The 2005 Statement of Principles, which was developed after consideration of analysis and advice from the Electricity Supply Industry Planning Council (ESIPC), sets out the Commission's view that the reliability and security of the South Australian power system was at significant risk in the absence of upgraded conditions for network connections, high quality wind forecasting, and proper market arrangements to integrate wind generators more fully into the NEM.

The Commission formulated its view in the following terms:

*The view of the Commission, based on consideration of the impact of additional wind generation in South Australia on the achievement of the objectives specified in section 6(1) of the Essential Services Commission Act and the findings of the ESIPC Report is that:*

- *the long term interests of South Australian consumers would be adversely affected in relation to reliability of electricity services by such a development, and that any off-setting benefits (eg those associated with enhanced competition in the generation sector) are minor; and*

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<sup>1</sup> It is noted that many domestic (roof-top) photovoltaic electricity generation systems have capacity < 100 kVA and hence are not required to be licensed.

<sup>2</sup> ESCOSA Wind Generation Licensing Statement of Principles 2005 <http://www.escosa.sa.gov.au/webdata/resources/files/050930-R-WindGenerationStatementofPrinciples.pdf>

- *accordingly there are grounds for the Commission to reject each of the wind generation licence applications*

***unless***

- *the main findings of the ESIPC Report are given effect in such a way as to bind the proponents of additional wind generation capacity in South Australia.*

The Statement of Principles then set out the particular measures and licence conditions by which the Commission proposed to manage the reliability and system security risks posed by significant volumes of wind generation; thereby allowing wind generators to continue to be licensed in South Australia while still enabling the Commission to meet its legislative objectives. In developing and finalising the Statement of Principles, the Commission expressed the view that it was preferable to address issues associated with the connection and operation of large volumes of intermittent electricity generation into the National Electricity Market (NEM) through national, market-wide solutions rather than individual state based responses. The Commission undertook to review the licence conditions set out in the Statement of Principles when changes to the national arrangements and the National Electricity Rules (NER) to better integrate wind generation into the NEM had occurred.

The key changes which have occurred since 2005 are:

- ◆ in 2007, the Australian Energy Market Commission (AEMC) made new Rules governing technical standards for wind generator and other generator connections<sup>3</sup>.
- ◆ in 2008, the AEMC made new Rules, applying from March 2009, to implement a new “semi-scheduled” category of generation which provides for the participation of wind in the dispatch process<sup>4</sup>;
- ◆ an advanced wind forecasting system - the “Australian Wind Energy Forecasting System” (AWEFS) has been developed and implemented by NEMMCO<sup>5</sup>; and
- ◆ changes have been made to the arrangements for recovering the cost of ancillary services in the market<sup>6</sup>.

In 2007, the Commission requested ESIPC to review the national developments and to provide advice and recommendations as to the continuing relevance and appropriateness of the licence conditions set out in the Statement of Principles.

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<sup>3</sup> Full details available at <http://www.aemc.gov.au/electricity.php?r=20060324.143345>

<sup>4</sup> Full details available at <http://www.aemc.gov.au/electricity.php?r=20070430.162452>

<sup>5</sup> Refer <http://www.nemmco.com.au/psplanning/awefs.html>

<sup>6</sup> Refer <http://www.nemmco.com.au/powersystemops/168-0100.pdf>

In December 2008, following receipt of advice from ESIPC, the Commission developed and published Draft Proposals for Wind Generation Licensing<sup>7</sup>. This document described the Commission's proposals for modification of the licence conditions for wind generators.

The Commission received seven submissions on its Draft Proposals<sup>8</sup> which were referred to ESIPC for review.

ESIPC has provided further advice to the Commission which is contained in Appendix 1 to this paper.

This paper sets out the Commission's Draft Decision on Wind Generation Licence Conditions.

It should be noted that, subject to the passage of the necessary establishing legislation, from 1 July 2009 ESIPC will merge with NEMMCO, VENCORP and a number of gas market operators to become the Australian Energy Market Operator (AEMO). Pursuant to the proposed legislative provisions both the Commission and the South Australian Government will continue to be provided with advice and assistance by AEMO.

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<sup>7</sup> *Proposals for Wind Generation Licensing December 2008* available at <http://www.escosa.sa.gov.au/site/page.cfm?s=xlist&t=submissionsXList&xlistId=63>

<sup>8</sup> All submissions are available at <http://www.escosa.sa.gov.au/site/page.cfm?s=xlist&t=submissionsXList&xlistId=63>

## 2 BACKGROUND

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### 2.1 Wind Generation in South Australia

In the Annual Planning Report 2008<sup>9</sup>, ESIPC reported that South Australia, as at June 2008, had 3,641 MW of installed conventional electricity generation (fueled by coal, natural gas, and distillate) and 867 MW of wind generation operating, under construction or considered committed.

The wind generation comprises:

- ◆ 387 MW - unscheduled wind generation (licensed prior to September 2005)
- ◆ 352 MW - scheduled wind generation (licensed after September 2005)
- ◆ 128 MW - wind generation under construction.

The Commission is presently considering licence applications for a further 193 MW of wind generation. If this plant is constructed as planned it is expected South Australia will have over 1,000 MW wind generation by the end of 2010. It should be noted that the summer peak demand in South Australia for 2007-08 was 3,172 MW while in 2008-09 it had risen to 3,450MW<sup>10</sup>.

At present South Australia has:

- ◆ The highest installed capacity of wind generation in Australia;
- ◆ The highest contribution by wind energy to State electricity demand in Australia; and
- ◆ One of the three highest penetrations of wind generation with respect to installed capacity world wide.

In the ESIPC advice attached to this paper, ESIPC notes that on the available information, in world terms, it now appears only Denmark has a higher relative contribution from wind generation to customer sales. Further, ESIPC notes:

*... the Planning Council is aware of many more proposed wind generation projects, a number of which are in an advanced stage of planning...*

*Recent advice from two different consultants to the National Planning processes behind this year's Statement of Opportunities and the National Transmission Statement – forecast 2,400 to 2,700 MW of wind generation in South Australia by the end of the decade [2020].*

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<sup>9</sup> Electricity Supply Industry Planning Council – Annual Planning Report June 2008  
<http://www.esipc.sa.gov.au/site/page.cfm?u=269>

<sup>10</sup> See Information Paper on the Performance of ETSA Utilities in the Heatwave of January 2009:  
<http://www.escosa.sa.gov.au/site/page.cfm?u=4&c=3145>

## 2.2 Current Licence Requirements

The licensing principles for wind generators established in the Commission's Statement of Principles in 2005 and presently applied by the Commission are additional to the general licence requirements for conventional generators. Key conditions are as follows:

◆ *Conditions precedent for consideration of application for an electricity generation licence*

A wind generator licence applicant must provide evidence to the Commission that a connection agreement between the proposed wind generator and the relevant network service provider has been executed or fully negotiated.

A wind generator licence applicant must certify in writing to the Commission that the generation plant and associated equipment that is the subject of the licence application will be operated to comply in all respects with applicable licence conditions as enunciated in the Statement of Principles. Necessary details and evidence must be provided where relevant as to the reasons why the wind generation proponent believes that the plant will be able to comply (usually this involves the provision of technical studies to the Commission which are evaluated by ESIPC).

◆ *Additional Licence Conditions*

Licence conditions imposed on wind generators, in addition to the standard generator licence conditions relate to the following matters:

*Technical Standards*

- technical standards for wind generators with a nameplate rating of greater than 5MW are higher than the technical standards prescribed by the NER in the areas of Fault Ride Through Capability and Reactive Power Capability.

*Optimized dispatch*

- wind generators with a nameplate rating of greater than 30MW are required to be classified as scheduled generators in the NEM and to provide forecasts of expected generation output to NEMMCO.

*Wind forecasting*

- wind generators with a nameplate rating greater than 5MW must provide wind forecasting data and models and cooperate with the development and implementation of national wind forecasting systems.

*Ancillary services*

- wind generators with a nameplate rating of greater than 5MW must register as market generators<sup>11</sup>, install appropriate metering and pay for ancillary services on the same “causer pays” basis as other generators.

For all licences, once the Commission has determined to issue a licence:

- ◆ *Condition precedent to issue of licence – payment of licence fee within 60 days of Commission approval*

Following a public consultation period, receipt of advice from ESIPC (which is sought in relation to each wind generation licence application), the Commission considers the licence application.

If the Commission decides to issue a licence, in accordance with the Electricity Act the licence cannot be issued until the relevant licence fee is paid.

The Commission now gives all licence applicants 60 days from the date on which the Commission approves the issue of a licence in which to pay the licence fee.

If the fee is not paid within 60 days of the Commission’s decision, approval for the issue of the licence lapses. If the approval lapses, the applicant must re-submit the application and the Commission reserves the right to undertake a further round of public consultation and to request further advice from ESIPC. Further advice is especially important if other generators have also been licensed to operate in the same general area of the network as the licence applicant.

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<sup>11</sup> A market generating unit is one for which the generation output is not purchased in its entirety by the “local retailer” as defined in the NER (the local retailer for SA is AGL SA Pty Ltd) or by a market customer located at the same connection point. A market generator is required to sell its generation output through the wholesale (spot) market operated by NEMMCO under the provisions of Chapter 3 of the NER. Importantly, as a market generator is part of market settlements, it is part of the recovery for ancillary services.

### 3 DRAFT PROPOSALS PAPER

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The Commission set out its draft proposals for wind generation licence conditions in its Draft Proposals Paper issued in December 2008. The Commission sought comments on the paper. Written submissions<sup>12</sup> were received from:

- ◆ Cathedral Rocks Wind Farm Pty Ltd
- ◆ Clean Energy Council
- ◆ National Trust of South Australia
- ◆ Pacific Hydro Pty Ltd
- ◆ Roaring 40s
- ◆ Suzlon Energy Australia Pty Ltd
- ◆ TrustPower Australia Holdings Pty Ltd

In general, submissions supported the removal of licence conditions made redundant by changes to the national framework.

Submissions were, however, divided in some areas, particularly the size of plant to be covered by licence conditions and the issue of whether there is a continuing need for South Australian specific technical standards.

The Commission requested ESIPC to assess the written submissions and to provide advice as to whether the proposals put forward in the Draft Proposals Paper should be modified or amended in view of the submissions received.

As noted above, the full text of the ESIPC advice is contained in Appendix 1 to this paper.

This section examines the key conclusions of the Proposals Paper in light of the submissions received and the ESIPC assessment and advice in relation to those submissions. It provides the Commission's draft decision in relation to each of the licence conditions.

