System Management's Position on Windfarm Capacity Credits in the Reserve Capacity Mechanism

Introduction

The following is System Management's response to the REGWG work package 2 report prepared by MMA.

Points Leading to System Management's Position

System Management would make the following points on capacity credits for windfarm generators in SWIS:

1. The WEM reserve capacity mechanism is directly linked to the statement of opportunity and the provision of capacity to meet the SWIS load demand. In this way the commercial and physical outcomes in the WEM are directly linked.

2. The capacity made available to System Management through the reserve capacity mechanism has a direct impact on the ability to operate the SWIS securely and reliably.

3. The Planning Criterion in the Market Rules (Clause 4.5.9) stipulate the greater of:

   - a reserve margin equal to the greater of 8.2% of the one in 10 year forecast peak demand or the capacity of the largest generating unit

   - an energy shortfall limit of 0.002% of annual energy consumption

4. In SWIS the reserve margin of 8.2% is the dominant factor. Note that this is the normal criteria used for 'peaky' power systems such as the SWIS. In the NEM, or power systems with high capacity factors (ie reasonably high base load), the 0.002% criteria is the more dominant factor.

   MMA's report to the REGWG used the 0.002% expected energy shortfall approach in lieu of the currently applicable reserve margin approach. However the current reserve margin of 8.2% is estimated by MMA to be equivalent to an expected energy shortfall of around 0.0005%.

   If the reserve capacity margin is moved to a lower value, commensurate with an expected energy shortfall of 0.002%, then we are accepting that lack of wind generation will result in load shedding during peak periods.

   The load at risk value associated with the 0.002% expected energy shortfall is 473 MW for a one in ten year forecast peak demand. The one in 2 year forecast peak demand is only about 160 MW less than the 10% POE forecast. This means that on average we are prepared to accept the loss of 313 MW of load during the peak period[1].

[1] Refer to DM 7100374, entitled "Comments on IMO Intermittent Generation Capacity report" provided by Tom Pearcy (on behalf of Western Power Corporation) to the IMO.

For this reason System Management does not endorse moving the current reserve margin downwards to a level commensurate with expected energy shortfall of 0.002%.

5. Whilst the current measure applied to total windfarm capacity credit is the historical average of total windfarm output, System Management is concerned that there may be some correlation between windfarm output and timing which is not visible when an annual average measure is adopted. In particular correlation between the time of day, the season and the windfarm output.

6. MMAs report to the REGWG suggested adoption of an average of windfarm outputs based on the peak load intervals (250, 500 or 750 intervals).

   System Management has concerns that this filtered averaging approach may lead to intervals being included which lie outside the summer afternoon peak periods (i.e. between 13:00 and 17:30 from 1 February to 14 March inclusive).

7. There is no real-time wind output data for major current wind farms on a one day in 10 year load. This lack of data requires that simulated data be used for years considered to be 10% POE load years.

8. The purpose of the reserve capacity mechanism is to ensure Power system Security and prevent load shedding.

   An averaging methodology introduces an additional risk to Power System Security. MMA's analysis has shown that, on average, 40% of the wind farm's output can be counted as reliable, though with a large degree of variation on specific days. However, the Power System cannot be operated on averages.

   The data indicates that, on peak days, wind farm outputs could be as low as 10%. Let us say that, once Collgar is commissioned, the maximum windfarm fleet output will be 460 MW. Should there be no oversupply of capacity, then Power System Security will be reliant on 184 MW of wind being provided (using the 40% capacity value).

   The IMO SOO[2] indicates that for 2011/12 the 10% POE maximum demand is estimated to be 4725 MW. Using the 8.2% margin, this will result in a Reserve Capacity Target of 5191 MW. Should there be no oversupply of capacity, and 8.2% of generation is unavailable (in line with the Planning Criterion), Power System Security could be compromised, as follows:

Margin (RC Target less 10% POE maximum demand)	**466 MW**
Less 8.2% of peak demand (generation on outage)	**387 MW**
Less 40% of maximum windfarm output	**184 MW**
Total	**-105 MW**

   Therefore, in order to avoid load shedding, wind output must be at least 23%

[2] IMO, 2009 Statement of Opportunities. Available at http://www.imowa.com.au/f176,17993/2009_SOO_Final_v0.2.pdf

of the maximum output (or 105 MW). If this output is not present on the peak day, load shedding will occur. The data indicates that, on peak days, total windfarm output can be as low as 10%. Therefore, should the 40% capacity credit factor be used, we will be designing a situation where load shedding may occur because the wind is not blowing.

An analysis of various scenarios (see attachment 2) shows that the next tranche of wind farms actually presents a turning point for the SWIS.