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<sup>12</sup> All submissions are available at <http://www.escosa.sa.gov.au/site/page.cfm?s=xlist&t=submissionsXList&xlistId=63>

## **3.1 Central Dispatch**

### **3.1.1 Proposed Licence Requirement**

In the Proposals Paper the Commission proposed that all future wind generators in South Australia be required to be classified as semi-scheduled under the NER rather than the current requirement that they be classified as scheduled plant.

#### **Rationale for Proposal**

In general, a generating unit with nameplate rating of 30 MW or greater is classified as a scheduled market generator and is required to be operated in accordance with the co-ordinated central dispatch process operated by NEMMCO under the provisions of Chapter 3 of the NER.

Central dispatch processes require each scheduled generating unit to bid its generation capacity for each trading period into the NEM. This capacity is subsequently dispatched by NEMMCO in order to match the demand on the system. This process ensures optimal dispatch of generation whilst maintaining the security of the power system.

At the time the Statement of Principles was developed, wind generators typically applied to NEMMCO for classification as non-scheduled generating units on the basis that the output of the generating unit is intermittent. In the NEM non-scheduled generation is treated as a negative demand rather than a source of supply. As a consequence, neither the forecast nor the actual quantity of wind energy is visible to the market. In particular, as non-scheduled generators do not participate in the normal market bidding and dispatch processes to determine which generators operate to satisfy market demand, NEMMCO is unable to manage market stability and security through its normal market optimisation techniques.

In 2005 the Commission concluded that to allow wind generation to continue to register as non-scheduled generating plant would lead to unacceptable market risks at higher levels of wind generation and that wind generators must be integrated into the security constrained, optimised dispatch system operated by NEMMCO. The Commission acknowledged the work then being undertaken at the national level in relation to the possible creation of a third classification for registration, namely “semi-scheduled”, which would be better tailored to intermittent generation such as wind generation. It determined that until appropriate arrangements (such as formalized semi-dispatch rules) were made in the NEM, it was appropriate to require wind generators to operate as scheduled generators under the NER.

On 1 May 2008, the AEMC gave notice of its final Rule Determination for National Electricity Amendment (Central Dispatch and Integration of Wind and Other Generation) Rule 2008.<sup>13</sup> As a result of these changes the NER now reflect a “semi-scheduled” generator plant category which became operational from 31 March 2009.

The semi-scheduled category requires intermittent generators (such as wind farms) to participate in the central dispatch and Projected Assessment of System Adequacy (PASA) processes through submitting dispatch offers (as for scheduled units), and limit their output at times when that output would otherwise violate secure network limits. This allows NEMMCO to more efficiently manage network constraints when they arise by being able to constrain the maximum output of semi-scheduled generating units in the same way as scheduled generating units at those times

In the Proposals Paper the Commission put the view that the operational arrangements for wind generators classified as *semi-scheduled* meet the objectives of maintaining efficiency and that system security and the NER changes to introduce a suitable form of central dispatch of wind farms removed the need for the Commission’s requirement that wind generators be classified as scheduled plant.

The Proposals Paper noted that the Commission’s current licence condition is worded so that a licensee is prohibited only from being classified as non-scheduled. This has the effect that wind generators in South Australia with licences issued after 2005, had to be classified as scheduled plant. Since March 2009 it has been possible for licensees to either avail themselves of the new category of semi-scheduled or to remain as scheduled plant.

### 3.1.2 Submissions

None of the respondents to the Commission’s Proposal Paper argued against the general principle that the Commission’s wind generation licences should recognise the new semi-scheduled category.

The submissions addressed two main issues. First, the size of wind farms which should be required to meet the requirements of being semi-scheduled; and second whether the requirement to be semi-scheduled should be extended to wind generators completed before the introduction of ESCOSA’s 2005 wind generator licensing arrangements established by the Statement of Principles. These matters are discussed in detail in Section 4 of this paper.

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<sup>13</sup> See <http://www.aemc.gov.au/electricity.php?r=20080306.153927>

TrustPower expressed the view that the Commission should not change the current license condition so that wind generators can choose to be either scheduled or semi-scheduled generators but are only precluded from being non-scheduled.

### 3.1.3 Commission Draft Decision

The Commission is satisfied that developments in NER operational arrangements since 2005 in relation to the new classification of semi-scheduled meets the Commission's requirements for South Australian system safety and security, and the Commission accepts that South Australian wind generators should be able to avail themselves of this new category.

On the basis that the NER now requires intermittent generators to be classified as semi-scheduled, the Commission can delete its own licence requirement.

The Commission notes that existing licensees wishing to transfer to the new category may do so within the terms of their existing licence.

<p><b><u>COMMISSION DRAFT DECISION</u></b></p> <p><b><u>Current Licence condition</u></b></p> <p>NATIONAL ELECTRICITY MARKET</p> <p>Subject to clause XXX and clause XXX, the licensee must hold and comply with the conditions of any registration required under the National Electricity Rules granted by NEMMCO (or the person responsible for the granting of such registrations under the National Electricity Law or the National Electricity Rules) at all times that such registration is required for the operations authorised by this licence.</p> <p>....</p> <p>The licensee must not apply to be classified as a non-scheduled generator under the National Electricity Rules.</p> <p><b><u>New Licence Condition</u></b></p> <p><i>NATIONAL ELECTRICITY MARKET</i></p> <p><i>Subject to clause XXX and clause XXX, the licensee must hold and comply with the conditions of any registration required under the National Electricity Rules granted by NEMMCO (or the person responsible for the granting of such registrations under the National Electricity Law or the National Electricity Rules) at all times that such registration is required for the operations authorised by this licence.</i></p> <p>...</p>
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## **3.2 Wind forecasting**

### **3.2.1 Proposed Licence Requirement**

In the Proposals Paper the Commission proposed that, for all new wind generators classified as semi-scheduled under the NER, there would be no need to retain the licence condition relating to the provision of wind forecasting information to NEMMCO, but the condition relating to the provision of information and models to the Commission and ESIPC would be retained.

#### ***Rationale for Proposal***

In 2005, the Commission noted that a fundamental strategy to deal with the variability of wind energy available to the market was to have techniques to ensure accurate wind forecasting. The need to have such forecasting techniques was regarded as critical because the output of wind generators varies significantly over time and affects the efficiency of the market and the security of the power system.

The Commission formed a view that it would be appropriate to require wind generators to provide forecasting data, to participate in the development of a centralised wind forecasting system, and to provide other data required for incorporation into pre-dispatch, medium term and long term PASA data.

All generators which are in the new semi-scheduled category are required to participate in the operation of the Australian Wind Energy Forecasting System (AWEFS) and are obliged to provide NEMMCO with wind forecasting data in a certain form.

### **3.2.2 Submissions**

The submissions accepted the removal of the licence condition relating to provision of wind forecasting information to NEMMCO.

Several submissions raised concerns that the requirements to provide models to both the Commission and ESIPC were proposed to remain. Pacific Hydro, for example, suggested:

*This would appear to be an unnecessary additional obligation given that the participating jurisdiction would have the right to obtain the information directly from NEMMCO out of the AWEFS system.*

The ESIPC advice to the Commission notes that the forecasts for individual wind farms that have been developed within the AWEFS are not publicly available and where that information can be obtained, it is subject to agreements as to how it can

be used. Further, even if AWEFS data were to be available to the Commission, such data is only produced when the wind farm is fully commissioned.

TrustPower, while supporting the removal of the condition concerning the supply of data to NEMMCO, put the view that the Commission should extend the requirement to supply data to all existing pre 2005 licensees.

### 3.2.3 Commission draft decision

The Commission notes that the current licence condition deals with the provision of a range of information - wind forecast data, models and information. While the Commission would not expect that the power to obtain this data would be routinely used, thereby minimising any impost on wind generators from this licence condition, it is of the view that it remains prudent for the Commission to have in place a licence condition which clearly enables it to access this information should the need arise.

The Commission further notes that in order to determine whether or not to issue a licence to a wind generator, the Commission can request a range of information, data and models in order to assess the performance of a proposed wind generator and the manner in which it proposes compliance with the Commission's technical standards. An applicant must provide any information requested by the Commission before the Commission will consider an application.

Given the advent of AWEFS the Commission will remove the specific and detailed licence condition in relation to wind forecasting, models and information and instead rely on the mandatory licence condition in relation to the provision of information to the Commission to gain any models and operational information it requires from a licensee once a licence has been issued.

The mandatory condition, which the Electricity Act requires the Commission include in all generation, distribution and retail licences; gives the Commission very broad powers to obtain information relating to the technical capacity of the licensee to continue the operations authorised by the licence and any other information the Commission requires – including all of the information presently incorporated into the specific licence condition in relation to wind forecasting.

In relation to the suggestion by TrustPower that the requirement to supply wind forecasting data should also be applied to all pre-2005 licensees, the Commission notes that **all** wind generators in South Australia have their output forecast by AWEFS, whether they are classified as scheduled or non-scheduled and whether they are a pre or post 2005 licensee.

**COMMISSION DRAFT DECISION**

**Current Licence Condition**

WIND FORECASTING

The licensee must, on request, provide to the Planning Council, the Commission or NEMMCO, accurate and verifiable wind energy forecasting data and temperature data, appropriately constructed wind energy conversion models, documents and other information concerning the operation of the electricity generating plant which the licensee is authorised by this licence to operate.

Any data, models, documents and information requested under this clause must be provided in the manner and form and within the time frame specified by the Planning Council, the Commission or NEMMCO.

The licensee must cooperate with the development and implementation of wind energy forecasting systems for use in the National Electricity Market and must provide timely, accurate, and verifiable information for this purpose.

**Proposed Licence Condition**

WIND FORECASTING

For generators classified as semi-scheduled - delete condition from licence

Broad general powers to obtain information contained in mandatory licence condition cover this licence condition:

*The licensee must from time to time, provide to the Commission in a manner and form determined by the Commission, details of the licensee's financial, technical and other capacity to continue the operations authorised by this licence and such other information as the Commission may require from time to time.*

### 3.3 Ancillary Services

#### 3.3.1 Proposed Licence Requirement

The Proposals Paper proposed to delete the licence condition relating to ancillary services and metering for wind generators classified as semi-scheduled.

##### *Rationale for Proposal*

In 2005, the Commission highlighted the importance of NEMMCO being able to maintain the power system frequency within secure limits. Variations in the output of generating units and loads disturb the supply/demand balance and routinely cause power system frequency to move away from the nominal 50 Hz.

NEMMCO procures regulation frequency control ancillary services (FCAS) through a spot market to ensure that power system frequency stays within the operating limits set by the Reliability Panel as established under the NER

The Commission noted, having received advice from ESIPC and examined the findings of the Wind Energy Technical Advisory Group (WETAG)<sup>14</sup> that in relation to cost recovery of regulation FCAS, the “causer pays” mechanism is defined at clause 3.15.6A of the NER for market generating units that have real time operational metering that records short-term variations in plant output.

*The causer-pays mechanism identifies relevant generators that are causers of frequency variations and allocates a causer pays factor to each. The remaining cause of frequency deviations is allocated to market customers, shared on a pro-rated basis. The causer pays factors are then used in market settlements to recover the procurement costs for regulation FCAS. (WETAG report, p 32)*

Thus, wind generators registered as market generators under the NER participate in the causer pays arrangements for regulation FCAS only if appropriate operational metering is installed. If such metering is not installed, that generator’s contribution to regulation FCAS will be met by customers. Non-market generators will not participate in such arrangements. In this case, the generator’s contribution will default to market customers as a group. The Commission noted the WETAG concerns about the cross subsidy caused by wind generators that are registered as market generators but do not have appropriate operational metering. It suggested that a preferred option for addressing this issue was to amend the NER to require that all market generating systems be included in the causer pays arrangements under the NER.

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<sup>14</sup> See <http://www.mce.gov.au/assets/documents/mceinternet/WEPWGDDiscussionPaperMarch0520050322094836.pdf>

The Commission therefore concluded, that while changes to the NER were the most desirable way of dealing with this issue, wind generators in South Australia should be subject to the payment of ancillary services costs to the extent that they contribute to the costs of those services (and earn revenue for services they provide). The Commission's view was that this would drive appropriate investment and operational decisions on the part of wind generators. For this to apply, a wind generator must be a market participant and hence be part of NEMMCO's settlement processes.

This was achieved by the Commission requiring wind generators to be classified as market generators. In addition, to ensure appropriate processes to calculate the contribution factors (or "causer pays" factors) applicable to wind generators, the Commission required that wind generators must install metering suitable for the purposes of clause 3.15.6A(h) of the NER. In addition, compliance was required with any future ancillary service arrangements established under the NER for wind generators.

On 30 July 2008, NEMMCO published its final determination with respect to the calculation of user pays factors for the allocation of the costs of obtaining regulation FCAS in the market.<sup>15</sup> This determination extends the calculation of such factors in an explicit manner to cover semi-scheduled generators from March 2009.

The Commission's Proposal Paper therefore concluded that as all generators registered as market generators and classified as semi-scheduled are now included in the national processes to recover the costs of ancillary services, there was no need for the Commission to specifically deal with ancillary services and metering in future wind generation licences.

### **3.3.2 Submissions**

The submissions supported the Commission's proposed approach.

### **3.3.3 Commission draft decision**

The NEMMCO determination extending the calculation of causer pays factors in an explicit manner to cover semi-scheduled generators from March 2009, has the effect that under new arrangements, wind generators which are classified as market semi-scheduled will meet the intention of the current licence requirements which can therefore be removed.

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<sup>15</sup> See <http://www.nemmco.com.au/powersystemops/168-0100.pdf>

**COMMISSION DRAFT DECISION**

**Current Licence Condition**

ANCILLARY SERVICES

The licensee must ensure that it has installed, and keeps operational, metering suitable for the purposes of clause 3.15.6A(h) of the National Electricity Rules to allow the individual contribution of the electricity generating plant to the aggregate deviation in frequency of the power system to be assessed within each trading interval of the National Electricity Market.

The licensee must comply with requirements imposed under the National Electricity Rules from time to time in relation to ancillary services arrangements

**Proposed Licence Condition**

For generators classified as semi-scheduled - delete condition from Licence

### **3.4 Technical Standards**

#### **3.4.1 Commission Proposal**

The Commission Proposal Paper proposed the retention of the technical standards set out in the licence conditions in relation to fault ride through and reactive power, and the review and refinement of those licence conditions for consistency with the NER, but not so as to vary their technical effect.

#### **Rationale for Proposal**

In 2005, the Commission concluded that higher technical standards would need to be imposed on future wind generators, in view of the anticipated high levels of wind generation in South Australia. In particular, the Commission determined that wind generators should have the ability to:

- ride through a prescriptive and more severe low voltage event than is usually negotiated in connection agreements;
- generate and absorb reactive power and control voltage;
- smooth short term fluctuations in output; and
- be remotely controlled and be able to curtail output where necessary.

### ***Fault Ride Through***

In forming its Statement of Principles in 2005, the Commission's view was that a robust approach to fault ride through capability was necessary, in light of the proposed high levels of wind generation in South Australia. The ability of generators to remain connected to the system through a fault is essential to prevent cascading failures. Cascading failures might otherwise occur where a system fault or the loss of one generator leads to further generators tripping off and making the situation worse.

The Commission accepted advice from ESIPC that standards higher than the minimum which could otherwise be negotiated by the wind generator proponent and the network service provider under the NER were required to ensure appropriate reliability (security) of electricity supply for South Australian electricity customers.

### ***Reactive Power***

As the minimum reactive power requirements that a generator must offer to the power system under the NER (as they stood in 2005) were very limited, the Commission determined that wind generators should be required to have reactive power capabilities greater than the minimum standard, so that:

- contribution could be made to local voltage control during and immediately after a fault; and
- the impact of further wind generators on the power system would be minimised, thereby deferring the time at which voltage control might become an issue.

The Commission's requirements were less onerous than the automatic access standard under the NER, but appropriate to ensure voltages on the network could be managed and voltage stability maintained.

### ***Changes to the NER since 2005***

In February 2006, NEMMCO proposed changes to generator technical standards in the NER to the AEMC. The AEMC completed its consideration of these proposed changes in March 2007.<sup>16</sup> The NER changes adopted by the AEMC implemented a number of significant changes to the technical standards applying to connecting generators and particularly to the application of those standards to wind generators. The tighter definition of the term 'continuous uninterrupted operation', the introduction of the consideration of impacts on reliability of the system as a result of connection, and a range of other measures improve the

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<sup>16</sup> Full details of the AEMC's Rule change process *Technical Standards for Wind Generation and Other Generator Connections* is available at <http://www.aemc.gov.au/electricity.php?r=20060324.143345>

NER. The work was, however, recognised as incomplete and the Reliability Panel is currently undertaking a broader review<sup>17</sup> for the AEMC.

### **Proposal**

The position put by the Commission in the Proposals Paper was informed by updated advice from ESIPC, which took account of the changes in the NER since 2005. ESIPC recommended that the Commission continue to impose South Australian specific technical standards in licence conditions. ESIPC observed it is very difficult to develop appropriate rules for the connection of wind generation across the NEM, given that such rules need to apply in South Australia, which has a relatively high penetration of wind generation, at the same time as applying to Queensland and New South Wales, where the relative contributions of wind generation to total generation output remains small.

ESIPC advised that the NER remain generally deficient in their treatment of reactive power and in provisions relevant to generator access arrangements as they affect network congestion. Both of these issues remain very important in the context of South Australia's growth in wind generation capacity and in the number of applicants seeking connection.

The NER allow applicants seeking to connect to the system to negotiate technical standards within a range. The lower limit, below which connection must not be allowed, is referred to as the *minimum access standard* and the upper limit at which connection is allowed without negotiation is the *automatic access standard*. In a number of cases, the criteria for any *negotiated access standard* between these levels are also outlined.

Schedule 5.2 of the NER sets out all the technical standards applicable to generators seeking to connect (clause S5.2.5). ESIPC advised the Commission that while the majority of the technical standards are satisfactory for wind farms and other generators seeking to connect in South Australia, for a number of the standards, ESIPC considered the technical standards which should apply to wind generators and which are necessary for network and system reliability in South Australia, lie within the range specified in the NER, but are above the minimum access standards specified.

For these standards ESIPC recommended that the Commission continue to impose (by licence condition or otherwise) a specific standard which is higher than the minimum access standard, i.e. the standard below which negotiation cannot occur. In other words, the Commission should continue to apply a narrower band in which negotiation can occur between the network service provider and the wind generator.

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<sup>17</sup> See <http://www.aemc.gov.au/electricity.php?r=20080509.151254>

In the Proposals Paper, the Commission concluded that, given the large volume of wind generation in operation, in development and in planning in South Australia, higher technical standards for fault ride through and reactive power capability should continue to be applied by the Commission through licence conditions, and this need remains despite changes to the NER.

### 3.4.2 Submissions

The Commission requested ESIPC to review the submissions received on the Proposals Paper.

While some submissions did focus on the technical standards, others indicated a preference to await the release of the proposed new wording of the technical standards licence conditions before providing detailed comment.

ESIPC has provided the Commission with a detailed response and has undertaken additional work on proposed re-wording of the technical standards to make them more consistent with the national framework.

#### *Fault Ride Through Requirements*

There were no specific comments in the submissions on the fault ride through requirements in the South Australian licence conditions.

ESIPC has recommended to the Commission that the intent of the current requirements should remain, but the statement of those requirements should be updated to incorporate the national changes and to improve clarity. In formulating its advice about the wording of the licence condition ESIPC sought advice from consultants SKM.

ESIPC recommended that the Commission replace the current licence condition in relation to fault ride through with a new provision in the following terms:

*Wind generators seeking to connect to the network in South Australia must comply with **S5.2.5.5 Generating system response to disturbances following contingency events - automatic access standard**; and*

*Wind generators seeking to connect to the network in South Australia must comply with **S5.2.5.4 Generating system response to voltage disturbances – Automatic access standard** except that generators may seek to negotiate compliance with clause S5.2.5.4 (a) (1) (the ability to ride through voltages in excess of 110 %) provided the Network Service provider agrees that there would be no material adverse impact on the quality of supply to other Network Users or power system security.*

The conditions proposed by ESIPC are similar to those currently applied by the Commission but use the NER as their basis.

The requirement to apply the automatic access standard under the NER for a generator's response to disturbances following a contingency also provides a better form of standard, targeted at the actual ride through performance required. The automatic access standard under S5.2.5.5 requires a generating system to be able to ride through a 3 phase to ground fault. This was the intention of the current licence requirements for the plant to be able to ride through a period of 175 msec of zero volts.

The application of the automatic access standard for riding through voltage disturbances then covers the remaining ride through requirements in the current South Australian arrangements.

Advice from consultants SKM to ESIPC was that the provisions in the automatic access standard S5.2.5.4 to be able to ride through periods of voltages above 110% are onerous and probably unwarranted. ESIPC has therefore recommended allowing negotiation with the relevant network operator as to whether that capability is required in a particular case.