System Management Analysis

System Management has performed an alternative analysis which is based on AEMO methodology which is the reliable output at the 95th percentile[3]. The approach taken in the NEM is summarised as follows:

> While wind has the possibility of making a significant contribution during peak demand periods, the Planning Council considers that a level of dependability at least as good as that from other forms of generation is appropriate. A 5% level of unavailability as a result of forced outages would be considered at the low end of acceptable performance by industry standards. It is therefore reasonable to use this as the assessment criteria for the contribution of wind power during peak periods.[4]

The results are shown in the table below:

	Summer	Winter
Queensland	0.000	0.000
New South Wales	0.050	0.050
Victoria	0.080	0.055
South Australia	0.030	0.150
Tasmania	0.000	0.000

Based on this methodology, the 95th percentile POE of total windfarm output for intervals from 15:30 to 17:30 for summer period were compared it to 95th percentile for total windfarm output the whole year. The detailed results of the analysis are included in an attachment to this note and the results are summarised below:

> It is clear that in WA the 95th percentile POE total windfarm output is higher in summer than the 95th percentile POE total windfarm output for the whole year.
>
> The 95th percentile POE value for the summer afternoon peak intervals for total windfarm output ranged between 15% and 25% over the three year period, with an average of 18.4%. The range varied depending on the commencement time used for the summer afternoon peak period.

[3] For details of the results see AEMO "ELECTRICITY STATEMENT OF OPPORTUNITIES" Table 6.6, available at: http://www.aemo.com.au/planning/0410-0015.pdf

[4] Electricity Supply Industry Planning Council, 2009 Annual Planning Report.

System Management's Position

System Management advises its position on the capacity credit for windfarms as follows:

1. System Management recommends that the capacity level be based on the reliable output of wind-farms at the 95th percentile, in line with the NEM. Therefore, the capacity credit for windfarms for reserve capacity mechanism purposes be set at 20%.

2. System Management also recommends that this capacity credit be reviewed on a regular basis as more data becomes available, in line with the reviewing of the reliability criteria.

ATTACHMENT A

SWIS Summer (Feb01-Mar14) Windfarm Generation
Percentage Of Time Duration Values

Peak Intervals	*Min*	*5%*	*10%*	*15%*	*20%*	*25%*	*30%*	*35%*	*40%*	*50%*
13:00 to 17:30										
2008	6	19	25	37	47	52	59	65	73	84
2009	1	17	30	43	52	62	67	72	81	91
2010	7	24	32	40	44	50	56	62	67	76
2008-2010	1	20	29	40	47	54	61	67	72	84
13:30 to 17:30										
2008	13	21	29	43	49	55	62	68	75	86
2009	4	21	38	49	59	66	72	78	83	96
2010	10	24	36	42	48	54	59	65	70	80
2008-2010	4	22	34	44	50	58	64	70	76	87
14:00 to 17:30										
2008	14	22	32	45	51	59	65	73	78	88
2009	4	28	45	55	63	70	77	82	86	101
2010	10	25	37	44	51	56	63	69	71	82
2008-2010	4	25	39	47	55	62	68	73	78	89
14:30 to 17:30										
2008	15	24	40	48	55	64	70	76	79	90
2009	4	38	49	61	67	73	80	84	88	107
2010	10	26	40	47	54	61	65	70	74	85
2008-2010	4	28	42	50	59	65	71	76	81	91
15:00 to 17:30										
2008	15	26	42	49	60	67	75	78	84	93
2009	17	43	56	63	70	77	82	86	91	111
2010	10	32	41	51	57	63	69	72	76	86
2008-2010	10	32	45	54	62	69	74	78	84	94
15:30 to 17:30										
2008	16	29	43	50	59	69	77	79	85	95
2009	17	47	61	67	73	80	83	88	97	113
2010	10	32	44	54	61	65	70	74	78	87
2008-2010	10	35	47	57	64	71	77	81	85	96

ATTACHMENT B

Scenario	Actual	Projected		A	B	C	D	E	F	G
Year	**2010/11**	**2011/12**		**2011/12**	**2011/12**	**2011/12**	**2012/13**	**2012/13**	**2013/14**	**2013/14**
2009 SOO Reserve Capacity Target	4836	5191		5191	5191	5191	5632	5632	5978	5978
Additional Load Following on top of SOO[5]	0	0		0	0	0	40	40	60	60
Amended Reserve Capacity Target	4836	5191		5191	5191	5191	5672	5672	6038	6038
10% POE Maximum Demand	4397	4725		4725	4725	4725	5132	5132	5452	5452
8.2% of peak demand	361	387		387	387	387	421	421	447	447
Maximum wind output	192	460		192	460	460	460	460	600	600
Capacity credit value for wind	30%	40%		40%	30%	20%	40%	20%	40%	20%
Capacity assigned to wind (WC)	57.6	184		76.8	138	92	184	92	240	120
Planning Criterion (PC)	439	466		466	466	466	540	540	586	586
PC less 8.2% of peak demand	78	79		79	79	79	119	119	139	139
PC less 8.2% of peak demand less WC	21	-105		2	-59	-13	-65	27	-101	19
System state if 8.2% of generation on outage and no wind	SECURE	INSECURE		SECURE	INSECURE	INSECURE	INSECURE	SECURE	INSECURE	SECURE
Load shedding may occur	NO	YES		NO	YES	YES	YES	NO	YES	NO

Note that highlighted fields indicate variations in assumptions between scenarios.

[5] The 2009 SOO used a Load Following amount of 60 MW for all future years. System Management has allowed an increase in the amount of Load Following due to the commissioning of new intermittent generation.