An international review undertaken by ESIPC supports that the current South Australian requirement is not inconsistent with international practice and the refinement proposed by ESIPC should be less onerous.

### *Reactive Power*

Some submissions addressed the technical standard concerning reactive power, while others indicated a preference to comment only when the actual wording of the licence conditions was available.

The introduction of the proposed climate change and renewable energy policies by the Commonwealth Government are expected to fundamentally change the generation portfolio in the national market over the next decade. ESIPC put the strong view that the expected changes in the generation portfolio over time will expose deficiencies in the NEM arrangements relating to reactive power and South Australia will face these risks earlier than other states. Both the Reliability Panel's review of technical standards and the AEMC's review of the impacts of climate change policies on the market will potentially address this matter, but these national reviews are still at an early stage.

Network analysis by ESIPC, and work by consultants BRW and digSilent (for NEMMCO) have all highlighted real risks of problems with voltage control and voltage stability if a relatively large number of wind farms are connected in South Australia with minimal reactive capability.

The current national arrangements allow the reactive capability of connecting generators to be negotiated down to zero.

Pacific Hydro urged the Commission:

*To alter the licence conditions to allow the negotiation of the access standards in accordance with the NER and await the outcome of the reactive power review recommended by the Reliability Panel*

Pacific Hydro further noted that an appropriate method must be developed in the NEM for the co-ordinated delivery of reactive power planning, with a particular focus on efficiency, so that in the future:

*Reactive capability will need to be provided through a number of decentralised methods that are efficiently and appropriately sized for local control requirements. .... More efficient reactive power planning and placement of plant to meet the network load requirements is required along with innovative network planning and a willingness to align and adopt the grid control methods.*

Roaring 40s argued that the current South Australian technical standards

*..... increase the cost of building wind farms in South Australia in the order of 3-4%, primarily due to the need to install STATCOMS to meet dynamic reactive power requirements.*

ESIPC cautioned that costs of compliance with the South Australian technical standards must be considered relative to the lower cost of plant with a poor fault ride-through and reactive standard which otherwise would probably not comply with national requirements.

ESIPC has recommended to the Commission that the South Australian requirements should continue until adequate national arrangements are implemented.

ESIPC recommends the Commission replace the current South Australian licence conditions for Reactive Power and Voltage control with the following:

- 1. Wind generators seeking to connect to the network in South Australia must at all times be capable of continuous operation at a power factor of between 0.93 leading and 0.93 lagging at the connection point at real power outputs exceeding 5MW.*
- 2. At least 50% of that reactive power requirement to meet the above power factors must be dynamically variable, with the balance able to be provided by non dynamic plant. For the purposes of this requirement, dynamically variable means*

*continuous modulation of the reactive power output over its range, with an initial response time of less than 200 msec and a speed of response such that 95% of the steady state reactive power response is achieved within 1 second. The two second short term overload capability of dynamic plant may be used to fulfil the 50% dynamically variable requirement provided compliance to the other technical requirements can be achieved with the use of that short term capability.*

3. *The reactive power capability of the generation plant operated by the licensee must be controlled by a fast-acting, continuously variable, voltage control system which is able to receive a local and remote voltage set point.*
4. *The licensee must be able to operate its generating plant to a set power factor that is able to be set locally or remotely if that is the preferred mode of control at any time. The power factor control mode must be capable of automatically switching to voltage control mode during power system voltage disturbances, and automatically reverting to power factor mode when the disturbance has ceased.*

ESIPC is of the view that such conditions will improve the clarity of the requirements without degradation of the intent. They are clearer and less onerous than the automatic access requirements in the NER and are sufficient to ensure that there should be no local issues with reactive power as a result of wind generators connecting to the system.

The more specific requirements relating to dynamic characteristics recommended by ESIPC are consistent with arrangements in several international codes including those in the United Kingdom. A fast response time ensures the generator provides support to the system during, and immediately following, faults. A high speed response also allows any short term overload capability to be used then reducing the overall cost. The response characteristics recommended above are also consistent with solutions being adopted by wind generation proponents in South Australia.

ESIPC examined the range of reactive capability required in a range of International codes compared with the current requirement in South Australia. It notes that which the overall requirement is typical of international requirements, the fact that only half is required to be dynamically available makes the South Australian requirement less onerous.

ESIPC notes that in future circumstances when South Australian wind generators are meeting a very high proportion of the demand and displacing other conventional generators in the greater Adelaide area, reactive power supply to that area may need to be managed. In the first instance this should be managed by NEMMCO applying constraints to dispatch but at some point an additional source or sources of supply closer to the Adelaide load may be warranted. It is expected that this should be justified when its construction by ElectraNet or supply from others delivered net market benefits.

### 3.4.3 Commission draft decision

The Commission remains of the view that it is preferable that the national arrangements deal with the matters of fault ride through and reactive power for intermittent generators. However, at present the rules do not meet South Australia's particular needs.

The Commission remains convinced that the particular circumstances in South Australia require a specific regulatory response.

Some wind generators have supported this position. Roaring 40s said:

*Roaring 40s believes it is prudent to apply a degree of conservatism in the areas of fault ride through and reactive power control. It must be made clear that this view does not in any way suggest there is a deficiency in the national arrangements. Rather, it recognises that application of the national arrangements will be tested to the full in South Australia over the next few years, justifying additional conservatism in the immediate future.*

The Commission considers that it should retain the two technical standards relating to fault ride through and reactive power while remaining as consistent as possible with the NER; but that the technical standards applying to wind generators in South Australia should continue to lie at the high end of the prescribed NER negotiating range rather than the minimum. While the current national arrangements allow the reactive capability of connecting generators to be negotiated down to zero, this represents an unacceptable risk to the security and reliability of the South Australian electricity system, given the already high penetration of wind generation.

The Commission requested ESIPC to undertake a brief international review of current international technical standards to check the reasonableness of the South Australian technical requirements. ESIPC has confirmed that the South Australian arrangements, while allowing negotiation only at the high end of requirements in the NEM, are similar to, or less onerous than, the technical standards applying to wind generation in other regimes. ESIPC's assessment considered requirements in Germany (E.ON), Denmark, the UK, Ireland and Canada (Alberta).

The Commission's decision is that there is a continuing need for the technical standards for both fault ride through and reactive power capability to be higher than the minimum access standards allowable under the NER. Accordingly the Commission will continue to impose the technical standards licence conditions for wind generators in South Australia.

The Commission accepts the recommendation of ESIPC that there is merit in rewording the current licence conditions to align them more closely with the NER and to clarify their intent and requirements. The changes proposed do not materially change the current arrangements.

**COMMISSION DRAFT DECISION**

**Current Licence Conditions**

***FAULT RIDE THROUGH CAPABILITY***

Each generating unit of the electricity generating plant operated by the licensee must be capable of continuous uninterrupted operation during the occurrence of a normal voltage fluctuation caused by a transmission network fault involving a single phase or two phase to ground condition with a loading level after the fault is cleared that is at, or reasonably about, the loading level immediately prior to the fault.

For the purposes of clause XXX, normal voltage fluctuation means voltage remaining within a band for 3 minutes, 10 seconds and 175 milliseconds following a fault, with the band having:

- an upper boundary of 110% of nominal voltage at all times; and
- a lower boundary of 0% of nominal voltage for the first 175 milliseconds during the fault, 80% of nominal voltage for the first 10 seconds after the fault is cleared and 90% of nominal voltage for the next 3 minutes.

**REACTIVE POWER CAPABILITY**

At full rated power output the electricity generating plant operated by the licensee must be capable of:

- absorbing reactive power of 0.395 times that power output; and
- delivering reactive power of 0.395 times that power output.

At generation levels below full rated output the electricity generating plant operated by the licensee must be capable of:

- absorbing reactive power at a level at least pro-rata to that of full output; and
- delivering reactive power at a level at least pro-rata to that of full output.

The electricity generating plant operated by the licensee must at all times be capable of providing:

- at least 50 percent of the reactive power capabilities referred to in clause XXX and clause XXX on a dynamically variable basis; and
- the balance of any reactive power capability referred to in clause XXX and clause XXX not supplied dynamically on a static basis.

The reactive power capability of the electricity generating plant operated by the licensee must be capable of control by a fast-acting, continuously variable, voltage control system which is able to receive a voltage set point.

The electricity generating plant operated by the licensee must be capable of operating to a power factor set by the network service provider from time to time.

**Proposed Licence Conditions**

***FAULT RIDE-THROUGH CAPABILITY***

*Each electricity generating unit of the electricity generating plant operated by the licensee must comply with:*

*NER S5.2.5.5 Generating system response to disturbances following contingency events - automatic access standard; and*

*NER S5.2.5.4 Generating system response to voltage disturbances – Automatic access standard except that generators may seek to negotiate compliance with clause S5.2.5.4 (a) (1) (the ability to ride through voltages in excess of 110 %) provided the Network Service provider agrees that there would be no material adverse impact on the quality of supply to other Network Users or power system security.*

***REACTIVE POWER CAPABILITY***

*The generating plant operated by the licensee must at all times be capable of continuous operation at a power factor of between 0.93 leading and 0.93 lagging at the connection point at real power outputs exceeding 5MW.*

*At least 50% of the reactive power required to meet the above power factors must be dynamically variable, with the balance able to be provided by non dynamic plant. For the purposes of this requirement, dynamically variable means continuous modulation of the reactive power output over its range, with an initial response time of less than 200 msecs and a speed of response such that 95% of the steady state reactive power response is achieved within 1 second. The two second short term overload capability of dynamic plant may be used to fulfil the 50% dynamically variable requirement provided compliance to the other technical requirements can be achieved with the use of that short term capability.*

*The reactive power capability of the generation system operated by the licensee must be controlled by a fast-acting, continuously variable, voltage control system which is able to receive a local and remote voltage set point.*

*The licensee must be able to operate its generating system to a set power factor that is able to be set locally or remotely if that is the preferred mode of control at any time. The power factor control mode must be capable of automatically switching to voltage control mode during power system voltage disturbances, and automatically reverting to power factor mode when the disturbance has ceased.*

## 4 OTHER MATTERS

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### 4.1 *Size of Wind Farms to be included in licence conditions*

Several submissions addressed the issue of the size of wind generators covered by the Commission's wind generation licence conditions.

#### 4.1.1 Present position

In the 2005 Statement of Principles the Commission made the following decisions as to the application of the specific wind generation licence conditions:

##### *Optimized Dispatch*

The Statement of Principles requires all wind generators with a nameplate rating greater than 30 MW to register with NEMMCO as market generators and not apply for classification as non-scheduled generators under the NER. The effect of this requirement was, until the advent of the new semi-scheduled category, that wind generators above 30MW must be classified as scheduled generators under the NER.

##### *Wind forecasting, Ancillary Services, Technical Standards*

The Statement of Principles required all wind generators over 5MW to comply with the wind forecasting, ancillary services and technical standards.

#### 4.1.2 Proposals Paper

The Commission has proposed in future, all wind generators needing to be registered under the NER (that is, wind generators with a nameplate rating of more than 5 MW) be required to be registered as market generators and be classified as semi-scheduled generators.

The advantage of this requirement is that part of the obligations attendant on the NER semi-scheduled requirements, are the requirements for such generators to participate in wind forecasting and ancillary services.

A number of submissions addressed this issue.

Roaring 40s suggested a 30MW threshold had the potential to make the development of smaller sub 30MW wind farms in South Australia very attractive in the short to medium term.

Roaring 40s said:

*The 30MW threshold has the potential to create a two tier network access regime, with sub 30MW plant gaining preferential access to scarce network capacity. This creates an inefficient and inequitable regime where smaller generators are isolated from economic signals arising from network congestion. It is envisaged this could result in difficulty in managing power system security and substantial economic harm in the medium term as smaller generators strand existing larger networks by crowding congested parts of the network.*

Roaring 40s went on to suggest that the Commission should:

*... move proactively on this issue and lower the 30MW threshold for registration as semi-dispatch to 5MW as an immediate response.*

*In the longer term we suggest that ESCOSA investigate lowering this threshold further in conjunction with streamlining of semi-dispatch or similar arrangements to minimise the transaction costs of small generators participating in semi-dispatch.*

Several submissions argued that the requirement for small wind farms to be classified as semi-scheduled was onerous. For example, Pacific Hydro argued that:

*applying semi-scheduling obligations to a 5MW wind farm adds a significant cost burden to the operational control and communication infrastructure required, and effectively represents a barrier to entry for small embedded generators, this is contrary to the NEO [National Electricity Objective] and the MCE's initiative on distributed generation.*

The Clean Energy Council suggested:

*applying an obligation for a 5MW wind farm to be semi-scheduled adds a cost burden through operational control and communication infrastructure subsequently required.*

ESIPC, while noting the differing views on whether generators below 30 MW should be classified as semi-scheduled, made the following comments:

*The Planning Council:*

- notes that small wind farms are likely to be in similar wind regimes as other wind farms and therefore generate at much the same time. For the purposes of forecasting and managing the security of the power system, such small wind farms would simply act as a multiplier on the aggregate wind generation in an area;*

- *would be concerned if wind farm developers sought to bypass the South Australian licence arrangements by artificially constructing wind farms as separately connected groups of wind turbines each of which was under the 30 MW limit; and*
- *would also be concerned if a number of additional wind farms connected to critical sub-transmission lines thereby inefficiently reducing the transfer capability of the network overall.*

### 4.1.3 Commission draft decision

#### 5-30MW Generators

The Commission notes the view put in some submissions that to require classification of 5MW-30MW wind generators as semi-scheduled represents a barrier to entry of smaller scale wind generators into the market.

The Commission notes that its current requirements for participation in wind forecasting, metering and cost allocation of ancillary services apply to all wind generators of 5MW or more. The Commission also notes, as Roaring 40s highlighted, the importance of smaller wind farms facing efficient ancillary service pricing signals.

The Commission's Statement of Principles already applies wind forecasting and ancillary services obligations to 5MW-30MW generators. It is likely that the operator of the network to which a small generator connects<sup>18</sup> would require a generator control system which would allow the generation output to be controlled by the network operator, therefore, the Commission does not consider that the additional requirement for such generators to be semi-scheduled (and thereby controlled by NEMMCO) to be a significant additional requirement.

The Commission is not currently aware of any interest in the construction of wind generators between 5MW – 30MW, nor has it licensed any such wind generators.

As outlined above, the Commission does not consider that requiring such generators to be semi-scheduled, given that the network operator would require the wind generator to have a generator control system in any event.

However, the Commission is prepared to consider a modified proposal whereby any 5-30MW wind generator would not be required to be classified as semi-scheduled but the Commission would review the status of each such generator every 3 years.

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<sup>18</sup> In the case of a small generator less than 30MW the most likely connection would be to the distribution network operated by ETSA Utilities rather than the transmission network operated by ElectraNet

In the event that a plethora of small wind generators did emerge in South Australia and were considered to be contributing to system reliability and stability issues the Commission would review such licences immediately.

### *Sub 5MW wind generators*

The Commission notes that Roaring 40s suggested that there is good potential in South Australia for the development of very small wind farms and recommended that the Commission investigate whether further measures might be required for wind installations of less than 5MW.

The Commission is not currently aware of interest in the development of smaller sub-5MW wind generators. In the event that such interest develops the Commission will work with both ESIPC and ETSA Utilities<sup>19</sup> to determine whether a specific regulatory response is required.

#### **COMMISSION DRAFT DECISION**

That wind generators 5-30MW will not be required to be classified as semi-scheduled under the NER, but the Commission will review the status of each generator licensed in this range every 3 years or earlier if network issues arise from the connection of such generators.

## ***4.2 Application of semi-scheduled requirement to pre-2005 licensees***

In the Proposals Paper the Commission noted the view of ESIPC that there would be some efficiency benefits from *all* wind generators in South Australia being classified as semi-scheduled (i.e. including those licensed prior to the 2005 Statement of Principles). The Paper noted that this could impose significant costs on some existing wind generators to implement such arrangements and the benefits in some cases could be small.

However, the Commission also noted that in some cases, wind generators licensed prior to 2005 have clauses in their connection agreements that require generation dispatch control by ElectraNet. Where generators are required to meet such requirements, they would have the tools to permit remote generator control. Control of some wind generators by ElectraNet and some which contribute to the same network limitations through central dispatch by NEMMCO, could lead to inefficient outcomes.

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<sup>19</sup> It is likely that any small (sub-5MW) wind generator will be distribution connected rather than transmission connected.

#### 4.2.1 Submissions

A number of respondents raised concerns that the Commission had requested that ESIPC review pre-2005 licences in regard to the semi-scheduling requirement. Pacific Hydro stated:

*Whilst this matter does not directly affect Pacific Hydro, it signals that the Commission is considering altering licence conditions for incumbent generators. Pacific Hydro considers that this constitutes a sovereign risk for generators in South Australia and we would urge the Commission to consider the broader implications of such action before proceeding further.*

Both Cathedral Rocks and the Clean Energy Council argued similarly.

On the other hand, TrustPower supported the review by ESIPC of pre 2005 licences and considers:

*that it would be desirable for those pre 2005 licensees that are technically capable of generation dispatch to be classified as either semi-scheduled or scheduled generators.*

ESIPC responded to these concerns by reiterating that the focus of this issue is particularly on those wind generators which have pre-2005 licences and whose output is already controlled under arrangements in their connection agreement with ElectraNet. This leaves these generators controlled by ElectraNet while other generators, perhaps in the same area, are to have their output controlled by NEMMCO (AEMO in the future). The joint management does not appear to fit with the usual roles and responsibilities in the NEM and may not lead to efficient and secure outcomes.

ESIPC was of the view that it is necessary to:

*... continue to monitor outcomes in the South Australian region of the NEM and will advise the Commission if experience indicates that the efficiency or reliability of the system is being materially affected by generators subject to dispatch control by ElectraNet*

#### 4.2.2 Commission Draft Decision

The Commission notes the views put in some submissions about the so-called “sovereign risk” to wind generators should the Commission seek to apply “new” rules to existing generators.

Under the Electricity Act the Commission has the clear power to vary the terms and conditions of existing licences. Before doing so it must give the licensed entity reasonable notice of the proposed variation and allow the entity a reasonable opportunity to make representations about the proposed variation. The Act also provides a review and appeal process.

The Commission also notes that in some European jurisdictions new and up-dated technical standards and other requirements are applied to existing wind generators.

That said, the Commission has no present intention of varying pre-2005 licences for plant whose output is controlled by ElectraNet. It will continue to be guided in this matter by advice from ESIPC and the assessment of the Commission's primary and subsidiary objectives. In the event of receiving particular advice that net benefits of reclassification of some wind generation plant to semi-scheduled are substantial the Commission may vary those pre-2005 licences, but would consult with affected generators before doing so in accordance with the legislative requirements.

**COMMISSION DRAFT DECISION**

*The Commission will continue to monitor the operation of wind generation plant licensed pre-2005 with dispatch control by ElectraNet to ensure the on-going efficiency and reliability of the South Australian power system are not compromised.*

## 5 CONCLUSIONS

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National developments to better incorporate wind generation into the NEM, together with the scale of further wind generation currently considering connecting in South Australia, and the high level of wind generation already operating, under construction or committed, have led the Commission to reassess whether the licensing approach outlined in the Statement of Principles for Wind Generation Licensing developed by the Commission in 2005, remains appropriate or requires modification.

Having assessed the national changes, considered submissions from interested stakeholders and further advice from ESIPC, the Commission has concluded that while some conditions can be removed for plant which is classified in the new category of “semi-scheduled”, it is appropriate to retain the technical standards licence conditions for reactive power and fault ride through.

The Commission has reached this conclusion taking into account its primary objective which is to protect the long term interests of South Australian consumers with respect to the price, quality and reliability of essential services.

In particular, the Commission remains concerned with the long term safety and reliability of the electricity system in South Australia with 867MW of wind generation licensed and either operating, under construction or considered committed and a further 193 MW of wind generation currently at the licence application stage. If this plant is constructed as planned, it is expected South Australia will have over 1,000 MW wind generation by the end of 2010 and it is entirely possible that South Australia will have 2,400 – 2,700MW of wind generation by the end 2020.

Given that South Australia has the highest installed capacity of wind generation in Australia; the highest contribution by wind energy to State electricity demand in Australia; and in world terms, only Denmark has a higher relative contribution from wind generation to customer sales, the Commission considers a measured and cautious approach to licensing wind generators remains warranted.

The Commission remains of the view that provided wind generator proponents can satisfy the Commission that the plant and equipment to be connected at the connection point will satisfy the Commission’s technical licence conditions, together with meeting the other licensing criteria, the Commission will be discharging its legislative functions in an appropriate manner.

The proposed changes to the Commission’s standard wind generation licence conditions are as set out in this paper.

The Commission invites comments on the licence conditions, described in this Paper by 24 July 2009.



## APPENDIX 1

# Electricity Supply Industry Planning Council Letter and Advice

Electricity Supply Industry Planning Council  
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Q:\PROJECTS\Wind Studies\2008 Wind Licence Conditions Review\Ltr to ESCOSA re review of licence conditions.doc  
2009PC0045-49  
PC2004/0055 Part 4

3 June 2009

Dr Patrick Walsh  
Chair  
Essential Services Commission of South Australia  
Level 8  
50 Pirie St  
ADELAIDE SA 5000

**Re: Review of South Australian Wind Generation licence conditions**

Dear Dr Walsh,

The Commission requested the Electricity Supply Industry Planning Council (Planning Council) to provide advice as to what changes could or should be made to the Commission's current licensing requirements in relation to wind generation in the light of experience and changes to the national arrangements. Please find attached our advice.

The Planning Council's final advice has been informed by responses received to a Draft Proposal published by the Commission following receipt of initial advice from ESIPC. The advice is also based on further work by the Planning Council, including a limited review of current International practice with respect to wind generator technical standards, and some advice from consultants SKM.

The Essential Services Commission of South Australia (ESCOSA) presently imposes licence conditions on wind generators in South Australia based on licensing principles set out in the Statement of Principles for Wind Generation Licensing, issued in September 2005. These licence conditions were considered to be transitional until the National Electricity Market (NEM) arrangements were changed to provide for the connection and operation in the market of larger volumes of intermittent electricity generation.

Changes have now been made to the National Electricity Rules (NER) to better integrate wind generation into the National Electricity Market (NEM) by the inclusion of a new semi-

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scheduled classification, an advanced wind energy forecasting scheme (AWEFS) has been implemented by NEMMCO and the AEMC has reviewed the technical standards in the NER which apply to generators, particularly wind generators.

The advice therefore suggests a considerable reduction in provisions and a streamlining of the current South Australian licence conditions based on the improved national arrangements. The Planning Council reaffirms its advice, however, that additional provisions are required in South Australia given the high level of wind generation in our power system. The proposed licence conditions seek to minimise any imposts on wind generators seeking to connect in South Australia, to be clear and to better complement the national arrangements.

The Planning Council thanks the Commission for the opportunity to undertake this important work. We also would like to record our appreciation of the cooperation from Commission staff in conducting this work.

I would be happy to discuss any issues arising from this correspondence and look forward to continuing our collaboration in this area.

Yours sincerely,



David Swift  
Chief Executive

## Electricity Supply Industry Planning Council

### Review of South Australian Wind Generation licence conditions

#### 1. INTRODUCTION

The Essential Services Commission of South Australia (ESCOSA) presently imposes licence conditions on wind generators in South Australia based on licensing principles set out in the Statement of Principles for Wind Generation Licensing, issued in September 2005. These licence conditions were considered to be transitional until the National Electricity Market (NEM) arrangements were changed to provide for the connection and operation in the market of larger volumes of intermittent electricity generation.

Changes have now been made to the National Electricity Rules (NER) to better integrate wind generation into the National Electricity Market (NEM) by the inclusion of a new *semi-scheduled* classification, an advanced wind energy forecasting scheme (AWEFS) has been implemented by NEMMCO and the AEMC has reviewed the technical standards in the NER which apply to generators, particularly wind generators.

ESCOSA requested the Electricity Supply Industry Planning Council (Planning Council) to review the national changes and to provide advice as to what changes could or should be made to the Commission's current licensing requirements in relation to wind generation in late 2008. ESCOSA developed and published a Draft Proposal on 29 December 2008 following receipt of initial advice from ESIPC.

This report provides the Planning Council's final advice in regard to the current review of the South Australian Wind Generation licence conditions. This advice has been informed by a number of responses to the Proposal Paper, further work by the Planning Council and some advice from consultants SKM. The Planning Council has also conducted a limited review of current International practice with respect to wind generator technical standards.

This document provides some background information to the current review, addresses the issues received in response to the Draft Proposal Paper and recommends a range of changes to the South Australian generation licence conditions.

#### 2. BACKGROUND

In 2004, ESCOSA requested advice from the Planning Council as to any impacts that the issuing of large numbers of wind generation licences might have on the long term interests of South Australian consumers. That advice was to be based on the potential impacts on the price, quality and reliability of electricity supply to South Australian customers as these are the fundamental matters to which the Commission is required to have regard under the Essential Services Commission Act when considering whether or not to grant an electricity generation licence.

The Planning Council's advice was provided to the ESCOSA in April 2005. That advice recommended that, with the larger concentration of wind generation foreseen at the time, additional action was required.

The advice recommended that future wind generators in South Australia should be required to:

- participate in the NEM central dispatch;
- have their output predicted and advised to the market operator (NEMMCO) and market participants using state of the art wind energy forecasting;
- pay for ancillary services on a "causer pays" basis as other generators; and
- meet higher technical standards than the minimum allowed under the NER

The Planning Council remains of the view that these are the essential elements required to ensure the successful integration of large quantities of wind generation in the NEM as well as within South Australia. Each of these elements has been addressed in national forums and reviews and the NER have been improved in all respects. However there still are some deficiencies when the particular situation in South Australia is considered.

The current status of wind farms in South Australia is provided in Attachment 1. In summary, the situation in South Australia now is:

Unscheduled wind farms	387.75 MW
Scheduled wind farms	352.2 MW
Wind farms under construction	127.7 MW
<hr/>	
Total (to be complete by Q1 2010)	867.65 MW

The installed wind generation capacity in South Australia is clearly the largest in any Australian state. Taking into account the scale of the South Australian system, the relative contribution from wind generation in the State is much larger than any other state. Information available to the Planning Council is that only Denmark has a higher relative contribution from wind generation to customer sales. It is not then surprising that some additional measures, or tighter application of the national measures, are required in South Australia.

Despite the already high relative size of wind generation in South Australia, the installation of much more seems likely over the next five to ten years. ESCOSA is currently considering licence applications for an additional 193.2 MW which, if constructed as planned would take South Australia over 1,000 MW of wind generation producing over 3,000 GWh/annum within the next two years. At this point, South Australia would have passed Denmark in terms of the relative contribution of wind to total customer sales.

In addition to these projects, the Planning Council is aware of many more proposed wind generation projects, a number of which are in an advanced phase of planning. The trigger for many of these projects to progress will be the passing of legislation to

**Attachment 1      Status of Wind Farms in South Australia**

Operating Non-Scheduled Wind farms			
Registered NEM Participant	Power Station	# Units and Nameplate Rating (MW)	Station Capacity (MW)
AGL Hydro	Wattle Point	55 x 1.65	90.75
Babcock & Brown	Lake Bonney Stage 1	46 x 1.75	80.5
Hydro Tasmania/EHN	Cathedral Rocks	33 x 2	66
International Power	Canunda	23 x 2	46
Transfield Services	Mt Millar	35 x 2	70
Transfield Services	Starfish Hill	23 x 1.5	34.5
<b>Total</b>			<b>387.75</b>

Operating Scheduled Wind farms			
Registered NEM Participant	Power Station	# Units and Nameplate Rating (MW)	Station Capacity (MW)
Babcock & Brown	Lake Bonney Stage 2	53 x 3	159
AGL Energy	Hallett Stage 1– Brown Hill	45 x 2.1	94.5
Trustpower	Snowtown stage 1	47 x 2.1	98.7
<b>Total</b>			<b>352.2</b>

Wind farms Under Construction			
Developer	Power Station	# Units and Nameplate Rating (MW)	Completion Targets
AGL Energy	Hallett Stage 2–Hallett Hill	34 x 2.1 = 71	Commissioning: Q2/2009 Complete: Q3/2009
Pacific Hydro	Clements Gap	27 x 2.1 = 56.7	Commissioning: Q3/2009 Complete: Q1/2010
<b>Total</b>		<b>127.7</b>	<b>Complete: Q1/2010</b>

implement the extended renewable energy target. This is expected later this year. Recent advice from two different consultants to the National planning processes behind this year's Statement of Opportunities and the National Transmission Statement forecast 2,400 to 2,700 MW of wind generation in South Australia by 2020.

### 3. THE DRAFT PROPOSAL PAPER

Comments were sought on the Draft Proposal for changes to the wind generation licencing requirements in South Australia by ESCOSA. Submissions were received from

- Cathedral Rocks
- Clean Energy Council
- National Trust
- Pacific Hydro
- Roaring 40s
- Suzlon
- Trustpower

These following addresses each of the main areas in the South Australian licencing arrangements, addressing comments received in each area.

#### 3.1. Central dispatch

*The Commission proposes to:*

*Require that all future wind generation licensees must be classified as semi-scheduled under the National Electricity Rules. The Commission notes that existing licensees wishing to transfer to the new classification may do so within the terms of the licence currently issued*

The Issues Paper also notes that the Commission has requested ESIPC to review other pre-2005 licences.

The Planning Council remains of the view that the market changes to introduce a suitable form of central dispatch of wind farms will be of increasing importance in maintaining power system security while connecting high levels of wind generation. None of the respondents argued against this general principle. Comments concentrated on the following issues:

- the size of wind farms which should be required to meet the requirements of being semi-scheduled; and
- whether the requirement to be semi-scheduled should be extended to wind farms completed before the introduction of ESCOSA's wind generator licencing arrangements.

The National Electricity Rules now require wind generators over 30 MWs to be registered in the new category of 'semi-scheduled' plant unless they are exempted by the transition arrangements. The proposed South Australian licencing conditions would require all

generators needing to be registered to be classified as semi-scheduled. The Rules and NEMMCO's procedures generally require wind generators over 5 MWs to be registered so the proposed South Australian licencing arrangements extend the national requirements to apply to wind farms over 5 MWs. In this respect, the proposed new arrangements are consistent with the current ESCOSA arrangements.

Several submissions argued that the requirement for small wind farms to be classified as semi-scheduled was onerous. For example, Pacific Hydro argued that

"applying semi-scheduling obligations to a 5MW wind farm adds a significant cost burden to the operational control and communication infrastructure required, and effectively represents a barrier to entry for small embedded generators, this is contrary to the NEO and the MCE's initiative on distributed generation."

On the other hand, Roaring 40s suggested that

"ESCOSA needs to move proactively on this issue and lower the 30MW threshold for registration as semi-dispatch to 5MW as an immediate response. In the longer term we suggest that ESCOSA investigate lowering this threshold further in conjunction with streamlining of semi-dispatch or similar arrangements to minimise the transaction costs of small generators participating in semi-dispatch."

The Planning Council notes the differing views on whether generators below 30 MW should need to be classified as semi-scheduled. The Planning Council does not want to place unnecessary barriers to entry on smaller size wind farms which may, in some cases, deliver advantages as embedded generators. We are not aware of any such proposals in South Australia at this stage and are concerned that the integrity of ESCOSA's licencing conditions are maintained. In this respect, the Planning Council:

- notes that small wind farms are likely to be in similar wind regimes as other wind farms and therefore generate at much the time. For the purposes of forecasting and managing the security of the power system, such small wind farms would simply act as a multiplier on the aggregate wind generation in an area;
- would be concerned if wind farm developers sought to bypass the South Australian licence arrangements by artificially constructing wind farms as separately connected groups of wind turbines each of which was under the 30 MW limit; and
- would also be concerned if a number of additional wind farms connected to critical sub-transmission lines thereby inefficiently reducing the transfer capability of the network overall.

The Planning Council is not aware at this stage of significant interest in smaller wind farms and considers that the way the current proposals apply to all registered wind generators removes the risk of distortions.

A number of respondents raised concerns that the Commission had requested that ESIPC review pre-2005 licences in regard to the semi-scheduling requirement. Pacific Hydro stated:

"Whilst this matter does not directly affect Pacific Hydro, it signals that the Commission is considering altering licence conditions for incumbent generators. Pacific Hydro considers that this constitutes a sovereign risk for generators in South Australia and we would urge the Commission to consider the broader implications of such action before proceeding further."

Cathedral Rocks submission argued similarly and added that:

"Investors committing to high-value long-life infrastructure projects such as wind farms do so with the reasonable expectation that they would be immune from punitive retrospective changes to network access arrangements."

On the other hand, TrustPower supported with the review by ESIPC of pre 2005 licences and considers

"that it would be desirable for those pre 2005 licensees that are technically capable of generation dispatch to be classified as either semi-scheduled or scheduled generators."

The Planning Council supports the need to provide confidence to investors in the competitive energy market and that this will lead to longer term lower costs and more efficient outcomes. The point of review was to focus particularly on those generators who have pre-2005 licences and whose output is already controlled under arrangements in their connection agreement with ElectraNet. This leaves these generators controlled by ElectraNet while other generators, perhaps in the same area, are to have their output controlled by NEMMCO (AEMO in the future). The joint management does not appear to fit with the usual roles and responsibilities in the NEM and may not lead to efficient and secure outcomes.

The Planning Council's advice to the Commission in regard to wind licensing continues to be based on consideration of the potential impacts on the long term interests of South Australian consumers and, in particular, the potential impacts on the price, quality and reliability of electricity supply to South Australian customers. As such, any potential impacts on equity between wind generators are not considered. The Planning Council will monitor outcomes in the South Australian region of the NEM and will advise the Commission if experience indicates that the efficiency or reliability of the system is being materially affected by generators subject to dispatch control by ElectraNet.

### 3.2. Wind Forecasting

*The Commission proposes to:*

*Remove the licence condition relating to the provision of wind forecasting information to NEMMCO, from 31 March 2009 for all new wind generators in South Australia registered as "semi-scheduled" generators and retain the conditions relating to the provision of information and models to both the Commission and ESIPC.*

1. *The licensee must, on request, provide to the Planning Council, the Commission or NEMMCO, accurate and verifiable wind energy forecasting data and temperature data, appropriately constructed wind energy conversion models, documents and other information concerning the operation of the electricity generating plant which the licensee is authorised by this licence to operate.*
2. *Any data, models, documents and information requested under this clause must be provided in the manner and form and within the time frame specified by the Planning Council, the Commission or NEMMCO.*

No responses argued against the removal of the licence conditions relating to the provision of wind forecasting information to NEMMCO. Under the current NEM arrangements, any generator registering as semi-scheduled becomes part of the national wind forecasting arrangements. The introduction of the Australian Wind Energy Forecasting System (AWEFS) to the national arrangements is a significant achievement and represents a major step forward since ESCOSA introduced these licence conditions. All wind farms in South Australia have their output forecast by AWEFS and these forecasts are used in market operations whether or not those wind farms are scheduled.

Several respondents raised concerns that the requirements to provide models to both ESCOSA and the Planning Council were proposed to remain. Pacific Hydro, for example, argued that "This would appear to be an unnecessary additional obligation given that the participating jurisdiction would have the right to obtain the information directly from NEMMCO out of the AWEFS system."

The Planning Council notes that the forecasts for individual wind farms that have been developed within the AWEFS are not publicly available. Where that information can be obtained, it is subject to agreements as to how it can be used. Even if AWEFS data were to be available to ESIPC and ESCOSA, such data is only produced when the wind farm is fully commissioned.

The Planning Council recommends that the requirement to supply such data on request to ESCOSA and the Planning Council should remain as proposed in the draft Proposal. It is expected that this power should not be routinely used in the future, minimising any impost on wind generators from this licence condition.

3.3. Ancillary services

*The Commission proposes to:*

*Remove specific provisions in relation to ancillary services and metering, for wind generators classified as "semi-scheduled" from March 2009.*

Few comments were received in regard to ancillary services. The Planning Council notes that generators who have registered as a *market generator* and been classified as *semi-scheduled* are now included in the national processes to recover the costs of ancillary services. This again is an improvement in the national arrangements since ESCOSA established the South Australian licence conditions for wind generators.

While parties appeared generally content with this proposal, Pacific Hydro again noted that the requirement for all wind farms to be market and semi-scheduled, means this causer pays obligation and the additional metering requirements are imposed on all wind farms of 5 MW or more. Again Roaring 40s took the alternative position, recommending that "smaller wind farms face efficient ancillary service pricing signals". The Planning Council's comments on small wind farms have been outlined above.

3.4. Technical standards

*The Commission proposes to:*

*Retain the technical standards for fault ride through and reactive power.*

*Review and refine the technical licence conditions for consistency with the NER but not so as to vary their technical effect.*

The Planning Council has reviewed comments in regard to technical standards under the two areas where South Australian licence conditions remain. The Planning Council would prefer that the national arrangements were adequate to meet South Australia's needs. However, the Planning Council remains convinced that the particular circumstances in South Australia require a specific response. This position has been supported by some wind generators. In their submissions Roaring 40s says:

"Roaring 40s believes it is prudent to apply a degree of conservatism in the areas of fault ride through and reactive power control. It must be made clear that this view does not in any way suggest there is a deficiency in the national arrangements. Rather, it recognises that application of the national arrangements will be tested to the full in South Australia over the next few years, justifying additional conservatism in the immediate future."

Others raised concerns. Pacific Hydro were concerned that the draft Proposal did not detail the proposed changes to licence conditions and that they would like further consultation before the requirements are finalised. The Commission could make a decision on the value of further consultation, considering the final package of measures proposed.

To remain as consistent as possible to the NER, the technical standards currently applying to wind generators in South Australia all lie within the prescribed negotiating range, albeit to the high end of the range rather than the minimum.

A brief review of current International technical standards has been undertaken to check the reasonableness of the recommended technical requirements. The Planning Council can confirm that the South Australian arrangements, while toward the high end of requirements in the NEM, are similar to, or less onerous than, the technical standards applying to wind generation in other regimes. This assessment has considered requirements in Germany (E.ON), Denmark, the UK, Ireland and Alberta Canada.

#### Fault ride through

There were no specific comments on the fault ride through requirements in the South Australian licence conditions. The Planning Council considers that the intent of the current requirements should remain, but the statement of those requirements should be updated to incorporate the national changes and to improve clarity. The Planning Council has also sought advice from consultants SKM.

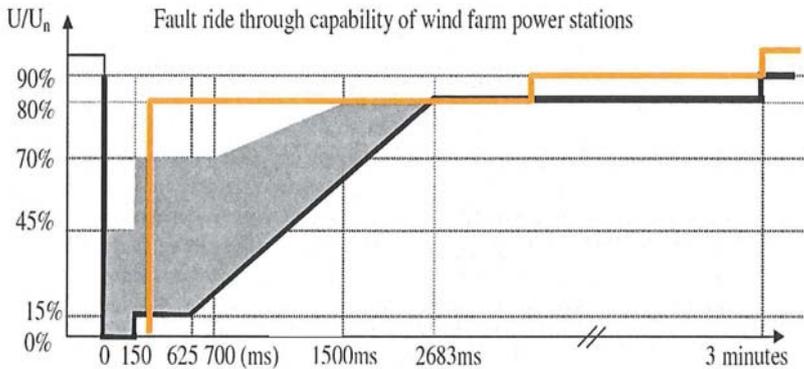
The Planning Council recommends that the following conditions replace the current South Australian licence conditions for fault ride through:

Wind generators seeking to connect to the network in South Australia must comply with S5.2.5.5 Generating system response to disturbances following contingency events - automatic access standard; and

Wind generators seeking to connect to the network in South Australia must comply with S5.2.5.4 Generating system response to voltage disturbances – Automatic access standard except that generators may seek to negotiate compliance with clause S5.2.5.4 (a) (1) (the ability to ride through voltages in excess of 110 %) provided the Network Service provider agrees that there would be no material adverse impact on the quality of supply to other Network Users or power system security.

These conditions are similar to those that currently apply but use the NER as their basis. The requirement to apply the automatic access standard under the NER for a generators response to disturbances following a contingency also provides a better form of standard, targeted at the actual ride through performance required. The automatic access standard under S5.2.5.5 requires a generating system to be able to ride through a 3 phase to ground fault. This was the intention of the current requirements for the plant to be able to ride through a period of 175 msecs of zero volts.

The application of the automatic access standard for riding through voltage disturbances then covers the remaining ride through requirements in the current South Australian arrangements. Advice from consultants SKM was that the provisions in the automatic access standard S5.2.5.4 to be able to ride through periods of voltages above 110% are onerous and probably unwarranted. The Planning Council has therefore recommended allowing negotiation as to whether that capability is required in a particular case.



Reactive power

Reactive power remains an area where the national arrangements in the NER are clearly deficient. The introduction of the proposed climate change and renewable energy policies by the Commonwealth Government is expected to fundamentally change the generation portfolio in the national market over the next decade. The Planning Council considers that the expected changes in the generation portfolio will expose the deficiencies in the NEM arrangements relating to reactive power. The Planning Council has made submissions in these respects to the Reliability Panel's review of technical standards and the AEMC's review of the impacts of climate change policies on the market. The Planning Council has also developed a "strawman" proposal for a new framework for reactive power in the NEM in association with consultants OakleyGreenwood.

These national reviews are still at an early stage and South Australia faces the risks outlined earlier than other states. Network analysis by the Planning Council, consultants BRW (working for the ESIPC) and digSilent (working for NEMMCO) have all highlighted real risks of problems with voltage control and voltage stability if a relatively large number of wind farms are connected in South Australia with minimal reactive capability.

The current national arrangements allow the reactive capability of connecting generators to be negotiated down to zero.

Pacific Hydro considers that in the future:

"Reactive capability will need to be provided through a number of decentralised methods that are efficiently and appropriately sized for local control requirements. .... More efficient reactive power planning and placement of plant to meet the network load requirements is required along with innovative network planning and a willingness to align and adopt the grid control methods."

They further argue that the "license conditions will inevitably result in inefficiencies, with systems being either under or over designed, rather than being designed according to the actual requirements of the SA network."

Roaring 40s argues that the current South Australian technical standards

"..... increase the cost of building wind farms in South Australia in the order of 3-4%, primarily due to the need to install STATCOMs to meet dynamic reactive power requirements.

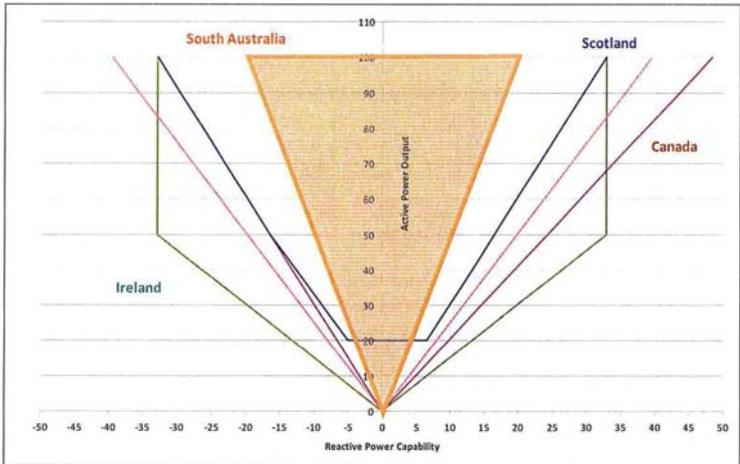
The Planning Council would like to see a proper framework for the acquisition and supply of reactive power in the NEM. There are potential inefficiencies in imposing requirements through connection standards. The Planning Council considers that Roaring 40s assessment of the cost is on the high side and must be regarded as relative to the cost of plant with a poor fault ride-through and reactive standard which otherwise does probably not comply with national requirements.

Despite the risk of some inefficiency, the Planning Council recommends that the South Australian requirements should continue until adequate national arrangements are implemented. The Planning Council proposes a rewording of the the existing requirements, in the light of experience, to make them clearer

The Planning Council recommends that the following conditions replace the current South Australian licence conditions for Reactive Power and Voltage control:

1. Wind generators seeking to connect to the network in South Australia must at all times be capable of continuous operation at a power factor of between 0.93 leading and 0.93 lagging at the connection point at real power outputs exceeding 5MW.
2. At least 50% of the reactive power required to meet the above power factors must be dynamically variable, with the balance able to be provided by non dynamic plant. For the purposes of this requirement, dynamically variable means continuous modulation of the reactive power output over its range, with an initial response time of less than 200 msecs and a speed of response such that 95% of the steady state reactive power response is achieved within 1 second. The two second short term overload capability of dynamic plant may be used to fulfil the 50% dynamically variable requirement provided compliance to the other technical requirements can be achieved with the use of that short term capability.
3. The reactive power capability of the generation system operated by the licensee must be controlled by a fast-acting, continuously variable, voltage control system which is able to receive a local and remote voltage set point.
4. The licensee must be able to operate its generating system to a set power factor that is able to be set locally or remotely if that is the preferred mode of control at any time. The power factor control mode must be capable of automatically switching to voltage control mode during power system voltage disturbances, and automatically reverting to power factor mode when the disturbance has ceased.

The above suggested modifications improve the clarity of the requirements without degradation of the intent. They are clearer and less onerous than the automatic access requirements in the NER and are sufficient to ensure that there should be no local issues with reactive power as a result of wind generators connecting to the system. The more specific requirements relating to dynamic characteristics are consistent with arrangements in several International codes including those in the United Kingdom. A fast response time ensures the generator provides support to the system during, and immediately following, faults. A high speed response also allows any short term overload capability to be used thus reducing the overall cost. The response characteristics recommended above are also consistent with solutions being adopted by proponents in South Australia.



The above graph shows the range of reactive capability required in a range of International codes compared with the current requirement in South Australia. The axis show the relative active and reactive power output with the range of the South Australian requirement which much be dynamically available shown shaded. While the overall requirement is typical of the International requirements, the fact that only half is required to be dynamically available makes the requirement less onerous.

In any future circumstances when South Australian wind generators are meeting a very high proportion of the demand and displacing other conventional generators in the greater Adelaide area, reactive power supply to that area may need to be managed. In the first instance this should be managed by NEMMCO applying constraints to dispatch but at some point an additional source or sources of supply closer to the Adelaide load may be warranted. It is expected that this should be justified when its construction by ElectraNet or supply from others delivered net market benefits.

#### 4. OTHER MATTERS

Some responses to the Draft Proposal raised other matters not addressed above. They are addressed in the following:

##### Congestion management

The Planning Council is concerned that further investment in wind generation in South Australia may lead to high levels of congestion in the transmission network. Congestion is already significant in the southeast of South Australia and at times has a significant impact on the capacity of the interconnector. Congestion in the mid-North is now emerging and could be made much more severe by the connection of wind farms in critical locations particularly on the 132 kV system or by poorly specified connection arrangements.

Roaring 40s provided the following comments in this regard:

"Inter-regional congestion is not having a major impact on the NEM at this point in time, however it is anticipated that substantial congestion will arise in the South Australian network over the short to medium term as a result of the rapid deployment of large scale wind farms.

Roaring 40s is gravely concerned that developers connecting to the South Australian system struggle to inform themselves of congestion risk as a result of limited computational techniques and poor access to power system data. This has potential to cause substantial economic harm in that poorly informed developers may unknowingly connect to congested parts of the network, so stranding their own investment and existing investments of others.

Roaring 40s suggests that ESCOSA give consideration to mandating provision of a congestion analysis report at time of license application to ensure connecting parties have informed themselves adequately of this risk. This would substantially mitigate the risk of a market failure due to insufficiently informed market participants."

The Planning Council shares these concerns but is unconvinced that it is ESCOSA's responsibility to protect developers from themselves. The Planning Council has run a full day forum with wind generation proponents and is developing better planning models to inform the market of these risks.

The Planning Council's remaining concern is that the minimum access standard under S5.2.5.12 'Impact on network capability' is deficient.

The automatic access standard under these provisions of the NER requires that a generator connecting to the system "does not reduce any *inter-regional* or *intra-regional power transfer capability* below the level that would apply if the *generating system* were not *connected*." The automatic access standard reduces the requirement to allow some reduction in power transfer capability but only applies to "*power transfer capability* into a region". This leaves open the risk that a new connection could have a severe and

inefficient impact on intra-regional power transfers or on regional exports. The Planning Council considers this deficiency should be rectified. While the South Australian licence conditions could be changed to implement this, the Planning Council considers that a better solution would be for ESCOSA to engage in talks with ElectraNet and receive assurances in this respect. Recent changes in ElectraNet connection policies conveyed to the Planning Council and the industry should, if maintained, deal with any concerns. The Planning Council will also seek opportunities to promote changes in the NER in respect to the minimum standards under clause S5.2.5.12.

Voltage and reactive power control characteristics

Pacific Hydro raised concerns that ESCOSA "may stipulate a requirement for a wind farm to meet the automatic standard in S5.2.5.13." Standard S5.2.5.13 specifies the characteristics required of a generating system in regard to "Voltage and reactive power control". Initial advice from our consultants SKM was to consider applying this requirement as a way of defining what was meant by "dynamic" capability and "fast response". However this standard is defined around conventional synchronous generators and is considered unsuitable in its current form.

The Planning Council considers this matter is dealt with in the conditions for reactive power discussed above and is based on International codes and current South Australian practice.

## 5. CONCLUSIONS

The Planning Council has addressed the issues received in response to the Draft Proposal Paper and recommends a range of changes to the South Australian wind generation licence conditions. Those changes do not seek to materially change the current arrangements but should improve their clarity and better align them to the National Electricity Rules. The proposed changes are:

That all future generation wind generators seeking licences in South Australia should be required to:

- A. be *registered* and *classified* under the NER as *market, semi-scheduled generators*
- B. provide information to support wind forecasting as follows:
  1. *The licensee must, on request, provide to the Commission or the Planning Council accurate and verifiable wind energy forecasting data and temperature data, appropriately constructed wind energy conversion models, documents and other information concerning the operation of the electricity generating plant which the licensee is authorised by this licence to operate.*
  2. *Any data, models, documents and information requested under this clause must be provided in the manner and form and within the time frame specified by the Planning Council, the Commission or NEMMCO.*

- C. meet the following conditions for fault ride through:
1. *Wind generators seeking to connect to the network in South Australia must comply with S5.2.5.5 Generating system response to disturbances following contingency events - automatic access standard; and*
  2. *Wind generators seeking to connect to the network in South Australia must comply with S5.2.5.4 Generating system response to voltage disturbances – Automatic access standard except that generators may seek to negotiate compliance with clause S5.2.5.4 (a) (1) (the ability to ride through voltages in excess of 110 %) provided the Network Service provider agrees that there would be no material adverse impact on the quality of supply to other Network Users or power system security.*
- D. meet the following conditions for Reactive Power and Voltage control:
1. *Wind generators seeking to connect to the network in South Australia must at all times be capable of continuous operation at a power factor of between 0.93 leading and 0.93 lagging at the connection point at real power outputs exceeding 5MW.*
  2. *At least 50% of the reactive power required to meet the above power factors must be dynamically variable, with the balance able to be provided by non dynamic plant. For the purposes of this requirement, dynamically variable means continuous modulation of the reactive power output over its range, with an initial response time of less than 200 msecs and a speed of response such that 95% of the steady state reactive power response is achieved within 1 second. The two second short term overload capability of dynamic plant may be used to fulfil the 50% dynamically variable requirement provided compliance to the other technical requirements can be achieved with the use of that short term capability.*
  3. *The reactive power capability of the generation system operated by the licensee must be controlled by a fast-acting, continuously variable, voltage control system which is able to receive a local and remote voltage set point.*
  4. *The licensee must be able to operate its generating system to a set power factor that is able to be set locally or remotely if that is the preferred mode of control at any time. The power factor control mode must be capable of automatically switching to voltage control mode during power system voltage disturbances, and automatically reverting to power factor mode when the disturbance has ceased.*

The Commission may wish to consider other matters raised in this report and to enter into discussions with ElectraNet regarding efficient connection policies.